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At What Time Did William HERSCHEL Observe the Planet Mars on the Day He Discovered Uranus?

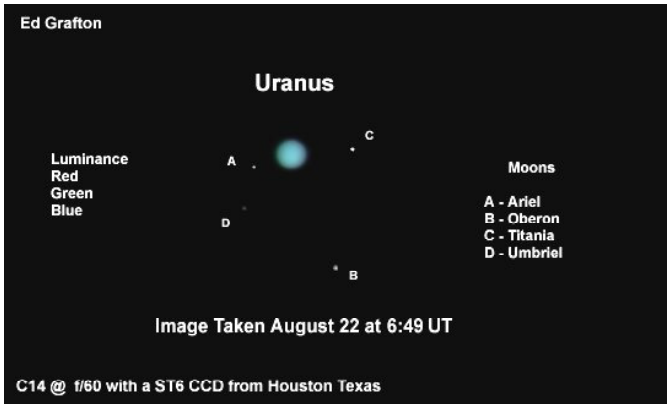
(Mars in 1781)

By

Hitomi TSUNEMACHI

This is a rough translation of a Japanese essay which Hitomi TSUNEMACHI wrote in 2001 (and published in CMO #251 - 25 September 2001 issue at page Ser1-3137). So the reader should be forced to go down at the time in 2001. This is however let now to come out to attract attention at what time the planet Mars was observed by William HERSCHEL on the night of 13 March 1781 when he discovered the new planet called later Uranus. Translation was made by M MINAMI.

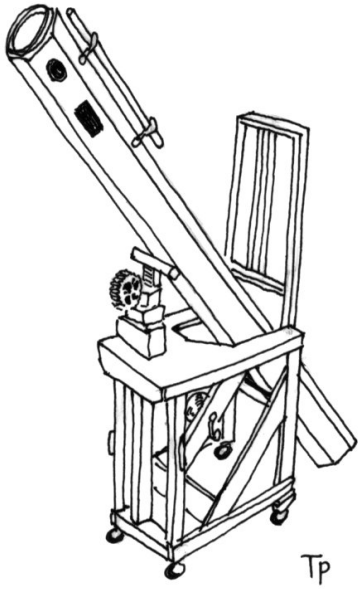
Autumnal equinoctial week visited now (in 2001). The summer which brought terrible hot days and nights in 2001 passed away now, and the apparent diameter of the planet Mars which has long been covered by the global dust storm, has shrunk to 11 arc of seconds, and, far away from Antares, is going to Capricorn passing through Sagittarius. The planet Uranus of about 6th magnitude which was at opposition on 16 August 2001 now lies among the inlaid autumn night stars in Capricorn. We hear, at the Fukui City Observatory, that they showed the tiny planet Uranus to the public in September by a 20 cm refractor.



The image of Uranus produced by Ed GRAFTON on 22 August 2001 is truly beautiful as shown here. Inspired much by his image I tried one night to look for the hidden star by the use of a 12.5 cm Fluorite refractor: It was really found as a small pleasant pretty jade-like blue planet: The image of the Takahashi Fluorite was really so excellent that Uranus was definitely a blue disc even by 40×.

As is well known, the planet Uranus was discovered by William HERSCHEL at around half past

10h PM on 13 March 1781. It appeared first just like a nebular like star or comet according to the description by Hiroshi SAIDA (in a Japanese book published in 1982: SAIDA was a late astronomical writer in Japan).



Friedrich William HERSCHEL made used of a 7 foot reflector with a 15.7 cm aperture speculum to discover the new planet. The observing station where he discovered the new planet was 19 New King Street in Bath.

William HERSCHEL was originally interested in Mars, and seemed to have started the observation of the planet Mars ever since 1777 (Mars was closest on 4 April 1777 with the largest apparent diameter of 14.91 seconds of arc). He observed the change of the polar caps and established the Mars' rotation axis which was only slightly more tilted than the Earth case. Furthermore he determined the rotation period of Mars to be 24h 39m 21.67s and so on. The latter was described in a paper in 1781, and the year 1781 was the very year when the planet Mars made a great perihelic apparition.

It is said even on the day when he discovered the planet Uranus, William never missed to observe the planet Mars: William SHEEHAN writes as follows:

> On the most fateful night of his career - March 13, 1781 - he observed Mars with recently completed 20-foot (6.1-m) reflector and recorded in his note book that there was a "very lucid spot on the southern limb… of a considerable extent." It was on the same night, between 10:00 and 11:00 PM., he had discovered with his 7-foot telescope a tiny disk among the stars. At first he thought it was a comet, but the disk later proved to be something much more consequential: it was nothing less than a new planet, the first discovered in modern times. (William SHEEHAN, *The Planet Mars, History of Observation & Discovery*, The University of Arizona Press, 1996, p32.)

According to the Table of Jean MEEUS, the planet Mars was at opposition on 12 July 1781 and was closest to the Earth on 18 July with the maximal apparent diameter of $\delta = 23.71''$, and so really it was the great apparition. Consequently if William HERSCHEL observed Mars in March it must have been in the morning, at earliest after the mid-night. Unfortunately we have no Ephemeris in 1781, and so we have to search a recent year where the planet Mars behaved like as in 1781. Fortunately Masatsugu MINAMI wrote a column of "Something Old" in CMO #106, and there he listed up a lot of (nearly) recurrence years. This is reproduced in http://www.hida.kyoto-u.ac.jp/~cmo/cmomn2/Cahier03.htm so that we ready know that the 205 year recurrence is very appropriate here, and 1781+205=1986 is resulted. Really in 1986 the planet Mars was at opposition on 10 July and was closest to the Earth on 16 July (with the maximal $\delta = 23.19''$), and so both are quite similar. The *Astronomical Almanac* in 1986 says that the apparent declination on 13 March 1986 was around $-22°50'$. As is known Bath is located westwards from London separated by 170 km, but the latitude is not so different. So if we roughly employ the latitude of Bath to be at 51.5°N, then the maximal altitude of Mars at Bath on the day is about 16° (maybe near dawn or in the bright morning sky).

William HERSCHEL moved at the beginning of March in this year from 5 River Street to the south side of the New King Street housing complex perhaps because he needed a backyard to observe the planet Mars which was destined to be seen lay low from Bath. According to MEEUS, the apparent dec-

lination of Mars when it was at opposition in 1781 was just −27°41', and hence the maximal altitude was about 11°. This low angle must have been the one Alan HEATH in England complained this year (in 2001) in CMO #249 at page 3103. This is quite natural because the apparition of 2001 is similar to the one in 1986 (as pointed already by Akinori NISHITA to me in the CMO 2000 Meeting in Yokohama). Roughly speaking the planet Mars which William HERSCHEL observed in 1781 is akin to the one we have observed this 2001 year. So we may say the apparition distressed the observers in England and hence HERSCHEL also did not observe the Mars markings in any good condition though he might be able to calculate the rotation period of the planet in 1781.

The description above by William SHEEHAN does not definitely say at what time William HERSCHEL observed the planet Mars: He just writes "it was the same night". But is it the night counted in the civil day or astronomical day (GMAT)? At any rate on the evening of 13 March, HERSCHEL must have been very busy in checking the new object and otherwise the planet Mars did not appear yet: Mars was seen in the morning. If it was counted on the same civil day, was it the morning of the civil 13 March (the preceding night) or the morning of the civil 14 March? If the former is true, and then we may not say it was the same night. Or was it on the morning of the civil 14 March 1781? (Perhaps in England it must have been annoying to change the date during the night--- before 1925, and so it was not the civil days on the HERSCHEL days -- supplemented by the translator.) Anyway Bill SHEEHAN must have a copy of the document and knows well about the difference of the days in the 18 century, and so it is expected that we could obtain a definite reply from him in a coming issue.

The *Almanac* in 1986 says that by chance on 13 March 1986 at 18h JST, Mars is to the north of Uranus by 0°21′. When the Uranus was discovered on 13 March in 1781 by HERSCHEL they (Mars and Uranus) were never close to each other, but after 205 years later they approached very closely. Is any one there who observed Uranus and Mars at the same time in 1986? MINAMI at Taipei in 1986 complained about the weather as well as the tiny Mars in March: In CMO #005 he wrote that the Martian size of about 7 seconds of arc was beyond his power, and so nothing in particular to record. Unfortunately he says he did not know the planet Uranus was near Mars. In 2001, the planet Mars was a bit larger and attained δ=8.7" on 13 March. There is a report in #241, and a CCD image by NISHITA is described: It was observed at 05:30 JST in the morning (20:30 GMT).

Surrounded by the pleasant sounds of the several kinds of autumnal insects, like "bell-ring" insects, it will be an amusing time to look at Uranus during the autumnal long night after the set down of the planet Mars until Saturn and Jupiter will come high up in the sky. At 19h JST on 26 November 2001, the planet Mars will be stay closely to the south of the planet Uranus by 0°48'.

(*Original article was written in September 2001; Illustration is given by TSUNEMACHI herself*)

CMO 09/10 Mars Note (5)

Bluish Markings in the Evening after the Northern Spring Equinox

0° Introduction

We already examined the cases of markings which may turn blue on the morning side in CMO #375 Note (3). Especially we newly found the case that the Ætheria dark patch proved bluish under the morning mist as shown by WALKER (*SWk*) and PARKER (*DPk*). This time we turn our eyes to the evening sides. We are not rich in the data, but we would like to caution the imagers to pay much attention to the very nuance of the colours of Mars though the Martian colour is poor-looking.

1° Margaritifer Sinus

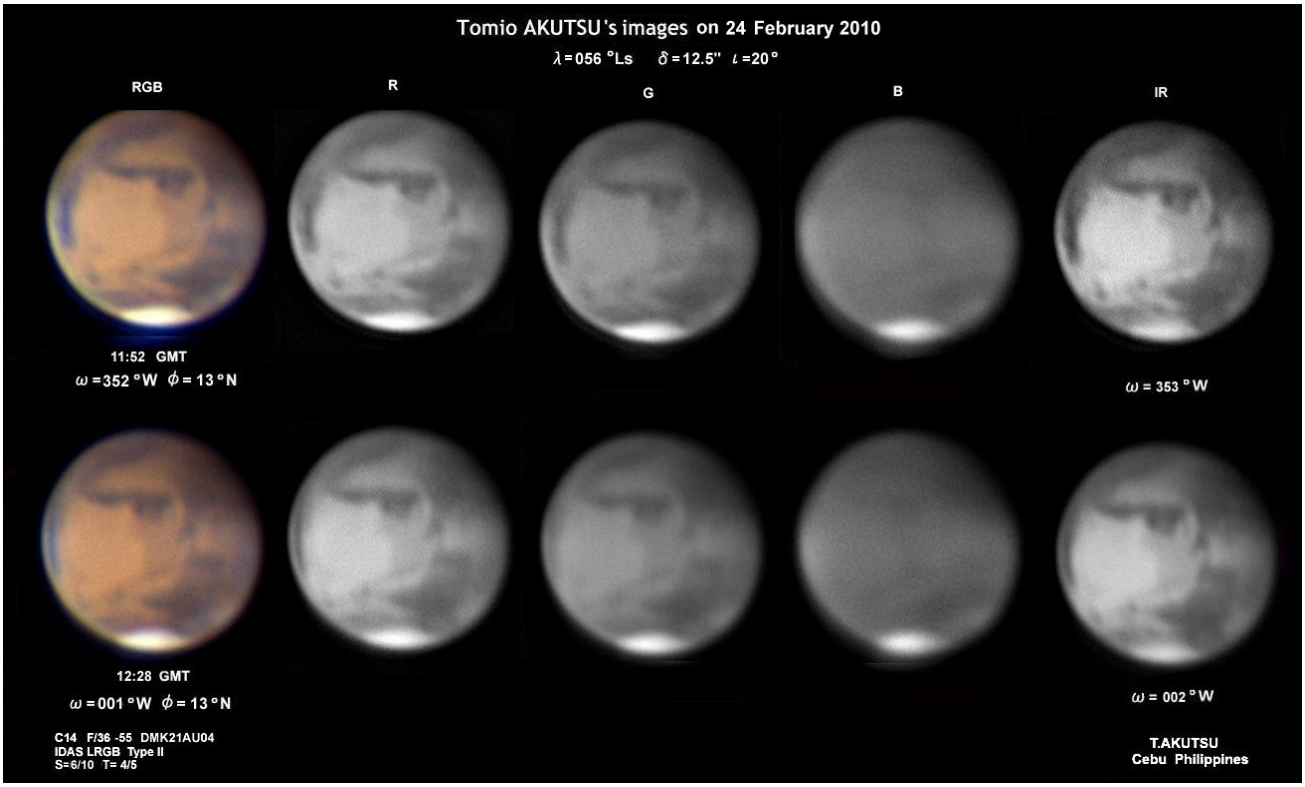
As was stated, when M Acidalium and the southern markings including Auroræ S and M Erythræum were faced towards us, the former looked dark brownish while the latter markings were rather bluish after the northern spring equinox. For instance, the present writer (*Mn*) noticed, in addition to the above characteristics, the area of Chryse-Xanthe was reddish between them on 30 Oct (λ=002°Ls) 2009 at ω=043°W etc.

Here we pick the case of Margaritifer S that showed a sky-bluish tint rather than the dark bluish one on 7 Nov (λ=006°Ls) 2009 at ω=016°W: S Meridiani was apparent at the same time but this was not so colourful but Margaritifer S was pretty sky bluish. The phase angel ι was 39°, and hence Margaritifer S was near CM, and still it was 3.5 hrs before the sunset, but we consider it was rather one of the evening phenomena. It was the first experience for *Mn* to see such a faint sky-bluish Margaritifer S, but he thought it was related with the fact that it depended on the fact the area was dusty faint in 2007, and now began to recover.

E.-M. ANTONIADI writes "*Le 0m83 nous a toujours montré par de bonnes images cette baie franchement verte (η=309° à 71°)*" and so the usual ccd imagers should pay much attention to the colour of Margaritifer S when the seeing is good. By the way heliocentric η=309° à 071° may correspond to the period between λ=222°Ls and 344°Ls, and so in 2011/2012 we have still an opportunity.

2° Evening Syrtis Mj

As a rough investigation the evening Syrtis Mj was sometimes taken slightly blue after December 2009. For example on the images on 1 Dec (λ=017°Ls) we can check it, though the data is not rich. It must have been slightly because the Libya mist was not yet active. PEACH (*DPc*)'s images on 31 Jan (λ=046°Ls) at ω=358°W, 002°W, 009°W show well the Libya mist and show a sinking a bit bluish Syrtis Mj: On this day because it was near at opposition there were a lot of work in England but not so concentrated on the sinking Syrtis Mj; and so we omit the description here. *DPc*'s images on 1 Feb (λ=046°Ls) at ω=339°W, 344°W also show the scene but he skips sometimes B images. Visually BIVER (*NBv*) sketched in colour on 1 Feb (λ=046°Ls) at the good angles at ω=330°W, 354°W and show the Libya Mist clearly but looked to miss the colour of



Syrtis Mj.

On 12 Feb (λ=051°Ls) *DPk* caught a good angle at ω=335°W, while Syrtis Mj is not bluish (just dark) though the Libya Mist was described, perhaps because his B image is made too enhanced.

On the other hand, on 22 Feb (λ=055°Ls) at ω=357°W, 007°W, AKUTSU (*Ak*) produced sets of good images where Syrtis Mj looks rather sky-bluish near the evening limb. In B, the Libya mist was mildly spread. *Ak*'s images on 23 Feb (λ=056°Ls) at ω=351°W, 001°W are similar: It is paradoxically instructive because the angles differs by 5°W. On 24 Feb (λ=056°Ls) *Ak* produced images of the same angles at ω=352°W, 001°W (above) where the seeing improved and especially the image at ω=001°W is excellent. Both cases, B images are good, and Libya mist is faintly seen (while the morning mist has been weaker than before). On 24 Feb, MORITA (*Mo*) took at ω=004°W, but missed the more timely moment. KUMAMORI (*Km*) also took at appropriate angles while the L filter of his easy LRGB images erases the true colours.

By the way, latter there appeared the examples where the blue nuance was extinguished. Typically the case of *DPc* on 7 Mar (λ=061°Ls, ι=26°) at ω=001°W, 005°W where the Libya mist clearly vanished and Syrtis Mj is sinking similarly to the other dark markings are. We of course have the data where the bluish Syrtis Mj at the evening side stays, but we skip the description.

3° Outlook

This time the activity of the evening Syrtis Mj was rather obscure because the time was after the opposition, that is, the Libya mist was not completely traced. In such a case we should calculate the angles beforehand and work more cautiously and appropriately. We are now not in the times to squeeze the details of the dark markings but should pay much attention to the colour nuance of the Martian images even if they are poor-looking.

As to a consideration of the bluish Syrtis Mj beneath the white mist, refer to (applicable to the evening case)

http://www.hida.kyoto-u.ac.jp/~cmo/cmo/note/9901/01.html

(*Mn*)

Letters to the Editor

●-------***Subject: Mellish article***

Received: Sun 12 Sept 2010 00:14:07 JST

Dear Masatsugu and Christophe; We ought to start compiling a backlog of materials to deploy when we need something for the ISMO journal, so we do not have to throw something together helter-skelter as with this Phillips piece.

I was recently corresponding with Richard Baum about T. J. J. See's possible glimpse of Mercury's craters with the U.S. Naval Observatory's refractor in either 1900 or 1901. I got to digging out old manuscripts, and came across a related piece discussing Mellish's much-discussed and disputed observation of November 1915 in which, with the Yerkes refractor, he thought he saw craters on Mars. I don't think he "discovered" craters in any absolute sense; but he saw features which were suggestive to him of those possibilities, and in the end he was proved right. Anyway, here is the text of that article for possible future deployment. Best

°-------***Subject: FW: Some information for the meeting***

Received: Wed, 22 Sept 2010 17:06:34 -0500

Dear Françoise (LAUNAY) and Masatsugu,

Note the attachment. I am going to be presenting in Milan for the Schiaparelli conference. I noted that Patrick Fuentes and Suzanne Dubarbat are also going to be there--which is great. I am looking forward to seeing both of them and it will especially be interesting to see Patrick since I'd had to cancel that hop over the Channel for Bank Holiday when I found out just how hard it was to get rooms and how expensive the Eurorail was.

Françoise, could you give me Patrick's e-mail address as I would like to communicate with him

Report of Professor Audouin DOLLFUS's Death: We are saddened by the passing away of Professor Audouin DOLLFUS on 1 October at Versailles: He was 85 of age. He was born in Paris on 12 November 1924, the year of the great apparition of Mars, as a son of Charles DOLLFUS (1893-1981) who entirely devoted to Aeronautics. Audouin studied the Mathematical Sciences at the University of Paris, obtained a doctorate in 1955. Before that at the age of 17 years of age he happened to receive a phone call from Bernard LYOT (1897-1952) (originally a call to his father who was absent), and from 1946 Audouin frequently visited Meudon and afterward Pic du Midi. Under the mentor of LYOT, Audouin learned much about photographs and drawings. Above all since LYOT was a precursor who introduced the polarimetry in astronomy, Audouin was very influenced by him and devoted to the observations by the polarised lights. He found that the polarimetric analyse permitted to characterise the surface of the Martian ground: the polarisation curve characterised the fine structure, the polarimetric curve gave the regolith, and the spectrum of the reflected light defined composition. In this way he thus proved the topical red colour of Mars is composed of the limonite or hydrate oxidic iron Fe_2O_3. These results were already published in 1955.

He is also well known by the adventures in that he made several balloon flights for the high-altitude observations. He is also the very discoverer of Janus in 1966, the tenth satellite of Saturn. *(Eds)*

before the meeting. Best,

Preliminary program

19 Ottobre - Life and science of Schiaparelli

8:30 - Registration

09:00 - 09:30 Welcome

09:30-10:15 G. V. Schiaparelli from astronomical observations to scientific imagination: *Giulio Giorello* - Università degli Studi di Milano

10:15 - 11:00 Schiaparelli and the dawn of astronomy: *Elio Antonello* - INAF-OABrera

11:00 - 11:20 Coffee break

11:20-12:05 Schiaparelli's Diary in Berlin and Pulkowo (1857-'59): a guide for his future scientific activity: *Pasquale Tucci* - Università degli Studi di Milano

12:05-12:50 Angelo Secchi and Giovanni V. Schiaparelli: *Padre Sabino Maffeo, S.J.* - Specola Vaticana

Afternoon

14:30-15:15 Schiaparelli, Flammarion and the French astronomers: *Patrick Fuentès & Suzanne Débarba*t - Obs. de Paris

15:15-15:35 Schiaparelli and the Arcetri Observatory in Florence: *Simone Bianchi* - INAF - OAArcetri [short contribution]

15:35 - 16:20 A few aspects of Schiaparelli's science: *Salvo De Meis* - Istituto Italiano per l'Africa e l'Oriente

16:20 - 16:40 Coffee break

16:40-17:25 Some historical crossroads between astronomy and visual neurophysiology: *Giovanni Berlucchi* - Università degli Studi di Verona

17:25-18:10 The study of the red planet in the past and in the future: *Angioletta Coradini* - IFSI-Roma

18:10-18:30 [short contribution]

20 Ottobre - Modern Planetary Science

9:00-9:45 Geological studies of Mars: *Cesare Perotti* - Università degli Studi di Pavia

9:45-10:30 Dust storms on Mars: *Dmitrij Lupishko* - Kharkov Observatory, Ukraina

10:30 - 10:50 Coffee break

10:50-11:35 The rotation of Mercury from G.V. Schiaparelli to Bepi Colombo: *Anna Nobili* - Università degli Studi di Pisa

11:35-12:20 G. V. Schiaparelli's classic study of Mercury in the light of CCD imagery: *William Sheehan* - Child and Adolescent Bevahvioral Health Service, Minnesota

12:20-12:40 The volcano-seismic events on the South American Pacific margin: *Giancarlo Scalera* - Istituto Nazionale di Geofisica e Vulcanologia di Roma [short contribution]

Afternoon

14:00 - 14:45 Exoplanets: the endless frontier: *J. Lunine* - Lunar and Planetary Laboratory - Arizona

14:45 - 15:30 Astrobiology: Complex textures of laminated sediments on Mars should be of biogenic origin: *V. Rizzo* - Università degli Studi di Firenze

15:30 - 15:50 Coffee break

15:50 - 16:35 Meteoroid streams and their parent bodies: *Jan Jopek* - Inst. Astron. Obs. Poznan, Polonia

16:35 - 17:20 Minor bodies: small actors in Solar System's history : *Alberto Cellino* - INAF-OATO

°-------***Subject: FW:[Fwd: Décès d'Audouin Dollfus]***
Received: Mon 04 Oct 2010 21:35:28 JST

------ Forwarded Message----------
From: Françoise Launay
Date: Sun, 03 Oct 2010 23:36:29 +0200
Subject: [Fwd: Décès d'Audouin Dollfus]

Dear Bill, I have just received this very sad piece

of news. Best wishes,

Françoise LAUNAY (Paris, France)

------- *Message original* ----------

Objet: ***Décès d'Audouin Dollfus***
De: ***"Daniel Egret"***
Date: ***Dim 3 octobre 2010 22:26***

Nous avons appris le décès d'Audouin Dollfus survenu le 1er octobre, à Versailles. Agé de 85 ans, Audouin Dollfus était astronome honoraire de l'Observatoire de Paris. Elève de Bernard Lyot, spécialiste du système solaire, il s'est rendu mondialement célèbre par ses observations astronomiques en ballon stratosphérique Ses obsèques auront lieu vendredi prochain à Versailles.

Daniel EGRET
(*Président de l'Observatoire de Paris*)

°-------***Subject: Re: Have a bon voyage!***
Received: Mon 04 Oct 2010 21:38:51 JST

Dear Masatsugu, Yes, I shall be glad to do so--assuming however they speak English!

I have just sent the very sad news about Audouin Dollfus to you. This should be announced in the ISMO. As you know, he was ill last year during the meeting in Paris, I almost had a chance to see him last spring--he had invited me to his home but the travel arrangements proved impossible, so I missed him--and just last week he had communicated from the hospital where he had been recovering from hip surgery, through Madame Dollfus his thanks for a copy of Françoise Launay's and my article on the Lady in the Moon.

He was a good friend to me over many years and will be greatly missed; one of the last of the great classical observers of the planet Mars. Ever,

°-------***Subject: Professor Dollfus***
Received: Mon 04 Oct 2010 22:21:02 JST

Dear Masatsugu, I think we should do a special issue of the ISMO containing reminiscences and appreciations of Professor Audouin Dollfus, who really was an especially inspiring figure to many of us. I corresponded with him over many years but met him only once--when I was at Pic du Midi in 1992--on the same occasion I had a very pleasant conversation with Henri Camichel in Toulouse. Nevertheless, he permitted me to interview him on many subjects--he was a brilliant but very approachable person, and ready to share his insights on an amazing range of topics. Much of what I learned about observing planets with large telescopes and the history of French planetary astronomy I owe to him. His loss is greatly felt in our small but intimate community. Let me know your thoughts.

Meanwhile, yes, I shall certainly look to meet Dmitrij Lupishko in Milano. With best wishes,

°-------***Subject: Re: About Audouin Dollfus***
Received: Tue 05 Oct 2010 11:31:05 JST

Dear Masatsugu, I believe a small corner with a black frame in which the death of Professor Dollfus is announced would be most appropriate. I would be glad to write a longer obituary article about Dollfus -- he wrote a splendid review of my book "*Planets & Perception*" for *L'Astronomie*, I spent several nights with him observing at Pic du Midi in 1992, and we corresponded over the past two decades on a fairly regular basis. I do not believe Tom Dobbins ever met him.

Richard McKim will undoubtedly publish a notice in the JBAA; perhaps he would say something too for the CMO/ISMO.

His death comes as a great shock, as I had just received, from Françoise Launay, a note indicating that he was in the hospital recovering from hip surgery, and she had received from Madame Dollfus (who has also been ailing) a kind note of appreciation of the article Françoise and I published in *Sky and Telescope* on the Lady in the Moon. I received this message just a day or two ago -- so naturally I assumed he was recovering. His death must have come suddenly and unexpectedly though I know nothing other than what Françoise sent me this morning. Best,

°-------***Subject:FW:Mare Orientale paper in l'Astronomie***
Received: Wed 06 Oct 2010 08:12:34 JST

Dear Masatsugu, This may be of interest. Best,

(***Note***) Mare Orientale-2010- l'Astronomie.pdf --- occupies *l'Astronomie*, Octobre 2010 pp32~37

°-------***Subject: FW: Lady's head***
Received: Wed 06 Oct 2010 08:21:28 JST

Dear Masatsugu, I received this from Françoise on

September 29-- a message regarding thanks received (via Madame Dollfus) from the Great Man himself, on receipt of a copy of our "Lady's Head" paper for *Sky and Telescope*. Only two days later, he was gone. I am still in shock; it is so very hard to believe.

> Dear Bill,
> I have just received a very nice thank you letter from Mrs
> Dollfus who tells me that her husband, who has been in
> an hospital in Versailles since August 23, sends us his
> congratulations for the *S&T* paper. My colleagues of
> Meudon told me that he is in hospital because of a hip
> operation, and they also told me that Mrs Dollfus has
> been treated for several months by chemotherapy
> (possibly because of leukæmia). These are not very
> good news. Best wishes, **Françoise LAUNAY**

Bill SHEEHAN (Willmar, MN, USA)

● *-------Subject: Too normal violet image*
Received: Wed 15 Sept 2010 00:36:21 JST

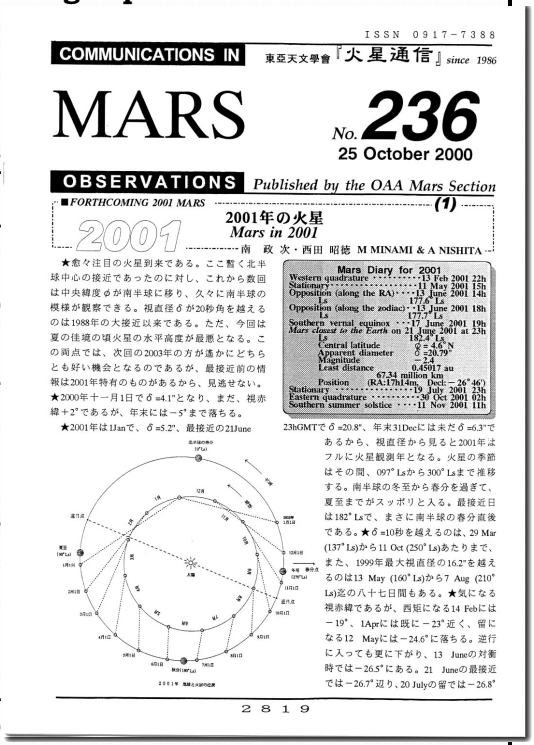
Dear Dr. Minami, and hello, all the areoholics on

TEN YEARS AGO (182)

----CMO #236 (25 October 2000) pp2819~2838 ----

http://www.hida.kyoto-u.ac.jp/~cmo/cmo/236/cmo236.html

From this issue the series of "Forthcoming 2001 Mars" began, and we made preparations for the coming apparition in 2001. The planet was to be closest to the earth on 21 June with the maximal diameter δ=20.8". So the first article was "Mars in 2001" and the second was "Ephemeris for the 2001 Mars. I " for November and December 2000. The former described some of main phenomena and showed the orbital elements and so on. The year 2001 was the one where we could always observe the planet: At the beginning in 2001, δ=5.2" and at end of the year it was δ=6.3". The southern hemisphere was declined to us and the season was from λ=097°Ls to 300°Ls. At the closest day the season was just after the southern spring equinox λ=182°Ls, and soon after it, at Fukui a dust cloud was found (in 24 June) and at the beginning of July it proved potentially the global dust storm. The article "1988/99 Mars CMO Note (14)" was "Two faint light patches in Tharsis" which were seen around at (095°W, 05°N) and (150°W, 00°N) somewhat different from the position of Olympus Mons, and were vivid in B.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COMMUNICATIONS IN 東亜天文學會『火星通信』since 1986
MARS No. 236
25 October 2000
OBSERVATIONS Published by the OAA Mars Section
■FORTHCOMING 2001 MARS (1)
2001年の火星
Mars in 2001
南 政次・西田 昭徳 M MINAMI & A NISHITA
Mars Diary for 2001
Western quadrature ····13 Feb 2001 22h
Stationary ····11 May 2001 15h
Opposition (along the RA) ····13 June 2001 14h
Ls 177.6° Ls
Opposition (along the zodiac) ····15 June 2001 18h
Ls 177.7° Ls
Southern vernal equinox ····17 June 2001 19h
Mars closest to the Earth on 21 June 2001 at 23h
Ls 182.4° Ls
Central latitude φ = 4.8° N
Apparent diameter δ =20.79"
Magnitude −2.4
Least distance 0.45017 au
67.34 million km
Position (RA:17h14m, Decl: − 26° 46')
Stationary ····19 July 2001 23h
Eastern quadrature ····30 Oct 2001 02h
Southern summer solstice ····11 Nov 2001 11h
★2001年は1Janで、δ=5.2"、最接近の21June
23hGMTでδ=20.8"、年末31Decには未だδ=6.3"で
2 8 1 9

At the latter half *Mn* wrote about a heterodox "How to read Mars" as K#6: Some severe attitudes to the observations of Mars were summed up here: Unfortunately it is not yet translated into English.

Information from Fukui described about a visit of the family of Gianni QUARRA (*GQr*): See the photo inside the dome:
http://www.hida.kyoto-u.ac.jp/~cmo/cmo/ff/ff236.html

TYA (62) picked out CMO#094 (10 Oct 1990) and CMO #095 (25 Oct 1990). 20 years ago, the planet Mars was at Tau, and on 20 Oct it was stationary. The apparent diameter went up 15" in mid-October 1990, and it came up to the meridian at 3 o'clock and the proper season set in. Reports came from five foreigners and domestically 11 numbers of observers were active. One of us (*Mk*) put forward first his photo observations.

At the latter half of September, the Japan main land suffered from the Typhoon and the rainy front, but in Okinawa they enjoyed good weather. At the beginning of October 1990, there was brought an alert of the dust near Eos from the US, but it was impossible to see from Japan. CMO #094 informs that T ASADA (*As*) will stay in the US for a year. (*Mk & Mn*)

this blue planet! Christophe Pellier's memorable very first paper in ISMO #01 was very interesting. It made me realize that imaging the red planet with violet (not blue) band of wavelength to be greatly effective to study the properties of Martian surface as well as cloud activities. I noticed Fig. 5 in this article, Christophe Guillou's fine W47 image taken on the opposition night in 2005 apparition with the famous 1-meter Cassegrain at Pic du Midi. This practically violet light image shows a « normal » surface with familiar albedo markings similar to those seen on longer wavelength pictures which the author ascribed to two aspects of the "opposition effect" upon violet images, namely (1): contrast enhancement (which had once misled Martian observers into the false idea of "Blue Haze Clearing") and (2): to make any shadow vanishing to render Valhalla very faint. At first sight I felt this W47 image was "too normal" that I almost doubted that the imager hadn't used any IR-blocking filter. However, it came to me after checking the images taken with HST and by CMO colleagues in the period around the 2005 opposition day that a high quality violet light image can actually show that « normal » surface appearance if it's obtained when almost whole the Martian surface of this side is seasonally transparent and cloudless. According to the previous spectrophotometric studies Martian regions, irrespective of brighter or darker, show remarkable drops in albedo down to 0.06 or below in the wavelength range shorter than 400nm. Many ground-based investigators with main interest in Martian water ice cloud activities still consider the differences of the planet's regional albedos in this violet spectral range to be quite insignificant. So that they can safely assume their violet images would show no albedo surface features, and the resultant uniform shadowy Martian bare surface would act as a very effective dark background screen to show cloud activities most readily. However, closer examinations of the results obtained by spectrophotometric researchers suggest there within shortest wavelength range do exist subtle but significant differences in albedo among the selected Martian measurement regions. It seems certain, thanks to recent high-tech imaging devices and image processing softs, that we can enhance such delicate albedo differences at shorter wavelength to show certain surface features on our violet Martian images, provided we get good enough raw images with favorable Signal/Noise ratios and higher optical resolutions. It may require not only good seeings but also "Mehr Licht"…larger aperture instruments and/or may perhaps special phase angle conditions and favorable apparent diameters of the planet's disk in near-opposition period. I believe Guillou's valuable W47 image is the fruit of his privilege of having access to an excellent large telescope as Pic du Midi 1-meter on the opposition night as well as his high-level imaging techniques. Yet I guess another reason of the "too normal appearance" of Guillou's W47 image is that in this side of Martian longitude, say, centered around 120°W major familiar dark albedo markings as Solis Lacus, Melas L., Noctice L., Phoenicis L., Aonius Sinus, Mare Sirenum, eastern Mare Cimmerium, Mare Chronium, etc., all have subtle but definite albedo differences against their surrounding areas in this violet spectral range with quite identical contrast relations to those seen in longer wavelengths (I mean "which of the neighboring Martian areas is brighter or darker?"). Yet again, we can even discern more delicate «usual» features in Amazonis region on this violet image! Such conspicuous «normality» of violet image surface appearances may not be expected for different longitudes. For instance, some spectrophotometric studies indicated that the measured albedo values of Sinus Sabæus/Sinus Meridiani region were often indistinguishably close to those for adjacent surrounding areas in V to UV spectral range, and were occasionally even significantly higher (brighter). Thus, this remarkably dark pipe-shaped marking may completely vanish on a quality violet image (just as HST's 13th May 2001 F410M image in Fig. 7 shows) even if taken when Martian sky is transpar-

ent and cloudless. We can make such quality violet bare surface images through various longitudes into a violet light albedo map of a certain apparition. A collection of violet albedo maps might be useful for studying long-term changes of the markings, detecting delicate cloud activities, telling clearing areas (of course not "blue clearing", I would rather say "white clearing") ,etc.….

Now returning to the author's plot at length, Pellier reproduced Guillou's W47 image to show an aspect of opposition effect upon Valhalla— that is, to render it disappearing at opposition. He considered such a disappearance to be one of the premises with which he deduced the effects of topographic relief from the darkness of Valhalla in violet light in larger phase angle conditions. Along with this W47 image, with the same aim, he cited to access to an HST image taken on 8 th Nov. 2005 captioned as "It is even hard to outline on the HST image…." Indeed Valhalla area looks quite featureless on this HST image. However, browsing through 2005 CMO Mars Gallery I noticed, around the opposition day, that many observers including Pellier himself had succeeded in showing Valhalla clearly (though rather faint). What's on Mars the matter with these findings!? Probably it's considerably a matter of image processing. Even at opposition, I suppose, Valhalla is an elusive but definite darker albedo marking which has similar contrast level to those of faint features in northern brighter area of this side of longitude. And image processings may be able to make it either pretty contrasty or almost vanishing on a Martian image. The HST image looks a little too featureless in the northern lighter area including Valhalla, which reminds me of the good old wet silver-salt days…I often spent overnight under a dark-orange safety light in my darkroom in doing a magitian-like dodging works on printing papers, often erased all planetary details from a disk! I am eager to learn "what do experienced ISMO visual observers/CCD imagers/image processors feel these different appearances of Valhalla and other markings?" Does the HST image look natural? Do some of groundbased imager's results seem to be over-enhanced with their image processings? We should be very careful, I feel, in examining the natures on the red planet through various images. When comparing separate images we should take the effects of respective image processings into account on the appearances of the resultant images, or serious misjudgments can occur.

Then for the author's another proposition, Pellier seems to regard the dark in violet Valhalla under inclined sunlight partly as strong absorption in violet light which may be bound up with Valhalla's red color. However, checking many images showing dark in violet Valhalla phenomenon, I noticed in most of the cases the area appeared fairly darker also on B,G,R and RGB images. So that the redness of the marking seems to me rather tricky. Anyway, as Dr. William Sheehan repeatedly pointed out, Martian colors are actually quite complicated, and we should wait for future discussions.

If we suppose to admit the effect of topographical relief upon the variable appearance of Valhalla, the darkness on the violet images can, at least partly, be attributed to the lack of light rather than selective absorption in a certain range of wavelength. Shadowing can surely cause the lack of light throughout the wavelengths, which may explain the sets of dark in V, B, G, R and RGB Valhalla images. I guess, though my logic may be circulating a little, the author would better try to discuss the color of Valhalla and other peculiar features also with near-opposition images to lessen the influence of shadowing.

Now concerning "A matter of relief?" a question arises. If Valhalla is a northward simple gentle downslope running diagonally (roughly ESE to WNW) along the northern coasts of Sirenum, Cimmerium and Tyrrhenum as Pellier proposed, why does it show darker appearances both under opposite lighting conditions at pre- and post-opposition periods? If the simple slope is lit from a certain direction to show a shadowy appearance, then it should look to be brighter when illuminated from

the reverse direction. That's just as the famous Lunar normal fault "The Straight Wall" looks like a linear shadow at sunrise while it appears as a bright line under an afternoon sun (see below).

http://the-moon.wikispaces.com/Straight+Wall

(See otherwise Tomio AKUTSU's fine set of the Straight Wall images under different lightings here).

Possible alternative candidates which can cause shadowing for the area both at opposite illuminating directions might be as follows:

(1) Tunnel-shaped elongated convex, or half-pipe like concave topography.
(2) Wavy or bumpy terrains.
(3) Fissure-rich or wrinkle-crowded surfaces,
(4) Smaller scale porous grounds.

Pellier suggested in the ending part of his paper the contribution of the reddish color and/or the topographical shading effect to other peculiar features' anomalous aspects in violet. I am looking forward to seeing what further progress he makes in this subject.

Here I'd like to stress again that this is an excellent paper which suggests us the importance of multicolor narrowerband (least overlapping or leaking) imaging in inspecting Martian matters more objectively or in some sense a little more quantitatively.

Thank you for reading my lengthy LtE through.

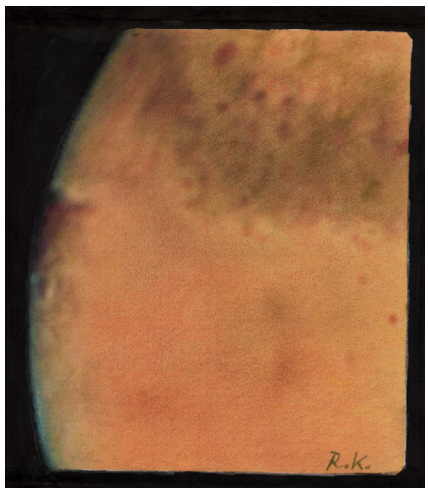
Good Images with Excellent Processings!

°------***Subject: A legendary hero***
Received: Tue 05 Oct 2010 17:05:12 JST

Dear Dr. Minami, I feel profound sorrow to learn of the passing away of Professor Audouin Dollfus. He was one of my legendary heroes repeatedly appeared in many guidebooks to planetary observation. I didn't have an opportunity of meeting with him in person, but I certainly remember what Professor Sadao Murayama used to tell us about his pleasant memories of time spent with the distinguished French astronomer who had visited Tokyo in 1968. Though he is gone, we are fortunate that we still have much to learn from the splendid works he left for us! Best wishes,

°------***Subject: Evening Canon LAU Phenomenon?***
Received: Sun 10 Oct 2010 01:23:27 JST

Dear Dr. Minami, When I was examining the HST Martian image taken on 8th Nov 2005 which Christophe Pellier had quoted in his paper in ISMO #01 to show opposition effect on Valhalla, a peculiar rectangular dark-reddish patch came to my attention. It was on the eastern rim of the disk just south of the equator. The patch seemed to have north to south size roughly 1/10 of the diameter of the Martian disk corresponding to about 700km. Its southern edge looked quite linear and pretty well-defined with slightly thickened border of bluish white mist. And at the northern end of the patch a very much dome-like figure "with a western brighter half and a shadowy eastern half" was noticed. The "dome" had about 0.5" north-south diameter on the 19.8" across Martian disk or "actual size" around 170 km. Its three-dimensional appearance might have been a kind of artifact by image processing because the Martian image was taken on just after the opposition—the most unlikely day to cast any shadow there on the evening rim where the eastern terminator had just gone over. However, if Dawes' limit is applied, HST's diffraction-limited resolving power was 0.048" or 16.4 km on the red planet. So that it seems highly probable that there existed something then.



Attached here is my close-up impression drawing of the patch on the HST image.

The reality of the peculiar feature on the HST image is verified by many CMO colleagues' images in the CMO 2005 Mars Gallery. Most remarkable one is on Larry Owens' image on 8th Nov., and the rivals are on Roland Chavez's images on the same day. The characteristics of the reddish-dark patch on the HST image are quite consistent with those recorded on the two ground-based observers' images to the details, namely overall rectangular shapes, thickenings of the southern bordering mist, and even discernible "domes" at the northern ends as well. Around the day 8th Nov. 2005 other imagers caught similar phenomena: Sean Walker and Kent DeGroff on 6th Nov., Roland Chavez on 7th, David Anderson on 8th, Don Parker on 9th and Ed Grafton on 10th respectively.

Each day the dark-reddish patch seems to have been located at around Amazonis Mensa which is slightly to the east of the location where the Morning Canon LAU Phenomena had been observed. Were those the Evening Canon LAU Phenomena!?

It's getting really cold, so please take care not to catch a cold. Best wishes,

Reiichi KONNAÏ (Ishikawa, Fukushima, Japan)

(*Note*) The dark limb spot was observed by Mn before opposition on 7 Oct at Lick. See also CMO #330 CMO 2005 Mars Note (13) as well as CMO #321 CMO 2005 Mars Note (4). (*Mn*)

●---------***Subject: Re: Post Stamp of G Schiaparelli***
Received: Wed 15 Sept 2010 22:39:25 +0200

Dear Masatsugu, Everything is fine with me, thank you, yes it was a pity that I could not reach you at Meudon, but I was very busy with my business, now I own a store in Rome (for astronomical equipment) and it takes a lot of my time. I hope to be travelling next year again to Japan, missing since 2004.

I will be happy to look for the Schiapparelli post stamp, if I can find it I will send one to you. Please say hello to all the CMO friends, I look forward to

meet you all again next year. I'm sorry but although I owns several telescopes, cannot find the time to do more than a few visual observations of the planets every year. Hope to do more from next year if I can set-up a remote controlled planetary telescope near Rome. Best wishes,

Giovanni A QUARRA SACCO (Roma, Italy)

●---------***Subject: some forgotten mars images 2010***
Received: Fri 17 Sept 2010 15:25 JST

Dear Masatsugu, kindly excuse the delay in transmitting you the remainder of the mars images, but i complete my mars collection of 2009/2010 only now. With best wishes

Ralf GERSTHEIMER(Habichtswald, Germany)

●---------***Subject: Juvisy Observatory***
Received: Fri 17 Sept 2010 18:11:08 JST

Dear Masatsugu, Exactly one year passed since you came to France for the IWCMO meeting. It was our pleasure to meet you and all the participants.

Presently, I am happy to tell you that there is some progress concerning Camille Flammarion's Observatory in Juvisy. On 6 September, as you can see with the enclosed photographs, the cupola and

the basis of the 24 cm refractor were put in place again after their restoration. The actual colour of the cupola is white, but it was still covered with blue plastic. The instrument

itself will be installed after one or two months, so that we hope to make the first observations before the end of this year.

Anyway, there is still a lot to do for the restoration of Camille Flammarion's house. The next step will be the third floor just below the observing room, where astronomers like Antoniadi and Quénisset worked after their observations.

If you have an opportunity to come again, we will be happy to invite you at Camille Flammarion's observatory and show you his souvenirs. In particular, a globe of Mars offered to him by Percival Lowell inscribes "Free land, free men, free trade". It was Lowell's typically American way to imagine the ideal life of Martians.

With best wishes.

Francis OGER

(SAF, France)

(*Photos by Yoko OGER*)

● ---------***Subject:Mars 2010 Rotating Globe Animation***
Received: Fri 01 Oct 2010 06:53:39 JST

Hi, You may remember back in May I sent out an albedo map of Mars created in Jupos from images of the planet taken between Jan and March this year with my 222mm reflector and a mono DMK-21AF04As camera.

Over the last few months I have been working to turn this map into an animation of the planet, rotating so that 1sec of time represents 1hour of rotation.

I wanted to have an animation where the appearance of the planet was as close as possible to the general appearance of the individual images that I took in the first place.

I hope you like the result which can be viewed at;
http://www.youtube.com/watch?v=of-mNmXkVJo

Thanks,

○ -------***Subject:Re:Mars 2010 Rotating Globe Animation***
Received: Tue 05 Oct 2010 05:57:41 JST

Hi Masatsugu, Thanks for your kind comments. I would be very happy if you put the animation onto your website. You know you are the first person to spot that it is rotating in the reverse direction. This was a mistake. I will try and produce a video with it rotating the right way.

The basic avi I created is enormous in size (527MB) and a gif animation will also be huge. The best compressed version I have is as a Quick Time movie (.m4v) which I have attached. If you are able

to use this that would be good as it is not too large and shows very few compression artifacts. I also attach an alternative which is an flv file which should play in Flash Player. This is not such good quality but may be okay for you. As an alternative I could send you a CD with the orginal avi on it by post. I will try and correct the rotation and send you another movie but please tell me what format you would like it in after you have tried to play the attached files. Regards,

°-------***Subject:Re:Mars 2010 Rotating Globe Animation***
Received: Tue 05 Oct 2010 15:41:50 JST

Hi Masatsugu, Here is a link to the new YouTube video with the corrected rotation;

http://www.youtube.com/watch?v=sMqXmjrozp0

Please let me know an acceptable format from my earlier mail and I will send you a compressed version of this new one by email or send you the large avi on a CD. Sorry about the error.

°-------***Subject:Re:Re:Mars 2010 Rotating Globe Animation***
Received: Wed 06 Oct 2010 05:33:44 JST

Hi Masatsugu, I cannot easily crop the image down to remove the edges but I have managed to reduce the frame from 640x480 down to 480x360 and save it as a gif. In some programs it plays at the right speed of 25fps and so takes 24 secs but in other programs it runs much slower. Please take a look and see if you are happy with it. The file is large but this is needed to make the movement smooth. Below I have some details for you if you need them;

"Animation of Mars by Martin Lewis. In this animation one second of time represents 1hour of rotation. This rotating globe is solely formed from seven images of the planet taken between 17th Jan and 5th March 2010 using a home-built 222mm Dobsonian reflector and a DMK21AF04AS mono camera with RG and B filters. This was done from the back garden of my home in St.Albans, UK with the Dobsonian being mounted on a home-built equatorial platform to enable tracking of the planet during imaging. The seven images, equally covering the whole of a rotation, were balanced and equalised and then imported into Winjupos to create a rectangular projection map of the surface of the planet. After considerable work in blending the differently formed sections of the map to generate a seamless look, the map was imported into a professional animation program by Chris Antoniou who was able to wrap the map back onto a sphere and then generate a set of 600 jpegs- one for each 2.5mins of real time. This image sequence was imported into Virtual Dub to generate an avi video of the full 360° rotation." Let me know your comments. Thanks,

°-------***Subject:*** ***Re:Re:Re: Mars 2010 Rotating Globe Animation***
Received: Thu 07 Oct 2010 03:56:46 JST

Hi Masatsugu, Thanks for uploading the file. However it really is very slow- it is much more than 1 second equalling one hour for me. I would delete that sentence from the description altogether and put nothing about the rotation speed.

To see how it is done with a YouTube link see the following, which I think looks better although you do have the YouTube logo and it is not continuous;

http://popastro.com/planet/mars-2010-globe-animation-martin-lewis/

Best regards,

Martin LEWIS (St Albans Hts, UK)

●---------***Subject: Congratulations***
Received: Sat 02 Oct 2010 09:51 JST

Dear Mr. Murakami, I would like to congratulate you on the appointment of Director of the OAA Mars Section and best wishes to your fellow recorders in their new positions as well. I am confident that you will guide the Mars section in the future to your fullest abilities. The OAA Mars Section is respected around the world as a resource of knowledge and experience on observing the planet Mars.

I would also like to thank Dr. Minami who has guided the OAA Mars Section for many years. Dr. Minami has been a friend, teacher, and inspiration to Mars observers around the world. I wish him the best in his "retirement" from the directorship.

The future is very exciting for all Mars observers. We now enjoy new tools to monitor Mars and very effective means of communication of events occur-

ring over Mars to observers/imagers around the world. Regards,

Carlos HERNANDEZ (Miami, FL, USA)

●---------***Subject: Final BAA Mars report for 2003***
Received: Mon 04 Oct 2010 02:36:32 JST

Dear Colleague, Part I of our latest final BAA Mars apparition report has been published in the October number of the BAA Journal, containing many dozens of drawings and images. Part 2 will appear in December and will contain a gallery of observers' portraits with their telescopes. You can download a .pdf file of Part 1 report from our website at
http://www.britastro.org/mars

There are also links to .pdf files of final apparition reports for 1995, 1997, 1999 and 2001 (in two parts), and interim reports for 2005, 2007-8 and 2009-10. There is also a list of our earlier reports published, extending back to 1892.

Meanwhile a final report for 2005 has been accepted for publication in the Journal next year and I am presently engaged in finishing another dealing with the global dust storm of 2007. With best wishes

○-------***Subject: RE: About Audouin Dollfus***
Received: Tue 05 Oct 2010 22:35:24 JST

Dear Bill, I shall be happy to add something if Masatsugu would like. I have his 'autobiography' here, and many of his papers. We knew each other for 30 years. He was a few weeks short of his 86th birthday, next month. In haste

○-------***Subject: RE: RE: About Audouin Dollfus***
Received: Wed 06 Oct 2010 03:57:56 JST

Dear Masatsugu, Yes, I think a more informal 'portrait' of Audouin would look good in the bulletin, and my thoughts about it are the same as yours. I have many nice photos which have never been published. When I have completed something I will be happy to send it to you. I will do this job before writing something more formal for the BAA Journal. It will be in the nature of a personal essay, concentrating upon his contributions to Mars research and my own memories of him.

I would like to write to Mr Robert Heffner about his 2007 Mars images. Would you be able to send me his email address please? Thank you.

For the last few weeks I have been very busy with the description of the 2007 global dust storm for the next BAA report. I am hoping that by the end of next year I shall be up to date with these papers, at last. In the 2007-8 report I want to publish some drawings of the planet before, during and after the dust storm. If you were able to send any of yours for this purpose (perhaps some early apparition ones) they would be appreciated as I haven't had any of them for some years. You could, if you wished, compare the same longitude at each phase of the event.

It was Professor Dollfus who, very many years ago, asked me to give a seminar at Meudon to the French Astronomical Society. I quickly agreed, but then he added, "well, you will have to deliver it in French". So there was nothing for it but to give my first lecture in a foreign language. With best wishes

○-------***Subject: Re: R Heffner and A.Dollfus's final paper***
Received: Fri 08 Oct 2010 06:20:36 JST

Dear Masatsugu, Thanks for the email and the warning, both of which are most useful. I have written, anyway, and the mail has not yet 'bounced'..... He had one or two critical images from early July 2007 which are helpful in understanding the storm, and which no-one seems to have duplicated.

I have begun to gather material for an article on Audouin. There was a short note about him in today's English national daily newspaper, The Daily Telegraph. Meanwhile I send you the English version of his final paper which I helped him to publish in the JBAA. Attached. With sincere regards.

(***Note***) Robert HEFFNER is the observer cited in CMO #333 where his image on 2 June 2007 is compared with MELKA's dust image on 25 June.

"His (DOLLFUS') final paper" is almost the same with the Dollfus paper that was prepared for the 2009 IWCMO entitled: *First Pic du Midi photographes of Mars in 1909* cerebrating one century development.

See
http://www.hida.kyoto-u.ac.jp/~cmo/cmomn5/2009Paris_Meudon_Talks_ADollfus2.htm

Richard McKIM (Peterborough, UK)

●---------*Subject: Re: Received l'Astronomie*
Received: Thu 07 Oct 2010 05:39:51 JST

Dear Masatsugu, I'm happy to you finally received the missing issue of *l'Astronomie*! I will thank Marie-Claude and Elisabeth.

Yes the passing away of Audouin Dollfus is a sad news indeed... I have been lucky to meet him once; in 2004 we had a meeting about Venus at the Institut d'astrophysique de Paris, just where we pass most of the IWCMO last year. He gave a talk on the discovery of the UV markings by Charles Boyer, and it was of course very interesting.

I'm thinking about a new paper for the ISMO, but I'm not happy with my current ideas. I'll tell you.

Now I have a very good news on my side: I'm finally leaving Paris! I have found a new job in Nantes (west France), close to my family. Nantes is a very nice town not far from the sea, and it will be better for astronomy also. I'll be there for the beginning of the new year... Best wishes

Christophe PELLIER (Seine-St-Denis, France)

●---------*Subject: Professor Dollfus*
Received: Sun 10 Oct 2010 03:48:47 JST

Dear Masatsugu, I was saddened to hear of the passing of Professor Audouin Dollfus.

Jeff Beish and I had the honor of meeting him back in 1980 at a pro-am meeting in Tucson, Arizona. He was a delightful person --very "down to earth." He was genuinely interested in what amateurs were doing and actually attended some of our A.L.P.O. paper sessions.

Dr. Dollfus was a giant in planetary astronomy. He will be sorely missed. Best regards,

Don PARKER (Miami, FL, USA)

§ § §

CMO 2009/2010 Mars Report #21 — CMO/OAA →ISMO

We further received several from the backlog of

GERSTHEIMER, Ralf (*RGh*) Habichitswald, Deutchland

1 Set of *RGB* +1 Set of *IRGB* + 5 *IR* Images (16 May; 3, 7, 15, 26 June; 4 July 2010)
32cm speculum @*f*/51 with a DMK21AF04

The IR image on 4 July (λ=114°Ls, δ=5.1″) at ω=299°W shows Syrtis Mj at the CM and Hellas a bit light. On 26 June (λ=110°Ls, δ=5.3″) at ω=027°W, R and IR show some markings. The IR image of 3 June (λ=100°Ls, δ=5.9″) at ω=250°W is rather good showing Utopia dark. Data should be accompanied with the season λ. "Distance" is needless. (*Mk* and *Mn*)

C_M_O Fu_Ku_I — **T NAKAJIMA (*Nj*)**

★We are very thankful to Hisaya HASEGAWA (442) for his kind donation to CMO/ISMO.

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CMO #377/ ISMO #03 (25 October 2010)

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