# Memoirs

OF THE

# British Astronomical Association.

VOL. XVI. PART IV.

# SIXTH REPORT OF THE SECTION

FOR THE OBSERVATION OF

# MARS.

*Director—E. M. Antoniadi, F.R.A.S.*

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*Frontispiece.*

The late Major PERCY BRAYBROOKE MOLESWORTH, R.E., F.R.A.S.

(1867–1908.)

# SECTION FOR THE OBSERVATION

OF

# MARS.

DIRECTOR.—E. M. ANTONIADI, F.R.A.S.

## *REPORT OF THE SECTION, 1903.*

## PART I.

### PROLEGOMENA.

#### 1. The Apparition of 1903.

The opposition with which we are now concerned, and which occurred on 1903, March 29, was a less unfavourable one than that of 1901. For, while Mars was almost at its maximum apparitional distance from the Earth, at 0·677 (62,800,000 miles), on 1901, February 15, he approached us to within 0·638 (59,200,000 miles) on 1903, April 3. But the still considerable altitude of the planet in 1903 atoned in some measure to European observers for the reduction of the disc, which did not exceed the value of 14″·7, a few days after opposition.

*Phenomena.*

| | |
|---|---|
| Vernal Equinox of N. hemisphere - <br> Autumnal Equinox of S. hemisphere | 1902, August 12. |
| Passage of Mars through Aphelion - | 1903, January 13. |
| Summer Solstice of N. hemisphere - <br> Winter Solstice of S. hemisphere - | 1903, February 27. |
| Mars in Opposition - - - | 1903, March 29. |
| Mars in apparitional Perigee - - | 1903, April 3. |
| Autumnal Equinox of N. hemisphere <br> Vernal Equinox of S. hemisphere - | 1903, August 28. |

It was the N. pole that the planet presented to the Earth throughout the apparition, the latitude of the centre of the disc at opposition being $+ 22°·5$.

## 2. The Members of the Section.

The following table gives the names of the Members who constituted the Mars Section in 1903, their telescopes, as well as the number of drawings forwarded by each to the Association :—

| Observer. | Locality. | Aperture of Instrument in Inches. | No. of Drawings sent. |
|---|---|---|---|
| ANTONIADI, E. M., F.R.A.S. | Paris - - - | 8½ Spec. | 19 |
| ATTKINS, E. A. L. - - | Highgate, N. - - | 6½ Spec. | 7 |
| CORDER, H. - - - - | Bridgwater - - | 6½ Spec. | 3 |
| GALE, W. F., F.R.A.S. - - | Waratah, New South Wales. | 10 Spec.<br>8½ Spec.<br>6 O.G. | 16 |
| HALL, W. J. - - - | Bury, Lancashire - | 6⅝ Spec. | 2 |
| KILLIP, R., F.R.A.S. - - | Southport - - | 5 O.G. | 2 |
| MOLESWORTH, Major P. B., R.E., F.R.A.S. | Trincomalee, Ceylon | 12¾ Spec. | 103* |
| PHILLIPS, Rev. T. E. R., M.A., F.R.A.S. | Croydon - - | 9¼ Spec. | 18† |
| | | | 170 |

* Major Molesworth's 103 drawings were lent to the Director for this Report.

† Twelve drawings by the Rev. T. E. R. Phillips are coloured, and they constitute most excellent and truthful pictures of the planet.

The Section has sustained a heavy loss since the publication of the last Report, by the death, on September 10, 1903, at the age of 55, of Dr. W. Ambrose Kibbler, F.R.A.S., one of the best observers and draughtsmen of Mars, who took such a prominent part in the work of the 1901 apparition of the planet.

Another irreparable loss was that of our ablest and most enthusiastic co-worker, Major P. B. Molesworth, R.E., F.R.A.S., who died on December 25, 1908, in the 42nd year of his age. If we consider the modesty of the means at his disposal and the high excellence of his work, our conclusion will be that Major Molesworth ranks amid the foremost observers of Mars. For, although using only a 9¼-in. Calver mirror, he was one of the first to resolve, in 1896–1897, some of the so-called "canals" into *knotted* bands.‡ In 1892 Prof. C. A. Young had already called attention to the discontinuous character of the "canals,"§ and on 1897, January 4, Dr. Cerulli recognised that those markings are groups of small spots,‖ an observation which confirmed Mr. Maunder's theory, framed in 1894–1895.¶ But the independent resolution of "canals" into knotted streaks with a small reflector

‡ *Memoirs*, B.A.A., Vol. VI., pp. 82–83.
§ Flammarion, *Mars*, Vol. II., p. 66.
‖ *Marte nel 1896–1897*, Collurania, 1898, p. 105.
¶ *Knowledge*, 1894, p. 251 ; 1895, p. 58.

gives very great credit to Major Molesworth's observational powers. From 1896 to 1903 his persevering industry enabled him to discover some 35 "lakes" on Mars; while his exhaustive data have thrown considerable light on the changes observed on the surface of the planet; on the veiling of the markings by thin cloud; on the projections of the terminator; and on contrast effects, such as the formation of subjective "canal-like" shades bordering bright regions near the "coasts" of Mars.* He was also one of the first to realise the true structure of the markings on the planet; for in his Report to the Royal Astronomical Society, published in 1905, he said that "the geometrical "and linear forms which the markings of Mars assume to many "eyes merely result from the minuteness of the component details, "and the inability of the eye to grasp their real nature."†

Major Molesworth was also a very energetic observer of other planets, and, especially, of Jupiter. During a single apparition of that planet he recorded no less than 6,758 transits of spots, and, during another apparition, as many as 5,651 transits.‡ Overwork of this kind, in such a torrid climate as that of Ceylon, finally injured his health; and his untimely death left a gap which cannot be filled in our ranks. We are glad to adorn this Report with the portrait of that distinguished observer, and, by so doing, to pay a lasting tribute to his memory.

## 3. Telescopic Notes.

Gale writes that "a newly silvered $8\frac{1}{2}$-in., by With, of "64 inches focus, was used continuously [after using a 10-in. "mirror of 75 inches focus made by R. W. Wigmore, of "Melbourne]. This speculum [of $8\frac{1}{2}$-in.] is of perfect figure, "and the image on some nights has not broken down under "a power of 700 $\pm$."

Also, "the eye-pieces used with the reflecting telescopes have "been invariably Browning achromatics. I find these give the "finest planetary definition I have seen with any telescope."

Beginners with reflectors should note that Molesworth could never have good definition as long as the tube of his $12\frac{3}{4}$-in. Calver mirror did not cool down. Another disadvantage of that otherwise most advantageous instrument—the reflector—is the occasional deposit of dew on the flat; and Molesworth often noted that, under "a heavy dew, the flat had to be warmed to "drive it off."

## 4. On the Use of Power on Mars.

On 1903, April 29, "with 750," says Molesworth, "the "brilliant sharpness of the image was lost, but the brighter "spots showed up very much more strongly with the increase "of power. I have always found this to be the case with high "powers on Mars."

As is well known, the dusky spots fade off rapidly under considerable magnification.

* *Memoirs*, B.A.A., Vol. VI., p. 74.

† *Monthly Notices*, R.A.S., Vol. LXV., p. 841.

‡ A. Stanley Williams, *Zenographical Fragments*, II., London, 1909, p. xiii.

### 5. Heat Waves and Definition.

Under date May 7, Molesworth wrote : "The bad definition "to-night was almost entirely due to very distant heat waves, "which could be sharply seen with only a very small alteration "from stellar focus." And "there is one type of cloud [in "Ceylon] which always exerts a most unfavourable influence "on definition. It is a fleecy, rather 'cotton-woolly' cloud, "generally of no great size."

### 6. Complexity of the Martian Details.

Writing about March 28, Major Molesworth says : "The "amount of detail visible is bewildering, and I despair of giving "even an approximate idea of it in a drawing." And "the broad "effects one draws are simply the combined results of myriads "of small details, too minute to be appreciated separately." Again, "I cannot help being certain that our present instruments "are quite incapable of dealing with the details of Mars, and "that even the best and most careful drawings give an utterly "wrong idea of the configurations of his surface. The eye "interprets as well as it can, but the task is beyond its powers."

### 7. Haze in the Atmosphere of Mars.

On April 28 Gale remarked that "a haziness" seemed "to "obscure the bays" of *Sinus Sabæus* and *Margaritifer Sinus*. On April 15, $\omega = 139°$, Molesworth noted that the details were "unusually faint," and on May 20, $\omega = 220°$, he wrote that "all "the details seem to have faded a good deal in intensity since April." Several other Members of the Section noticed a temporary pallor of the markings, which the Director, after his experience with the great Meudon refractor in 1909,* unhesitatingly attributes to obliteration by very thin cloud. The effect of Martian haze is to tarnish the brilliancy of white regions and to reduce the intensity of the dark spots. A list of such cases of obscuration may be given as follows† :—

| Date. | Cloudy Region. | Observer. | Date. | Cloudy Region. | Observer. |
|---|---|---|---|---|---|
| 1903. March 3 | *Hellas* | Molesworth. | 1903. April 30 | *Argyre* | Molesworth. |
| " | *Lunæ Lacus* | " | May 2 | *Syrtis Major* | Gale. |
| " 31 | *Hellas* | " | " 3 | *M. Tyrrhenum* | " |
| April 2 | *Hellas* | " | " " | *Syrtis Major* | " |
| " | *M. Tyrrhenum* | Gale. | " 4 | *Syrtis Major* | " |
| " 7 | *Elysium* | Molesworth. | " 7 | *Auroræ Sinus* | Attkins. |
| " 8–9 | *Sinus Sabæus* | Gale. | " " | *Hellas* | Molesworth. |
| " 28 | *Sinus Sabæus* | " | June 4 | *Argyre* | " |
| " " | *Margaritifer Sinus* | " | July 6 | *M. Acidalium* | Gale. |
| " 30 | *M. Tyrrhenum* | " | | | |

* *Journal*, B.A.A., Vol. XX., pp. 22–24.

† More details on Martian cloud will be found in this Report in the description of the various markings.

Gale and Molesworth observed hazy condensations in the S. polar regions,* while the results of the same observers, combined with those of Phillips and of the Director, show that the N. polar regions were very frequently obliterated by cloud,† much more, indeed, than the equatorial zone of the planet.

Prof. W. H. Pickering's brilliant discovery of clouds appearing pale yellow in colour,‡ and which the Director attributed to the fact that the thinness of such veils enables us to see partly the yellow surface of the planet beyond,§ will help us to account for the following statements of Molesworth: "The general tone of "the planet is a bright corn-colour [April 16]"; and "hardly "any red tinge about the continents [May 21]."

## 8. Bright Spots.

Phillips remarks that "the number of bright areas and spots "on Mars this last apparition was quite astonishing."

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## 9. Projections on the Terminator.

On February 22 Molesworth had "strong suspicions of a "very small projection" towards $\Omega = 306°$, $\Phi = -25°$ to $-30°$.

On April 16 he saw a "distinct very small brilliant "projection on the N.W. limb, and not far from the polar cap." Visible "for about 5 minutes . . . . . Certainly real, and "not merely optical." According to the value of $\varpi$ at the time, this must have been towards $\Omega = 255°$, $\Phi = +70°$. Position very uncertain.

On May 4 he detected "a slight deformation of terminator "as a low white mound just N. of *Lunæ Lacus*. . . . . "The terminator at this point was slightly brighter than else-"where. The phenomenon was certainly real, and not merely "optical, as the seeing was very sharp." This is shown on Fig. 1.

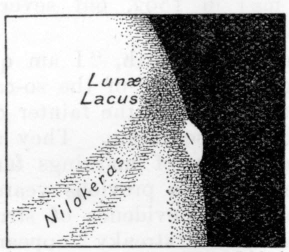


FIG. 1.—Projection seen on the terminator of Mars on 1903, May 4. (Major Molesworth.)

The Ceylon observer saw a few other projections, but these were invariably optical.

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* *See* p. 91.
† *See* pp. 98–99.
‡ *Annals of Harvard College Observatory*, Vol. LIII., No. viii., p. 155.
§ *Journal*, B.A.A., Vol. XX., p. 23.

## 10. Blue Light on Terminator.

On February 25 Molesworth found "a curious bluish light "along the terminator." This was confirmed on May 8 and 19, while on March 27 a similar light extended over the limb. The Director does not think the phenomenon to be due to atmospheric dispersion. "From the distance to which the terminator shade "extends inwards," concludes Molesworth, "I should be inclined "to suspect that the atmosphere of Mars is a good deal more "extensive than is usually allowed."

## 11. Colours of the Dark Regions.

Generally, Molesworth found the colour of the "seas" indigo blue, with frequent, and more or less decided, tinges of green. On April 9 Attkins found "the grey-green of the 'seas' very "pronounced."

Writing on February 21 Molesworth says: "The detail "visible to-night on the planet is exquisite. The whole of the "*Maria* being stippled and shaded in a way which defies "reproduction. It is clear at a glance that there are no uniform "sheets of water, but tracts full of complicated and most "delicate detail."

## 12. Streaks.

The term "canal" is a misnomer; for, in English it means an "artificial channel."* And as we have never seen, and shall never see, any artificial channels on Mars, we can no longer maintain the term in question. A good philosophical English word for the minor details of Mars is "streak," which we shall invariably adopt henceforward.

"I have seen no hard, fine canals," says Gale, "similar to "those noted [by me] in 1892, but several sketches show "narrow, diffuse markings."

"Personally," says Molesworth, "I am quite convinced of "the reality of the great majority of the so-called canals. . . ". . I do not mean to say that the fainter ones exist exactly "in the form in which we see them. They are, to quote Mr. "Maunder, 'the integration of markings far too small to be "'separately defined.' As in previous years, even the fainter "ones appear to me to have evidence of structure. They are "'streaky,' not linear, the 'streaky' appearance being most "distinct when the definition is best. They are more like a "streak made on very rough paper with a round-pointed crayon "or stump than an ink-line drawn with a pen. The *Læstrygon* "is, I think, the most uniformly linear of them."

The Members of the Section have seen 114 streaks during the 1903 apparition, of which 89 belong to Schiaparelli's maps,

* In Italian *canale*, and in French *canal*, mean not only a *canal*, but also a *channel*. Hence in these two languages the term may be preserved in connection with the established nomenclature of the planet.

1 to Mr. A. Stanley Williams's results of 1890, 4 to Lowell's charts (1894-1896), 3 to Dr. Cerulli's map (1898–1899), and 7 to the sectional observations of 1901, while 10 are new, or of doubtful identification.

The following table gives the number of streaks seen by each observer :—

| | |
|---|---|
| Major Molesworth | 108 |
| Rev. T. E. R. Phillips | 61 |
| The Director | 40 |
| Attkins | 30 |
| Gale | 29 |
| Corder | 6 |
| Hall | 3 |
| Killip | 1 |

Eleven streaks were seen or suspected double ; while 41 per cent. of them appeared as more or less intensified edges of faint shadings.

Twelve of these so-called "canals" were partly resolved into knots by four Members of the Section. Of these 11 were broken up by Molesworth, 2 by the Director, 1 by Attkins, and 1 also by Gale.

Molesworth saw also 12 streaks or "canals" in the dark regions, adding that "there is no doubt of the intimate connection "between the continental dark canals and those seen in the "*Maria*. Both are evidently the same phenomena seen against "a different background."

# PART II.

## THE OBSERVATIONS.

### Introductory.

In dealing with such a large number of drawings Mr. Maunder's excellent programme of 1892 was followed in arbitrarily dividing, as usual, the surface of the planet into eight sections, of which six, each having a mean breadth of 60° in longitude, extend from + 60° to − 60° of latitude, while the remaining two sections deal with the polar regions.

| Section. | Breadth. | Limits of Longitude. | Limits of Latitude. | Region. |
|---|---|---|---|---|
| I. | 60° | 310° to 10° | + 60° to − 60° | *Sinus Sabæus.* |
| II. | 60 | 10 ,, 70 | + 60 ,, − 60 | *Mare Acidalium.* |
| III. | 50 | 70 ,, 120 | + 60 ,, − 60 | *Solis Lacus.* |
| IV. | 60 | 120 ,, 180 | + 60 ,, − 60 | *Mare Sirenum.* |
| V. | 70 | 180 ,, 250 | + 60 ,, − 60 | *Mare Cimmerium.* |
| VI. | 60 | 250 ,, 310 | + 60 ,, − 60 | *Syrtis Major.* |
| VII. | 360° | 0° ,, 360° | − 60° ,, − 90° | South Polar Region. |
| VIII. | 360 | 0 ,, 360 | + 60 ,, + 90 | North Polar Region. |

As for past apparitions, we have used Schiaparelli's areographical nomenclature. The dark areas have been systematically alluded to as "seas," or anything implying the more or less direct presence of water (*Mare*, *Sinus*, *Fretum*, *Lacus*, *Palus*, "marsh," "swamp," "shoal," "strait," "channel," "canal," &c. ; also *Fons*, *Lucus*, *Silva*, &c.). The yellow background has received names conveying the idea of "land" (*Regio*, *Promontorium*, *Chersonesus*, *Pons*, *Insula*, "coast," &c.). All this is mere convention, as we cannot expect to know the exact nature of the markings on the planet. It is probable, however, that the dark areas are a combination of water and vegetation, and that the yellow expanses are deserts.

The following abbreviations will be found in this Report :— $\Omega$ = areocentric longitude, reckoned from *Fastigium Aryn* to the right ; $\Phi$ = areocentric latitude ; $\omega$ = longitude of the centre of the globe ; $\phi$ = latitude of the centre of the globe ; N. = North ; S. = South ; E. = Areographic East (west or left for the observer) ; W. = Areographic West (east or right for the observer) ; $p$ = preceding ; $f$ = following ; C.M. = central meridian of the planet.

The dates are invariably given in G.C.M.T.

Reference to the Chart at the end of this Report will render clearer the following analysis.

## SECTION I.

### Sinus Sabæus and Mare Erythræum.

$\Omega = 310^\circ$ to $10^\circ$ ; $\Phi = +60^\circ$ to $-60^\circ$.

*HAMMONIS CORNU.*—This remarkable "promontory" is shown blunted by Attkins, Corder, Gale, and Killip. Molesworth also saw it usually rounded, but on May 8 he found it "a distinct cape," as shown in Fig. 2. This is its true form, discovered by

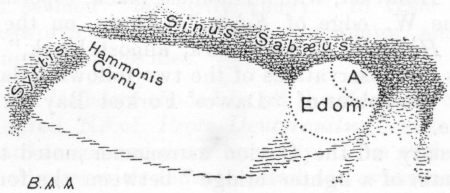


FIG. 2.—*Hammonis Cornu* and *Sinus Sabæus*, as seen on 1903, May 8, by Major Molesworth.

Green in 1877. Phillips and the Director show the "cape" moderately pointed. Regarding its intensity, Molesworth says that it was a "half-tone"; yet Gale drew it bright on April 30.

*SINUS SABÆUS.*—The E. part of this marking was narrow to Phillips, which we may consider as the normal appearance of the "strait." Attkins saw the *Sinus* "pale, but not very," on April 8 and 9, while Corder drew it dark at the same time. It was moderately dark to Gale and Hall, but Gale saw it obliterated by haze on April 28. On February 21 Molesworth found it less dark than either *Margaritifer Sinus* or *Mare Acidalium*; usually, however, the Ceylon observer described it as "very dark " and rather sinuous; dark and clear-cut along its N. coast, but " rather diffuse on the side of *Deucalion*." Finally, it was fairly dark to Phillips and to the Director. Molesworth also noted its colour, which was a "decided blue" in February, "indigo" in March, and also "very dark grey, darkening to black in the " darkest parts," and "very dark blue" in April; again "dark, " rather indigo blue" in June.

*FURCA SINUS SABÆI*, or "Dawes's Forked Bay," was not resolved by Corder (Plate IV., 6) and Hall.* On April 8 Attkins saw both forks, the distance separating which was 12°. Gale, on the contrary, makes the forks only 4° apart; to Molesworth they appeared 8° distant (Plate III., 2); to Phillips 6° at the utmost (Plate III., 1); while the Director found here an interval of 9°. Gale writes most truthfully: "I have seen the Forked

* The constant representation of the two forks by Mr. Scriven Bolton, using a $4\frac{1}{8}$-in. O.G. on a Mars in aphelic opposition (*Memoirs*, B.A.A., Vol. XI., p. 96), shows that this observer used to draw markings beyond the defining powers of his modest refractor, and that, in his planetary work, he was somewhat influenced by pre-existing results obtained with powerful telescopes—a not infrequent result of genuine enthusiasm.

" Bay distinctly on several occasions, but usually the marking has " had a blurred effect." Molesworth found, on May 1, that " the " *Hiddekel* prong . . . . is itself double, extending in two " points inclined some 30° to one another " (Plate I.). Attkins found *Furca* darker than the " strait," and in this he is supported by all the other Members of the Section. But Molesworth remarks that the double " bay " was " nowhere so dark as the " point of the *Syrtis*." He adds the following particulars: March 24, " the estuary of *Gehon* " is " decidedly darker than " that of *Hiddekel*." Two days later " the darkest portion is the " estuary of *Hiddekel*, which is almost black, especially where it " borders the W. edge of *Edom*." Again, on the 27th, " the " mouth of *Hiddekel* is very dark, almost black," and this is confirmed by the observations of the two following days. Molesworth found the colour of " Dawes' Forked Bay " a " very dark " indigo blue."

On February 26 the Ceylon astronomer noted that he was " almost certain of a lighter bridge " between the forks " joining " the point of *Fastigium Aryn* with *Deucalion*. This bridge, " although shaded, is considerably lighter than the forks on either " side."* Traces of this marking are visible on Plate III., 2.

*PORTUS SIGEUS* was beautifully drawn by Corder (Plate IV., 6) and Molesworth (Plate IV., 4) as a large, though somewhat shallow, indentation of the strait; and this is supported by the Director (Fig. 6). It was very dark.

*XISUTHRI REGIO* was seen very vaguely by Molesworth and the Director.

*FASTIGIUM ARYN* is well shown by Attkins, Gale, Molesworth, Phillips, and the Director. Molesworth found it " very " slightly shaded," as in past oppositions (Plate III., 2).

*EDOM PROMONTORIUM* was described, as usual, as " very " white " on April 9 by Attkins. Molesworth generally notes it as " very brilliant," and this is confirmed by Phillips. Yet such whiteness of a " cape " running into a marking as dark as *Sinus Sabæus* must be largely, if not wholly, subjective, and due to contrast. This is white spot 17 of our Chart.

*EDOM* appeared very bright to Molesworth, but on May 8 it was " not so white as usual, except a diffuse white patch, close " to the curved coast of the *Mare* (A) " (Fig. 2). *Edom* was seen brightening near the limb or terminator by Gale and Killip.

*EDEN* is described as " strongly ruddy " by Gale on April 27, while Molesworth found it shaded to W., beginning from the E. branch of the *Gehon*, and from *Fastigium Aryn* to *Mare Acidalium*.

*THYMIAMATA* also appeared strongly ruddy to Gale. Molesworth saw a slight shading here, but " *S. Thymiamata* " was

*The " bridge " in question was discovered by Schiaparelli in 1890 (Flammarion, *Mars*, Vol. I., p. 476, Fig. 246), and it may be an effect of contrast.

"rather a dull white circle." This is our white spot 3. Attkins found *Thymiamata* whitening with the obliquity of illumination.

*AERIA* is drawn whitish in all positions by Molesworth and Phillips. Its increasing whiteness near the limb or terminator was noted by Attkins, Gale, Killip, Molesworth, Phillips, and the Director.

A whitish spot, 14 of the Chart, was seen bordering *Aeria* to E. by Gale and Molesworth.

*ARABIA* seemed "markedly ruddy" to Gale on April 27, while Molesworth saw it bright on terminator, and, on July 23, even bulging out of the disc.

*DIOSCURIA* is shown shaded by all the Members of the Section. "All the detail N. of *Proto-Deuteronilus*," says Molesworth, "is very hard to see and draw correctly. The surface here seems "stippled all over with delicate detail, too evanescent to record." The Ceylon observer saw here the whitish spot, 16 of our Chart, traces of which he had already suspected with Attkins during the 1901 apparition of the planet.*

*CYDONIA* appears shaded on Corder's sketch of April 8 (Plate IV., 6), and Hall's drawing of February 28, while Molesworth saw it irregularly shaded, as on the Chart.

Phillips observed here the white spots 1 and 4, Molesworth the white spot 2, of the Chart. A bright spot, *p* the *Mare Acidalium*, was also seen by several Members of the Section in 1901.†

*SIRBONIS PALUS* was "just visible as a faint diffuse shade of "considerable extent" to Molesworth on March 1 and 8.

*ASTABORÆ FONS* is the name now given to a small shading on junction of *Astaboras* and *Phison*, discovered in 1890 by Schiaparelli.‡ This marking was seen by Molesworth as a small "lake," 2° in diameter.

*ANUBIDIS FONS* is the name now given to a similar "lake," 2° in diameter, which Molesworth saw at the junction of *Anubis* and *Phison*.

*ISMENIUS LACUS* was observed by six Members of the Section. It appears as a dark oval, 8° long and 6° broad, on Attkins's drawing of February 8, while it is described "very dark" and "roundish" on February 9. Corder draws it fainter on April 8 (Plate IV., 6), 14° long and 6° wide. To Gale the "lake" was generally 11° long and 4° broad. "The *Ismenius Lacus*," says the Australian observer, "and its extension W. are now quite "unlike any delineation I have reference to." On July 6 this "lake" was fainter than *Arethusa Lacus* to Gale. Molesworth usually gives 8° and $2\frac{1}{2}$° for the two dimensions of *Ismenius Lacus*, which he describes as "very dark," and its colour as

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* *Mars Report* for 1901, p. 97.
† *Ibid.*, pp. 97–98.
‡ Flammarion, *Mars*, Vol. I., p. 476, Fig. 246.

"an intensely dark indigo blue." It is also very dark on Phillips's fine drawings, where its length extends over 8°, its breadth over $3\frac{1}{2}$°. The Director saw the "lake" under good conditions on April 6, when it was 9° long and 4° broad. For

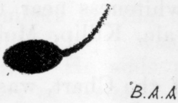


FIG. 3.—Glimpse of *Ismenius Lacus* on 1903, April $6^d\ 21^h\ 55^m$, G.C.M.T., by the Director.

about a second *Ismenius Lacus* appeared as a black, sharply-defined egg, with a black hook to S.W. (Fig. 3). No doubt, this view is a geometrical mask of a very complex and irregular natural structure. It is probable that *Ismenius Lacus* is composed chiefly of two irregular condensations, of which the *f* is the larger.*

Molesworth's drawings place this lake in $\Omega = 330°$, Gale's in 334°, Phillips's and the Director's towards 336°. Gale's value seems to be the most trustworthy of all.

ARETHUSA LACUS is shown as a darker portion of *Pierius-Callirrhoe* by Gale on April 27; on May 5 it appeared as a slight swelling of the streak, 9° long and 4° broad; on July 6 it extended over 12° from E. to W. and over 7° from N. to S., when it was described as "clearly seen." Molesworth found it "nearly circular [4° in diameter nearly], distinct, but much fainter "than *Ismenius*." Also "*Arethusa* appears to have a very "small companion lake (almost in contact) on *Pierius*, just E. "of it." This is a very important observation of the Ceylon observer, as showing that the double appearance of *Arethusa Lacus*, discovered by Schiaparelli in 1888,† is due to two spots of unequal size.

SILOE FONS is indicated as a very faint shading by Molesworth (Plate III., 2); Phillips makes its diameter 5° (Plate III., 1); while the Director saw it as one of the condensations of *Tritonilus*, of which hereafter.

ARETHUSA FONS‡ was well seen by the Director as a dot, 3° in diameter, on April 5.

CALLIRRHOES FONS is the name now given to a small "lake," 3° in diameter, which Molesworth saw on *Callirrhoe*, towards $\Omega = 345° \pm$.

DEUCALIONIS REGIO is represented narrow by Gale and Phillips, broader by Molesworth and the Director. On April 9

* This structure was recognised by Schiaparelli in 1890 (Flammarion, *Mars*, Vol. I., p. 476, Fig. 246), and the double appearance seems to have been photographed by Prof. Lowell.

† Flammarion, *Mars*, Vol. I., p. 424, Fig. 226.

‡ This "lake" was discovered by Lowell in 1894 (Lowell's *Mars*, Plate, No. 262), and was temporarily christened *Sphingos Lacus* in our 1901 *Report*, p. 98.

Attkins described it as "pointed at E. end." Regarding its intensity, all Members agree in showing it somewhat fainter than the "continent" to N., with a tendency to variation in albedo. Molesworth found this "island" whitening with the obliquity of illumination.

Molesworth further calls attention to "distinct signs of a "brighter bridge, narrow and uniform, crossing the shaded

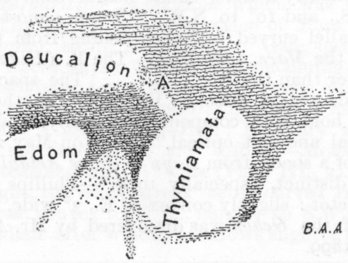


FIG. 4.—"Bridge" uniting *Deucalionis Regio* with *Thymiamata* on 1903, March 24. (Major Molesworth.)

"strait between *Deucalion* and *Thymiamata* (A in the rough "sketch given)" (Fig. 4).

*PANDORÆ FRETUM* is rather broad on the drawings of Corder and Gale; but Molesworth and Phillips show it narrow and faint. The Director rather confirms this last representation of that remarkable "strait," whose occasional breadth and darkness are most plain. Such variations may be due to cloud on Mars.

*NOACHIS* is shown very white on S. limb by Gale, Molesworth, and Phillips.

*HELLESPONTUS* was described "darkish" by Attkins in March and April. Molesworth found it sometimes faint, sometimes "as a dark streak." Phillips shows it well, but the Director always drew it confuse and faintish.

*MARE ERYTHRÆUM* is described "bluish" by Molesworth, and "a good deal bluer than *Mare Acidalium*"; also "chequered, "marbled, and veined."

## STREAKS.

*ANUBIS.*—Seen by Molesworth: 2° wide, faint.

*ARNON.*—Molesworth: $1\frac{1}{2}$° wide, faint.

*CALLIRRHOE.*—Gale: April 27, 4° wide, "most evident," not extending into *Mare Acidalium;* 28, 3° wide, "certainly does not connect with *Mare* "*Acidalium*"*;* May 5, do.; June 3, "distinctly darker than *Protonilus* "and *Deuteronilus*, and disconnected from *Mare Acidalium*"*;* 4, do.—Molesworth: 2° wide, edge of shade to N., but running as far as *Mare Acidalium.*—Phillips: 3° wide, faint, running into *Mare Acidalium.*—The Director: faint traces, certainly not extending into *Mare Acidalium.*

*CANTABRAS.*—Molesworth: edge of shade to N., or of brightness to S.

*DEUTERONILUS I. AND II.*—Attkins: 5° wide, diffuse.—Gale: 3° wide, "most evident."—Molesworth: 2½° wide, fainter than *Protonilus* and edge of shade to S.—Phillips: 2° wide, darker to E.

*EULÆUS.*—Molesworth: edge of shade to S.W.

*EUPHRATES.*—Molesworth: 1° wide, very faint.—Phillips: 3° wide, faintish.

*GEHON I.*—Attkins: 3° wide, diffuse.—Gale: 3½° wide, distinct.—Molesworth: anomalously double, bands nearer each other to S. than to N.W., 8° apart to S., and 10° to N.W. "I am almost certain that it is "double; two parallel curved branches issuing from the two forks, and "curving round to the *Mare Acidalium*. The E. (*Hiddekel*) component is "a great deal fainter than the W. . . . . . The space between the two "is slightly shaded, except close to the fork. At the moments of best "definition I can hold both components steadily, and I am certain the "gemination is real and not optical." Also, on May 2 "*Pseudo-Gihon* is "simply the edge of a shade from *Aryn* to *Mare Acidalium*, while the true "*Gihon* is fairly distinct, especially to S."—Phillips: straight, 2° wide, faintish.—The Director: slightly convex to E., 3° wide, faint.

The duplicity of the *Gehon* was discovered by Mr. A. Stanley Williams and Dr. Cerulli in 1899.

*GEHON II.*—Molesworth: 2° wide, faint.—Phillips: 2° wide, edge of shade to S.W.—The Director: 3° wide, faint and diffused.

*HIDDEKEL.*—Attkins: 2° wide, faint.—Molesworth: convex to W., 1½° wide, faint.—The Director: 2° narrow, hooked and black near *Ismenius Lacus.*

*ORONTES.*—Molesworth: edge of bright *Edom.*

*OXUS.*—Gale: 3° wide, well shown.—Molesworth: 1° wide, edge of shaded *Oxia.*—Phillips: 3° wide, edge of shaded *Oxia.*—The Director: 3° wide, edge of shaded *Oxia.*

*PHISON.*—Molesworth: convex to W., 3° wide, faint.—Phillips: edge of bright *Aeria.*—The Director: 4° wide, very faint, and visible only to N.

*PROTONILUS.*—Attkins: 5° wide, diffuse.—Corder: edge of shade to N.—Gale: March 28, some 4° wide, diffuse; April 27, width varying from 2° to 5°, a "most evident" feature, visible as "a slightly irregular" band; 30, width 5° almost; May 1, width 4°; 3, width 4°; 5 do.—Hall: edge of shaded *Dioscuria.*—Molesworth: generally single and knotted (Plate IV., 4); but on April 5, "decidedly double under very sharp definition; the space "between the components being shaded, except close to *Coloe Palus*, where "there is a light spot between the two. The S. component appears slightly "the darkest, but both are very knotted and irregular" (Fig. 5).—Phillips:

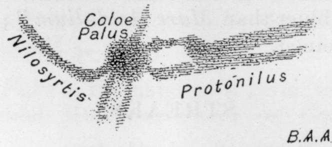


FIG. 5.—The *Protonilus* as seen on 1903, April 5. (Major Molesworth.)

3° wide on April 12 and May 14, double on May 12.—The Director: 3° wide, edge of shaded *Dioscuria.*

The irregularities of *Protonilus* were discovered by Schiaparelli in 1890.*

*PIERIUS.*—Attkins: April 8, 4° wide, diffuse.—Gale: March 28, 7° wide, diffuse; April 27, 5° wide, "most evident"; 30, 5° wide nearly; May 1,

* Flammarion, *Mars,* Vol. I., p. 474, Fig. 244.

4° wide; 3, do.; 5, 5° wide; June 3, "distinctly darker than *Protonilus* "and *Deuteronilus*."—Molesworth: $3\frac{1}{2}$° wide, intensified edge of shade to N.—Phillips: $3\frac{1}{2}$° wide, "dark and conspicuous."—The Director: 4° wide, fairly intense.

This is one of the prominent dark streaks of the planet.

*SITACUS.*—Seen only by Phillips on May 12 and 14, very narrow, $1\frac{1}{2}$°, line-like and dark (Plate III., 1).

*TRITONILUS.*—This is the name given by Molesworth to a streak uniting *Ismenius Lacus* to *Margaritifer Sinus*, and which was quite an obvious feature to Schiaparelli during the 1886 apparition of Mars.* It was missed in 1903 by Attkins, Corder, Killip, and Phillips. Gale, speaking of the S.W. extension of *Ismenius Lacus*, says: "Instead of continuing by *Hiddekel* into "the E. fork of *Fastigium Aryn*, it was seen very clearly to continue "further W. and to sweep S. into *Margaritifer Sinus*." This is splendid work. April 28, width 3°, May 1 and 5, 4°.—Hall: February 28, edge of faint shade in *Oxia*, but not intensified, and diffuse.—Molesworth: edge of shaded *Oxia*, but intensified and $2\frac{1}{2}$° wide (Plate III., 2).—The Director: April 6, a beautiful sight, the whole streak being curved from *Margaritifer Sinus* to *Ismenius Lacus*, convex to N.W., narrow to S.W., and broadening as far as the zero meridian after which it narrows slightly to W.

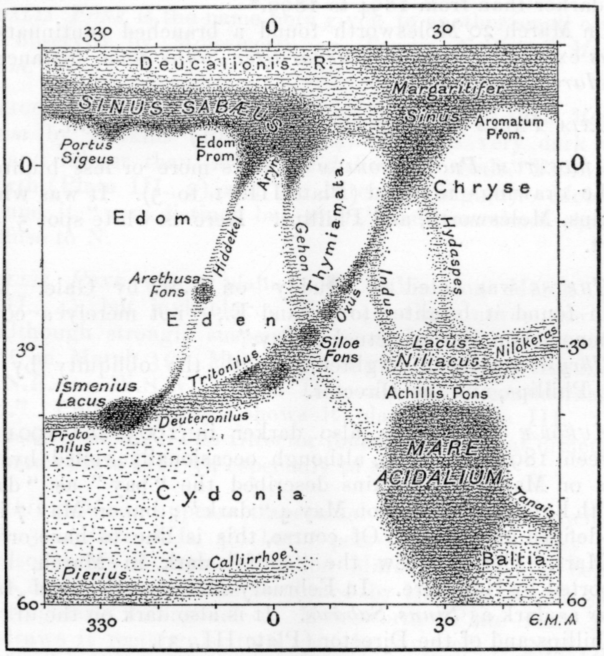


FIG. 6.—Appearance of the *Tritonilus* and surrounding region in 1903, according to the Director's observations.

The streak was very uneven and irregular in tone, containing at least five dusky nuclei, of which *Siloe Fons* was the most important (Fig. 6). Other three of these condensations are marked *a*, *b*, and *c* on the chart, while the S.W. one was *Oxia Palus*.

*TYPHONIUS.*—Molesworth: edge of bright S. *Aeria*.

*XENIUS.*—Molesworth: 1° wide, faint.

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* *Memoria Quinta*, Rome, 1897, Plate III., Figs. III. and IV.

## SECTION II.

### Margaritifer Sinus, Auroræ Sinus, and Mare Acidalium.

$\Omega = 10^\circ$ to $70^\circ$; $\Phi = +60^\circ$ to $-60^\circ$.

*MARGARITIFER SINUS* is shown under its usual form by the majority of the Members, but Molesworth drew it as bulging to N.W. (Plate III., 2). On March 31 Attkins found it "dark "and well-defined." Gale calls attention to its having been obscured by "haziness" on April 28, but it was "more con-"spicuous" on July 6. It was darkish to Hall on March 31, while on February 21 Molesworth pronounced it to be the darkest part on the disc, as dark as *Mare Acidalium*. Phillips shows it at least as dark as *Sinus Sabæus* on May 7, 12, and 14, the Director fainter than "Dawes's Forked Bay" in March and April (Fig. 6).

There can be no doubt that in 1903 and 1901 this "gulf" was darker than from 1894 to 1899.*

On March 20 Molesworth found a branched continuation of *Indus* extending beyond *Margaritifer Sinus* some distance into the *Mare Erythræum*.

*OXIA PALUS* was "fairly distinct" to Molesworth.

*AROMATUM PROMONTORIUM* appears more or less blunted on all the drawings to hand (Plate III., 1 to 5). It was white to Attkins, Molesworth, and Phillips. Here is white spot 5 of the Chart.

*CHRYSE* was noted as "ruddy" on C.M. by Gale. Molesworth found it brighter to S. and E., "not merely a contrast "phenomenon, but an actual reality."

*Chryse* was seen brightening with the obliquity by Gale, Hall, Phillips, and the Director.

*AURORÆ SINUS* was also darker in 1903 and 1901 than between 1894 and 1899, although occasionally veiled by haze. Thus on March 31 Attkins described the "bay" as "darkish "with lighter centre"; on May 4 "dark"; but on May 7 it was "ill-defined and pale." Of course, this is due to haze or cirrus on Mars. Corder drew the "gulf" dark in March, and is supported by Hall here. In February Molesworth found *Auroræ Sinus* as dark as *Sinus Sabæus*. It is also dark on the drawings of Phillips and of the Director (Plate III., 3).

Molesworth calls attention to the "patchy and irregular" tone of *Auroræ Sinus*, and finds it "very dark along the edge." He further saw in it the dark streaks C, D, and E of the Chart (C being *Hipparis* and E *Garrhuenus* of the 1901 Chart).

Regarding the colour of this "bay," Molesworth found it to be "a decided indigo blue," with a "faint greenish tinge."

*LUNÆ LACUS* is mentioned as "darkish" and "standing out "very boldly in sharp moments" by Attkins, who makes its

* See *Mars Report* for 1901, p. 101.

diameter 11°. To Corder it appeared elongated E. to W., 10° long, 5° broad. Hall saw it on March 31 as a very extensive and diffuse, faint circular shading. Molesworth speaks of it as "dark with diffuse edges and a slight condensation in its centre." Phillips (Plate III., 6) and the Director show it as a dusky circle, 7° in diameter. Molesworth notes that *Lunæ Lacus* was darker in April than in March, which we may attribute to haze on Mars over this region during the month of March 1903.

*OXIA* is the name given by the Director to the shaded area between the *Indus*, the *Deuteronilus*, and the *Tritonilus*. The shading, which seems to exist here permanently,* was seen during the apparition, with which we are now concerned, by Hall, Molesworth (Plate III., 2), and Phillips (Plate III., 1).

*ACHILLIS FONS* is the name now given to a small "lake," discovered by Schiaparelli in 1888,† and seen by Molesworth on *Nilokeras*, S.W. of *Mare Acidalium*.

*ACIDALIA FONS* is the name here given to another small oval "lake," observed by Molesworth on *Tanais*, N.W. of *Mare Acidalium*.

*NILIACUS LACUS*, although dark, was found paler than *Mare Acidalium* by Attkins (Plate III., 4). It was very dark to Corder, and fainter than *Mare Acidalium* to Gale, Phillips, Molesworth (Plate III., 2), and the Director (Fig. 6). Molesworth found it "very distinct, but small," and sometimes sharp to S., diffuse to N.

*ACHILLIS PONS* was "plain" to Attkins on March 31 (Plate III., 4), but invisible on May 4. Gale never saw it clearly, although strongly suspecting it on July 6. Hall could not see it on March 31. Molesworth draws it oblique, trending from E.N.E. to W.S.W. (Plate III., 2), and "considerably "shaded." Phillips always shows it plainly (Plate III., 1), with a breadth of 4°. The Director found it somewhat difficult and confused (Plate III., 3), especially to S.

*ACIDALIUM MARE* appears trapezoidal on Attkins's drawing of March 31 (Plate III., 4), but "pear-shaped" on May 7. Corder also shows it pear-shaped on March 28; Gale, bell-shaped on April 28, an outline confirmed by Hall on March 31. It was irregularly hexagonal to Molesworth (Plate III., 2). Phillips draws it rectangular to S., but bending off to N.W. in higher latitudes (Plate III., 1 and 6). To the Director, it was roughly pentagonal (Fig. 6 and Plate III., 3).

The intensity of *Mare Acidalium* was very considerable in 1903, equalling its tone of 1901, though not that of 1896 and 1899.‡ The observations of Gale establish that it faded off considerably during the end of the apparition, when it might have been veiled by haze. The *Mare* appeared "very dark" to

* See *Mars Reports* for 1896, 1899, and 1901, Charts.

† *Memoria Sesta*, Rome, 1899, Plate I.

‡ See *Mars Reports* for these various years.

Attkins and with "diffused" edges on March 31; "darkish" on April 8; "very dark" on May 2; "very nearly black" on May 7. Corder saw it dark near the limb and on the C.M. Gale described it "not very dark" on limb on March 28; and on April 27 he wrote that "*Syrtis Major* is dark and about "equal intensity to *Mare Acidalium*, now visible much fore-"shortened in extreme N.W."; on April 28 it was not very dark; on May 3, on terminator, it was "lighter in tone than "*Syrtis Major*"; on May 5 it was "just showing, fainter than "*Syrtis Major*"; on May 18 it appeared very faint near the limb; while on July 6 Gale described *Mare Acidalium* "much "fainter than it appeared at opposition." On February 28 Hall depicted this *Mare* darker than *Sinus Sabæus*, and a similar intensity was noted on March 31. Molesworth found *Mare Acidalium* "intensely dark" on January 17; "very dark" on February 16; "still very dark" on February 26; "very dark" on March 20; "dark, but by no means black," on March 24; "intensely dark" on April 20; "very dark" on April 21, 22, 24, May 4, 8 and 29; "dark . . . but by no means black," on June 1, and "still very dark" on June 4. Phillips does not show the "sea" any darker than the S. *Maria*, and he is here supported by the Director.

Molesworth has studied carefully the colour of *Mare Acidalium*, which was to him "a neutral grey" on January 17; "a greenish-blue tinge" on February 23 and 24; "bluish" on March 20; "indigo tinge" on March 21; "greenish indigo "blue" on March 22; "indigo greenish" on March 23 and 24; "bluish grey" on March 27; "dark indigo blue" on April 27; "blue grey with an indigo tinge" on April 29; "indigo blue "with a slight greenish tinge" on May 2 and 4; "greener" than *Sinus Sabæus*, which "is blue," on May 7; "decided blue" on May 29; "dark indigo tinge" on June 1; and "greenish "indigo" on June 4.

The Ceylon observer found *Mare Acidalium* on February 21 "very unequal in tone, darkest at the edges, especially "its N.E., and (in a rather lesser degree) its S.E. end," and, on the same night: "The patchy nature of the *Acidalium* is "now very distinct. At times it seems almost a dull area "enclosed in broad shaded streaks. There seem distinct darker "lakes at the corners." On February 23 "the whole of the "E. side of the *Acidalium* is very dark." On March 24 "the "knot at the E. of *Mare Acidalium* is the darkest part of the "*Mare*"; on April 20 the "sea" is "patchy"; on April 27 there is an "unevenness, clearly due to canals crossing the dark "area," and again, "the edges of the *Mare Acidalium* are darker "than the centre [a vague view of *Scheria Insula*], and the "corners seem dark and knotted." Molesworth saw a central knot, $\alpha$ of our Chart, and four others, $\beta$, $\gamma$, $\delta$, and $\epsilon$ at the angles,* while the *Mare* seemed crossed by the streaks A and B, both passing through the knot $\alpha$. Of course, the marginal intensification of

* Some of these angular knots, such as $\gamma$ and $\epsilon$, were discovered by Schiaparelli in 1888 (*Memoria Sesta*, Plate I.).

the "sea" may be due to contrast, and the corner "lakes" may also have the same origin.

*TEMPE* is described as "yellowish white" and "dull" near C.M. by Attkins. Molesworth speaks of its "luminous pale "rose" colour, "whitish to N., and still more to N.E.," near *Mare Acidalium.*

Its intense brightness under oblique illumination was noted by Molesworth and by the Director.

The white spot 6 of the Chart, which may be identified with white spot 3 of 1901,* was seen by Attkins, Molesworth, Phillips, and the Director.

*EOS*† is shown by Attkins as "bridging *Auroræ Sinus*" on May 4. It is also indicated by Molesworth and Phillips.

*PYRRHÆ REGIO* is diffuse and dusky on the drawings of Attkins, Hall, Molesworth, Phillips, and the Director.

*PROTEI REGIO* was seen by Phillips only on May 4.

*ARGYRE* appeared generally very bright on limb to Gale, Molesworth, Phillips, and the Director. Molesworth saw it even projecting, through irradiation, beyond the limb on January 17. However, this whiteness was not so marked on April 30 and June 4 to Molesworth, who then saw this "island" rather "dull white to S., not very brilliant." This may be due to obscuration by cloud or haze and its shadow.

## STREAKS.

*DARDANUS.*—Gale: May 18, 5° wide, "extremely faint."—Molesworth: convex to N., 2° wide, faint.

*GANGES.*—Molesworth: 3° broad, faint, "but rather nebulous."—Phillips: 4° wide, doublish.

*HYDASPES.*—The Director: 3° wide, extremely faint.

*HYDRAOTES.*—Attkins: 3° wide, single.—Molesworth: 3° wide, faint, hardly extending to *Margaritifer Sinus.*—Phillips: emerging out of *Lunæ Lacus* only, and confuse.

*IAMUNA.*—Molesworth: convex to W., 3° wide, diffuse.—Phillips: 3° wide, faint.

*INDUS.*—Attkins: March 31, curved, 2° wide, "indications of this "canal"; May 7, 3° wide, curved, easy.—Gale: July 6, curved, 4° wide, distinct.—Hall: W. edge of shading.—Molesworth: curved, 2° wide, "very "dark" and "knotted," also "tapering," edge of shaded *Oxia.*—Phillips: curved, 2° wide, edge of shaded *Oxia.*—The Director: 3° wide, faint.

*NILOKERAS.*—Attkins: March 31, merges into *Niliacus Lacus;* May 2, "suspected double"; 4, "double," 2° wide bands and 4° apart; 7, anomalously double, the 2° wide bands being separated by 6° to S.W. and 7° to N.E.—Corder: March 28, broad to E., narrow to W.—Gale: April 28, triangular, 11° wide to E., 3° to W.—Hall: March 31, 6° wide, diffuse.—Molesworth: "anomalously double," bands 2° wide, and separated by 3° to S.W., by 10° to N.E.; "the N. component being much the darkest. "This component does not present a hard line-like appearance, but seems

* *Mars Report* for 1901, Chart.

† See *Mars Report* for 1901, p. 102, and Chart.

" much more like a rough line of ill-defined spots"; and the "space " between the components slightly shaded." Also, " I am certain this is " not a 'canal' in the Schiaparellian sense at all. It is a 'combined " 'impression,' a rough line of spots and streaks. There is a small fairly " distinct lake on it, a short distance from where it meets *Mare Acidalium* " [*Achillis Fons* of our Chart], from which a faint canal curves round " enclosing a circular white patch: the brightest part of *Tempe*."— Phillips: anomalously broad, breadth 4° to S.W., 9° to N.E., very dark on *Tempe*.—The Director: anomalously wide, 4° to S.W., 9° to N.E., dark.

*TANAIS*.—Attkins: May 4, 5° wide, diffuse.—Hall: March 31, 9° wide, a very dark "canal."—Molesworth: $2\frac{1}{2}$° wide, very dark to E., edge of shaded *Baltia*.—Phillips: 3° wide, faint.—The Director: 3° wide, edge of shaded *Baltia*.

### NEW STREAK.

*CRIUS*.—A name given to Molesworth's diffuse, 2° wide band, running out of *Achillis Fons* in a S.E. direction.

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## SECTION III.

### Solis Lacus.

$$\Omega = 70° \text{ to } 120°. \quad \Phi = +60° \text{ to } -60°.$$

*THAUMASIA* appeared dull white to Molesworth and to Phillips. All the space N. of *Solis Lacus*, between *Lacus Tithonius* and *Lacus Phœnicis*, was shaded, according to Molesworth.

*SOLIS LACUS* was seen oval by Attkins, Phillips (Plate III., 6), and the Director. Molesworth says that it did "not appear " absolutely oval, but rather diffuse and irregular." Regarding the intensity of this marking, we find Attkins writing on March 31 that *Solis Lacus* was " visible as a dark smudge near S.W. " limb," and that it was "dark" on May 4. Gale could never see it properly. Molesworth and Phillips show it fairly dark, but the Director found it rather faintish.

*NECTARIS FONS*, or the "lake," seen in 1877 by Green and Schiaparelli E. of *Solis Lacus*,* was observed at the estuary of *Nectar*, or *Auroræ Sinus*, and not some way in the interior of *Thaumasia*, by Molesworth and Phillips (Plate III., 6).

*TITHONIUS LACUS* is not shown as a swelling of *Agathodæmon* by Attkins. Corder saw traces of it on March 28. Gale does not seem to have caught any glimpses of it at all. Hall shows this "lake" diffuse on March 31, 20° long and 12° broad—a most truthful though inadequate view of more definite detail (Plate III., 5). Molesworth depicts it as a single oval condensation, 6° long and 4° broad, noting that on April 24 it was "very black" on *p* limb. Phillips confirms Molesworth's outline (Plate III., 6), but gives greater dimensions to the knot. Finally, on March 21 and 22 the Director saw *Tithonius Lacus* very dark and large, but ill-defined and diffuse near *p* limb.

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* Flammarion, *Mars*, Vol. I., p. 278, Fig. 168, and p. 292, Fig. 174.

*AUREA CHERSO* is shown by some Members, although others do not represent it at all. Thus, while Hall (Plate III., 5) and Phillips (Plate III., 6) draw this part like Schiaparelli in 1890,* Attkins (Plate III., 4) and Molesworth both agree in showing the estuary of *Agathodæmon* expanding into a triangle. An intermediate interpretation between these conflicting data was adopted in our Chart.

*AONIUS SINUS* was not seen by any Member of the Section as it was in 1879.† Indeed, Molesworth wrote : "I cannot see " the faintest trace of *Aonius Sinus*."

*PHŒNICIS LACUS* looked "very faint" to Molesworth.‡

*DÆDALIA*, slightly shaded to Molesworth, appeared white on limb to Gale and Phillips.

*ARSIA SYLVA* was seen by Molesworth as a faint knot, 3° in diameter.

*THARSIS* is described "ruddy" by Gale on C.M. Attkins, Molesworth, Phillips, and the Director agree in showing it white on the limb.

Two white spots, 8 and 9 of the Chart, were seen on *Tharsis* by Phillips in April and May.

Molesworth saw a projection N.W. of *Lunæ Lacus*, on May 4, as already stated on p. 59, and shown on Fig. 1. This is white spot 7 of our Chart.

*OPHIR* was seen bright near the limb by Gale.

*ASCRÆUS LACUS* is indicated by Gale on May 15 and 24 as a very faint and diffuse spot. Molesworth draws it as a dot, 3° in diameter.

*MAREOTIS LACUS* is pronounced to be "very dark, and almost " as dark as *Mare Acidalium*," on May 2, by Attkins ; on May 4 it was "large and dark, standing out very boldly in sharp " moments," an ellipse 9° long and 8° broad, elongated E. to W. (Fig. 7). Corder had glimpses of it on March 28. Gale, on May 18, $\omega = 106°$, wrote : "A little W. of centre is a very faint " marking." Molesworth says : "It is a diffuse spot, elongated " in the direction of *Gigas*" ; and on April 23, "fairly sharp to " S., but diffuse to N." ; also, on the same date, "darkest at its " E. end, and fades gradually to W." (see the Chart), and

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* Flammarion, *Mars*, Vol. I., p. 475, Fig. 245.

† *Ibid.*, p. 317, Fig. 179.

‡ Señor Comas Solà, who, in 1894, with a $4\frac{1}{4}$-in. O.G., saw 26 "canals," found with that instrument that "the colour of *Phœnicis Lacus* is ruddy, " that of *Solis Lacus* bluish" (Flammarion, *Mars*, Vol. II., p. 226) ! Here we have evidence of an observer straining himself to see things far beyond the reach of his telescope. As "canals," a $4\frac{1}{4}$-in. showed to the Director in 1892 only the *Nilosyrtis* and *Protonilus*.

"oblong." Phillips drew the lake as an oval dusky spot, some 8° degrees long, N. to S., and 6° wide, W. to E. (Fig. 8). The

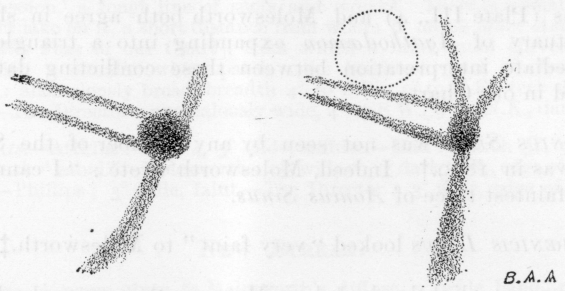


FIG. 7.—May 4 (Attkins). FIG. 8.—May 7 (Phillips).

Appearances of *Mareotis Lacus* in 1903.

Director saw here a faint, very broad and diffuse shading on March 21.

TRICHONIS LACUS is the name now given by the Director to a knot, 3° wide, seen by Molesworth towards $\Omega = 118°$, $\Phi = +26°$.

*ASCURIS LACUS* was seen by Molesworth as a 3° wide condensation of *Tanais.*

*MÆOTIS PALUS* is described as "well seen," and as "a distinct shading," by Gale, on June 23, and, on the following day, "faint but well seen. It extends further W. than expected "from chart." Molesworth observed it as "faint and diffuse"; and it is very faintly shown by Phillips and the Director.

## STREAKS.

*AGATHODÆMON.*—Attkins: March 31, "E. end . . visible," 2° wide; May 4, 3½° wide, diffuse; May 7, 4° wide, diffuse.—Molesworth: 2° ± wide, and broadening considerably into *Auroræ Sinus;* dark to E., and "knotted all along."—Phillips: 3° wide, dark.—The Director: 3° wide at least, dark and confuse.

Molesworth saw this streak "crossed by a bright bridge at the point where "it meets *Auroræ Sinus*" on April 29.

*CERAUNIUS.*—Attkins: 3° wide, diffuse (Fig. 7).—Corder: March 28, 12° wide, very diffuse.—Gale: June 24, "visible only in part."—Molesworth: "anomalously double" as far as *Mareotis Lacus;* 2° bands, 15° apart to N., 4° to S.—Phillips: anomalously broad, 3° to S., 6° to N., darkish.—The Director: 12° broad and very diffuse, badly seen.

*CHRYSORRHOAS.*—Attkins: 3° wide, diffuse.—Molesworth: convex to W., 2° wide, diffuse.—Phillips: 3° wide, faint.

*CLARIUS.*—Gale: June 23, "well seen."—Molesworth: 2° wide, faintish, edge of a shade.—Phillips: 4° wide, faintish.

*EOSPHOROS.*—Molesworth: 2° wide, edge of a shade to E.

*IRIS.*—Molesworth: 2° wide, faint.—Phillips: 2° wide, faint.

*NECTAR.*—Attkins : "suspected."—Molesworth : 3° wide, rather faintish.

*NILUS.*—Attkins : May 2, "wide and plain" ; 4, double, 2° wide bands, 4° apart (Fig. 7) ; 7, 6° broad, diffuse ; 18, 5° wide, "extremely faint."—Molesworth : convex to S.W., 4° broad, doublish (see the Chart).—Phillips : anomalously double (Fig. 8), 2° wide bands, radiate out of *Lunæ Lacus*, and diverge on *Ascræus Lacus*, where they are 10° apart. Yet this anomalous gemination may be a view of the *Nilus* (single) and of *Uranius*.

*PHASIS.*—Attkins : 6° wide, faint.—Molesworth : 1½° wide, very faint.—The Director : 3° wide, very faint.

*TANTALUS?*—An edge of shade to N.E., seen by Molesworth to unite *Ascræus Lacus* to *Trichonis Lacus*.

*ULYSSES.*—Molesworth : 1½° wide, faint.

*URANIUS.*—Molesworth : 2° wide, faint.

### NEW STREAKS.

*CHARADRUS.*—A name given to a band seen by Molesworth to run from *Mareotis Lacus* to *Phrygius Lacus :* 4° wide to E., 2° to W. ; partly edge of a shaded area to S.E.—Phillips : 4° wide, diffuse.

*EOUS.*—A name now given to the streak which Molesworth saw running N.N.E. of *Solis Lacus ;* 2° wide, edge of shade to W.

*OAXES.*—A streak emerging out of *Mareotis Lacus* in order to run S.S.E. Seen by Molesworth as a 1½° wide band ; and christened by the Director.

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## SECTION IV.

### Mare Sirenum.

$$\Omega = 120° \text{ to } 180° ; \Phi = +60° \text{ to } -60°.$$

*ICARIA* was seen snow white on limb by Gale.

*PHAETHONTIS* also appeared bright on limb to Gale.

*MARE SIRENUM* was observed by Molesworth "as in Lowell's "chart." It was moderately dark to Gale in May (Plate IV., 1), and to Phillips in April, and fainter than *Mare Cimmerium* to Molesworth. The Director found it very faint in March. The colour of this "sea" was a "pale blue grey," according to Molesworth.

*SIRENUM SINUS* was "glimpsed" on May 2 by Attkins ; it was confuse on May 18 to Gale, on April 29 and May 1 to Phillips, and on March 21 to the Director. Molesworth writes : "Beak appears rather blunted," and seems "to end in a small dark knot," marked ζ on the Chart.

*TITANUM SINUS* could not be seen at all by Gale on May 14 and 15. Molesworth describes it, however, as the darkest part of the *Mare*, and Phillips saw it well on April 22.

*ATLANTIS I.* was "just visible passing off, as an ill-defined "lightening" by Molesworth on April 14 (Plate IV., 2).

*MEMNONIA* is shown brightening with the obliquity by Molesworth.

*AMAZONIS* appears shaded on the drawings of Molesworth, the shading running as far S. as *Eumenides-Orcus*.

*Amazonis* was brightening near the limb to the Director.

A bright spot, 10 of the Chart, was seen by Phillips on *p* limb, towards $\Omega = 140°$, $\Phi = + 15°$ (?), on April 19.

*ARCADIA* was seen "ruddy" on C.M. by Gale; but between May 25 and 29 it assumed a "dull white" tinge to Molesworth.

*NODUS GORDII* had the form of a small, roundish lake on the intersection of *Sirenius* and *Eumenides*, according to Molesworth.

*TATTA LACUS* is the name now given to a small knot which Molesworth detected on intersection of *Eumenides* and *Gorgon*.

*PHRYGIUS LACUS* was seen on April 15 by Molesworth as a "dark and pretty distinct but very diffuse spot. Larger than "preceding knots, and fully 4° in diameter."

*AMMONIUM* is represented by Molesworth quite as large as *Phrygius Lacus*.

*APHNITIS FONS* is the name given by the Director to a "lake," 2° in diameter, which Molesworth saw on junction of *Titan* and *Erebus*.

A smaller "lake," *d* of the Chart, was seen by Molesworth a short way to the S. of the preceding.

These two "lakes" are close to the position of *Titanum Lacus* of 1901.*

*ASCANIA PALUS* is the name now given to a shading seen by Phillips S.E. of *Propontis* on *Pyriphlegethon*.

*ARTYNIA FONS* is the name given by the Director to a small knot which Molesworth observed at the junction of *Eurotas* and *Hippalus*.

*PROPONTIS I.* appears on the drawing of April 22 by Attkins as a circular knot, 10° in diameter. Gale does not show the "lake" free from the shadings to N. To Molesworth it was "distinct, as a dark elongated (E.—W.) condensation in the "triangular shade [of *Titania*]." Phillips makes the length of this spot some 22°, and its breadth some 5° (Fig. 10), and shows it very dark. To the Director it was more diffused and more oval (Fig. 9).

*EUXINUS LACUS* is vaguely shown by Gale in May, as the shading hereabout was seen clearly to divide "at its termination." It is also shown by Molesworth, who notes that the E. end of *Propontis* is very dark. But to Phillips and to the Director this "lake" was undistinguishable from the mass of *Propontis I.*

* *Mars Report* for 1901, p. 111, and Chart

*HERCULIS PONS* is shaded on Molesworth's, Phillips's (Fig. 10), and the Director's drawings (Fig. 9).

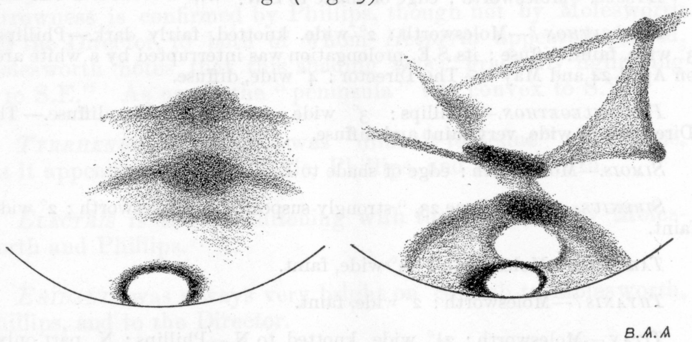


FIG. 9.—March $18^d\ 22^h\ 40^m$, $\omega = 158°$. (The Director.) FIG. 10.—April $24^d$, $\omega = 167°$. (Phillips.)

The *Propontis* region in 1903.

*PROPONTIS II.* was well delineated in 1903 by Phillips and by the Director. It was quite as dark as, and had roughly the shape of, *Propontis I.* plus *Euxinus Lacus*.

On April 19 Molesworth remarked that the "detail in the "shades near *Propontis* was quite bewildering."

*CASTORIUS LACUS* is drawn by Molesworth to the E. of the position of *Propontis II.*, just like *Euxinus Lacus* is shown by the same observer to the E. of *Propontis I.* It seems fainter and smaller than *Euxinus Lacus*.

*TITANIA* appears shaded on the drawings of Gale (Plate IV., 1), Molesworth (Plate IV., 2), Phillips (Plate IV., 3), and the Director (Fig. 9). From April 14 to the end of the apparition, "a dark triangular shade," says Molesworth, "covering the "whole of the N. portion of *Titan* with darker canal edgings" was seen, having a "bluish" tinge. The shading is evidently a permanent feature in these regions, and it was also observed in 1901.*

## STREAKS.

*ACHERON.*—Gale: May 18, 3° wide, "extremely faint."—Molesworth: 2° wide, very faint.

*DAMASTES.*—Molesworth: 2° wide, edge of shade to W.

*EUMENIDES.*—Attkins: May 4, 5° wide, easy.—Molesworth: 4° wide, edge of shaded *Amazonis*.—Phillips: 2° wide, faint.

*EUROTAS.*—Gale: seen on June 23.—Molesworth: sinuous, 2° wide, edge of shade, darkish.—Phillips: 3½° wide, soft, streaky.—The Director: 4° wide, edge of shade, faint and diffuse.

*FEVOS.*— Molesworth: edge of shaded *Titania*.— Phillips: do.—The Director: do., 4° wide?

*GIGAS.*— Gale: May 18, 4° wide, "extremely faint."— Molesworth: convex to N.W., 2½° wide, faintish.—Phillips: 3½° wide, faint.

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* *Mars Report* for 1901, p. 111, and Chart.

*GORGON.*—Molesworth : convex to N.W., 1° wide, faint.

*HYSCUS.*—Molesworth : edge of shade to S.W.

*PHLEGETHON ?*—Molesworth : 2° wide, knotted, fairly dark.—Phillips : 3° wide, faint, diffuse ; its S.E. prolongation was interrupted by a white area on April 24 and May 1.—The Director : 4° wide, diffuse.

*PYRIPHLEGETHON.*— Phillips : 3° wide, wider to N.W., diffuse.— The Director : 5° wide, very faint and diffuse.

*SIMOIS.*—Molesworth : edge of shade to E.

*SIRENIUS.*—Gale : June 23, "strongly suspected."—Molesworth : 2° wide, faint.

*TARTARUS.*—Molesworth : 1½° wide, faint.

*THYANIS ?*—Molesworth : 2° wide, faint.

*TITAN.*—Molesworth : 2½° wide, knotted to N.—Phillips : N. part only, 2½° wide, faint.—The Director : N. part only, very faint.

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## SECTION V.

### Mare Cimmerium, Elysium, and Trivium Charontis.

$\Omega = 180° \text{ to } 250° \; ; \; \Phi = +60° \text{ to } -60°.$

*MARE CIMMERIUM* is variously represented by the Members of the Section. Thus Attkins saw it confuse ; Phillips and the Director, rounded to W. ; while Gale and Molesworth agree in showing it sharply pointed on the *f* side, which is nearer the truth. Molesworth represents the estuaries of *Læstrygon*, *Cyclops*, and *Cerberus* as considerably indenting the "coast," while the Director saw only the *Læstrygon* embouchure as an indentation. This *Mare* was described "pale" by Attkins in April, and "not so dark generally" by Gale, a statement supported by Phillips and the Director. Yet it was "fairly "dark" to Molesworth, and especially "very dark along its N. "edge"; also "very dark at the estuary of *Cyclops*," $\theta$ of the Chart, and "with darker knots at the estuaries of . . . "*Læstrygon*," $\eta$ of the Chart, and *Cerberus*. Molesworth always remarked "a distinct blue tinge" in *Mare Cimmerium.*

*CIMMERIA INSULA* was practically invisible in 1903. "No "trace of it," says Molesworth, on April 14, adding that "this "is curious, as Barker has drawn it clearly with no previous "knowledge of its existence."

A "lake" seems to have been seen by Gale at the *f* end of *Mare Cimmerium*, for on June 9 he wrote: "The N.W. "extremity of *M. Cimmerium* is dark, and marked by a "projection from the general outline." It is noteworthy that, at this very spot, the Director, using in 1909 the great 32·7-in. refractor of Meudon, saw a "lake" of considerable size, and of a very irregular form.* This observation gives great credit to the ability of Gale.

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* *Journal*, B.A.A., Vol. XX., Plate facing p. 80, Fig. 1.

*HESPERIA* was "suspected" by Attkins on April 16. Gale always saw it narrow, and "conspicuous" near the limb. This narrowness is confirmed by Phillips, though not by Molesworth and the Director, to both of whom *Hesperia* appeared shaded. Molesworth notes that this shading was "gradually lightening "to S.E." As usual, the "peninsula" was convex to S.W.

*TYRRHENUM MARE (E.)* was "difficult to define" to Attkins, but it appeared normal to Gale, Phillips, and Molesworth.

*ELECTRIS* is shown whitening with the obliquity by Molesworth and Phillips.

*ERIDANIA* was always very bright on S. limb to Molesworth, Phillips, and to the Director.

*ZEPHYRIA*, "very bright where it borders the *Mare*," according to Molesworth, was whitening with the obliquity of the illumination, according to the Director.

*ÆOLIS* appeared "fairly white" to Molesworth.

*ÆTHIOPIS* was "bright" to Attkins on April 18.

*ELYSIUM* is shown "oval" by Attkins on April 16, and by Gale on May 9; but roughly pentagonal, with blunted angles, except to S., by Molesworth, Phillips, and the Director, who found it more defined to E. than to W. Its tone was much brighter than that of the surrounding regions, according to Gale, Molesworth, Phillips, and the Director. Attkins found it "golden yellow with tinge of red" on April 18, and "ground "tint" on April 22; Gale, "brighter than other portions"; Molesworth, "not very bright" on April 7, but "bright white "oval" a week later—a change due probably to haze on Mars.

The brightest part of *Elysium* was, as usual,* its *p* angle, where Attkins, Molesworth, Phillips, and the Director saw the white spot 11 of our Chart.

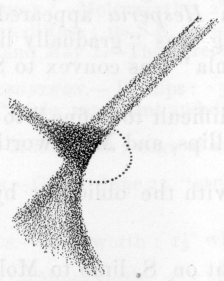
The further brightening of *Elysium* under oblique illumination was also observed by Attkins, Molesworth, Phillips, and the Director.

*PAMBOTIS LACUS* is described "very dark and distinct" by Molesworth, and "like a smaller *Trivium*." Phillips also saw this "lake" under favourable circumstances (Plate IV., 3).

*TRIVIUM CHARONTIS* looked "darkish and smudgy" to Attkins on April 16; "dark and crescentic" on April 18; "very dark "and triangular, apex towards *Orcus*," on April 22 (Fig. 11). Gale found it diffuse, and some 10° in diameter in April; as an "ill-defined dark patch" on May 9, elongated N. to S. and faint,

* See *Mars Report* for 1896, p. 89; for 1899, p. 91; and for 1901, p. 115.

18° long and 10° wide; also elongated on May 13 and 14 (Plate IV., 1). To Molesworth the "lake" was "very dark



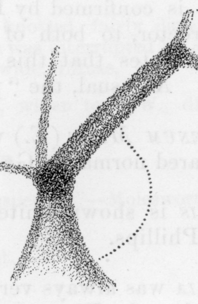


FIG. 11.—April 22, $\omega = 207°$. (Attkins.) FIG. 12.—April 19, $\omega = 215°$. (Phillips.)

The *Trivium Charontis* region in 1903.

" and diffuse" (Plate IV., 2) and "knotted" on April 16. Phillips shows it as a circular condensation, 6° in diameter (Fig. 12); the Director, larger and more diffuse. According to Molesworth, the *Trivium Charontis* did not extend as far as *Elysium*, but was more to E.

*Stygia Palus*, the "lake" whose visibility in 1896 gave rise, very probably, to the so-called duplication of the *Trivium Charontis*,* was seen by Molesworth in 1903 as a knot 3° in diameter on the *Styx*.

*Hecates Lacus* appeared to Phillips as it did during the past three apparitions; that is, like a very dark "lake," 4° across (Plate IV., 3). The Director could not see it at all.

*Morpheos Lacus* was observed under the same form as the foregoing by Molesworth and Phillips (Plate IV., 2 and 3).

*Sintius Lacus* is drawn by Molesworth as a knot 3° across, somewhat larger perhaps than in 1901.†

*Sithonius Lacus* is shown by Gale on June 9 and 12. Molesworth describes it as a "large, diffuse shade near the "terminator" on May 19.

*Phlegra* is intensely shaded on the sketches of Attkins, Molesworth, Phillips, and the Director.

*Cebrenia* appeared faintly shaded to Attkins, Molesworth, and the Director.

*Ætheria* showed a greyish, ruddy tinge to Attkins on April 16, and is slightly shaded on the drawings by Molesworth and the Director.

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* See *Mars Report* for 1896, pp. 90–91.
† *Mars Report* for 1901, p. 117.

## STREAKS.

*ALCYONIUS*.—Attkins : April 16, edge of shaded *Utopia*.—Corder : do.—Gale : do.—Molesworth : 4° wide, do.—Phillips : do.—The Director : do.

*ANIAN*.—Molesworth : 2° wide, faint.

*ANTÆUS*.—Molesworth : $1\frac{1}{2}$° wide, very faint.

*BOREAS*.—Molesworth : 3° wide, N. edge of shaded *Phlegra*.—Phillips : 3° wide, do.—The Director : 3° wide, do.

*CHAOS*.—Attkins : April 16, 3° wide, "darkish and confused"; 18, faint shading.—Gale : May 9, 3° wide, diffuse.—Molesworth : $2\frac{1}{2}$° wide, faint edge of bright *Elysium*.—Phillips : 3° wide, do.—The Director : very faint, do.

*CERBERUS I*.—Attkins : April 16, 5° wide, "darkish and confused"; 18, "faint shading"; 22 "seems double," bands 1° wide and 4° apart, and shaded between them (Fig. 11).—Gale : May 9, 3° wide, diffuse.—Molesworth : April 14, "Distinctly double, the S. component being a very dark "straight succession of knots. It is much the darker of the two"; May 19, "very dark and knotted." This duplication is of the anomalous kind, as the $1\frac{1}{2}$° bands seen at Ceylon were $2\frac{1}{2}$° apart to S.W., and 4° to N.E.—Phillips : double near C.M. in April, 2° wide bands, 3° apart (Fig. 12), dark intensified edge of *Elysium*. The gemination seen by Phillips is thus normal, not anomalous.—The Director : 6° wide to N.E., 5° to S.W., edge of bright *Elysium*.

*CERBERUS II*.—Molesworth : $1\frac{1}{2}$° wide, single and faint.

*CYCLOPS*.—Molesworth, $2\frac{1}{2}$° wide, diffuse.—Phillips : 3° wide, faintish.—The Director : 5° wide, diffuse.

*EREBUS*.—Molesworth : 2° wide, diffuse.—Phillips : 3° wide, dark.

*EUNOSTOS*.—Attkins : April 16, 4° wide, "darkish and confused"; 18, "the easiest canal visible, it is darkish and medium wide."—Gale : April 3, width 3°, from *Nubis Lacus* to *Cerberus;* May 9, 3° wide, diffuse.—Molesworth : $2\frac{1}{2}$° broad generally, edge of shade to S.W.—Phillips : 4° broad, diffuse, edge of bright *Elysium*.—The Director : edge of bright *Elysium*.

*GRANICUS*.—Attkins : April 22, edge of shade.—Molesworth : 5° wide, knotted, edge of shaded *Titania*.—Phillips : 3° wide, faint.—The Director : 4° wide, faint, diffuse.

*GYNDES I*.—Gale : May 9, 3° wide, diffuse.—Molesworth : 4° wide, knotted, edge of shade to N.—Phillips : 3° wide, faintish.

*HADES*.—Attkins : April 22, 6° wide, edge of shade to W.—Gale : May 9, 3° wide, diffuse.—Molesworth : convex to N.W., 2° wide, edge of shade to W.—Phillips : 3° wide, edge of shaded *Phlegra*.—The Director : 4° wide, edge of shading to W.

*HEPHÆSTUS*.—Molesworth : 3° wide, edge of shade to N.E.—The Director : wide and diffuse.

*HYBLÆUS*.—Attkins : April 16, 4° wide, faintish.—Molesworth : 4° wide faint, edge of bright *Elysium*.—Phillips : 4° wide, edge of bright *Elysium*.—The Director : very faint edge of bright *Elysium*.

*LÆSTRYGON*.—Molesworth : 2° wide, faint.—Phillips : 2° wide, faintish.—The Director : 3° wide, faint.

*MARSYAS*.—Molesworth : 2° wide, faint.—Phillips : $2\frac{1}{2}$° wide, faintish.

*MYRMIDON*.—Molesworth : 2° wide, faint.

*ORCUS*.—Attkins : April 22, suspected, 3° wide, diffuse.—Molesworth : 4° wide, edge of shaded *Amazonis*.—Phillips : 2° wide, faintish.

*PACTOLUS.*—Phillips: convex to S.W., $2\frac{1}{2}°$ wide, faintish.

*SCAMANDER.*—Molesworth: seen to N., broad and diffuse.

*SINNYS.*—Molesworth: $1\frac{1}{2}°$ wide, faintish.

*STYX.*—Attkins: April 16, 5° wide, "darkish and confused"; 22, edge of shade to E., or of *Elysium* brightness to W.—Gale: May 9, 4° wide, diffuse; 14, 3° wide, dusky.—Molesworth: $1\frac{1}{2}°$ wide as far as *Stygia Palus*, dark; $2\frac{1}{2}°$ wide further N.W., and diffuse; edge of *Elysium* whiteness.—Phillips: 3° wide, edge of *Elysium* brightness.—The Director: 5° wide, edge of *Elysium* brightness.

*XANTHUS.*—Molesworth: 6° wide, diffuse.

*ZEPHYRUS.*—Molesworth: edge of brightness to E. part of *Elysium*.

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## SECTION VI.

### Syrtis Major.

$\Omega = 250°$ to $310°$; $\Phi = +60°$ to $-60°$.

*MARE TYRRHENUM* (*W.*) had in 1903 its normal shape, according to Molesworth, Phillips, and the Director. Its darkness was inconsiderable to Attkins. Gale drew it faint early in April, darker subsequently, faint again on April 30 and May 3, and once more dark from May 9 to 14. Here we may have evidence of veiling by haze. Molesworth notes that "the region "between *Libya* and *Ausonia* and *Hellas* is very patchy and "complicated"—a statement of great moment, as shown by the observations of 1909. A dark knot, $\iota$, was seen by the Ceylon observer in this *Mare* S. of *Libya* (Chart at end of this Report), whilst two dark streaks, F and G, cross *Mare Tyrrhenum* and N. *Ausonia*.

*SYRTIS PARVA* was scarcely indicated by Attkins on April 16, but Corder saw it beautifully on April 13, and so also Gale on several occasions, although the Australian astronomer described it as "not prominent." Killip saw it well on April 15, but not at all on May 21. Its outline is normal on the drawings of Molesworth, Phillips, and the Director. Molesworth describes it as "faint and more bluish compared with the *Syrtis*," and "fairly dark at the point," but fading "gradually southwards," also "very insignificant." Phillips drew it dark on April 19 (Plate IV., 3); but the Director found it generally faintish.

*AUSONIA* appeared bright to Gale and the Director on limb, almost always. Molesworth found it "dull white" and "oval" on limb, but this only for S. *Ausonia*, the N. part of this "island" being shaded on the Ceylon drawings (Plate IV., 4).

*HADRIACUM MARE* was seen dark by Corder, Phillips, Molesworth, and the Director. Molesworth noticed a "greenish "indigo" tinge in this dusky area.

A small bright projection was observed by Molesworth on February 22 in *Hadriacum Mare*, towards $\Omega = 306°$, $\Phi = -25°$, probably due to cloud on Mars. This is white spot 15.

*HELLAS* showed a roughly semicircular outline to N. It was white on limb to Attkins, Corder, Gale, Phillips, and the Director. Molesworth recorded some irregularity in the whitening. He thus found this "island" as "dull white" on March 3; "by no "means bright" on March 31, "rather dull" on April 2, "very "white" on May 4, "rather dull" on May 7, "fairly white, but "not brilliant" on June 19, and "very white" on June 23. It is highly probable that these variations are subordinated to the changing transparency of the Martian atmosphere.*

On March 3 Molesworth saw the N. end of *Hellas* projecting beyond the terminator curve.

*LUNÆ PONS* is described "very faint and indefinite" by Molesworth, and also visible on a disc of $7''\cdot4$.

*SOLIS PONS* was usually "quite distinct, appearing almost to "sever the *Syrtis* from the end of *Sinus Sabæus*." It was "very indefinite" on March 29, and often appeared bounded to S. by a dark streak. Molesworth saw it, like the preceding "bridge," on a disc of $7''\cdot4$.

These *Pontes* are evidently mere integrations of very irregularly scattered whitish spots.

*IAPYGIA* is shown as a diffuse white spot, elongated E. to W., on April 12, by Phillips.

*ŒNOTRIA* is described "plain and bright" by Attkins on April 18. To Molesworth it appeared faintish generally, yet visible on a disc of $7''\cdot4$. Phillips found it bright and narrow in April (Plate IV., 3), while the Director always saw it broader and more diffuse.

*SYRTIS MAJOR* was, as usual, the most prominent of the markings on the planet. And first, with reference to its shape, we may say that it was Lowellian† to Attkins, Corder, Molesworth (Plate IV., 4), Phillips (Plate IV., 3), and the Director. Gale gives to it Green's form, although showing the "sea" to invade *Lacus Mœris*. To Killip it was V-shaped (Plate IV., 5), and trending to N.E. Molesworth saw the coast of *Aeria* indented at the estuaries of *Astaboras* and *Typhonius*, while *Mœris Lacus* was a deep "bay" of the great "sea."

Molesworth further observed the N. end of *Syrtis Major* forked, as discovered by H. J. Townshend in 1896.‡

The intensity of *Syrtis Major* was very considerable in 1903. It was "darkish" on April 9 and 16 to Attkins, and "dark" on April 18. Corder always drew it very dark. To Gale it appeared dark on March 28 and May 10, but less so on April 3, 27, 30, May 1, 2, 3, and 5; on July 11 it was again "dark." Molesworth always found *Syrtis Major* "very dark" in 1903, and the impressions of Phillips and of the Director are similar.

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* See also *Mars Report* for 1901, p. 122.

† See *Mars Report* for 1896, p. 93, for 1899, p. 95, and for 1901, p. 123.

‡ *Mars Report* for 1896, p. 94, and Plate IV., Fig. 16.

On April 9 Attkins saw the "W. shore very well defined, E. "shore diffuse." A week later he also noted that the "*f* shore "of *Syrtis Major*" was "well-defined." This is confirmed by Molesworth, who found that the W. edge of the *Syrtis* was "very dark all along." The Ceylon astronomer noticed that "the "whole of the *Syrtis* is very patchy and irregular in tone," and "with darker knots here and there," while at times it looked "almost a chess-board pattern in parts." Molesworth saw a dark knot towards *Mœris Lacus;* another such knot, $\kappa$ of our Chart, E. of *Iapygia;* another central knot, $\lambda$; the dark triangle $\mu$ at N. end of the *Syrtis;* and the two dark knots, $\nu$ and $\xi$, at estuaries of *Astaboras* and *Typhonius.* "The darkest part," says Molesworth, "is a diamond-shaped area at its N. end"; again "the N. end of the *Syrtis* is intensely dark, almost black." This is confirmed by Phillips and the Director. Molesworth further notes that the *Syrtis* is "lighter in the centre" although this is doubless due, in part at least, to contrast. He further notes that "there is an ill-defined small lighter patch in it [the "*Syrtis*] between *Mœris* and the estuary of *Astaboras.*"

Molesworth saw five dark "canals" in *Syrtis Major.* One of these, H of our Chart, prolongs *Anubis* into *Hadriacum Mare;* the other, I, runs from *Astusapes* to *Hellas*, passing through the knots $\kappa$ and $\lambda$; the third, K, unites *Pandoræ Fretum* to *Libya*, and traverses the knot $\kappa$; the fourth "canal," L, runs between the "estuaries" of *Typhonius* and *Nepenthes;* while the last streak, M, is a prolongation of *Astaboras* into *Mœris Lacus.* The Director considers, of course, that these "canals" in the dark regions do not exist at all as such on Mars; and that their fleeting visibility should be considered as an optical symbol of a very complex and irregular natural structure, beyond the grasp of a $12\frac{3}{4}$-in. reflector. This is also Molesworth's conclusion on the subject.

Regarding the colour of *Syrtis Major*, Molesworth supplies the following records: March 3, "a greenish blue"; March 27, "decided blue, almost a bright blue"; 30, "greenish blue, very "distinct colour"; 31, "dark blue tint, without much trace of "green"; April 2, "indigo greenish blue"; 3, "greenish "indigo tinge; not regular, but here and there greener, in other "places greyer"; 4, "greenish indigo," and "bluer towards "*Hellas*"; 7, "a very dark indigo tinge with just a faint tinge "of green"; June 21, "a slight indigo tinge"; July 23, "still "bluish." From these data, it results that the general colour of *Syrtis Major* did not change during the 1903 apparition, and that it was indigo blue with a faint tinge of green.

On March 30, Molesworth wrote that "no one looking at the "*Syrtis Major* under definition such as there is to-night, could "possibly imagine it to be a sea. It is full of detail, the "gradations being sometimes quite sharp, and sometimes very "indefinite, but no uniformity. I am certain that the dark lines "in it are not straight lines at all, but merely accidental chains "of details too minute to be defined separately, 'integrated' "into a line by the eye. If by any means we could magnify it "tenfold with no loss of definition, I am convinced the aspect "would be completely changed, and we should never recognise "it."*

On March 1, "the *Syrtis Major* near the terminator," says Molesworth, "presents an unusual appearance. The dark "portion near the point seems nearly separated from the rest "by a bright bridge in prolongation of *Astaboras*. The triangular portion cut off by the bridge is very dark, and of a "decided blue tinge. There are slightly darker knots at each "angle. The bridge is slightly shaded at its junction with "*Aeria* and does not open direct into the latter." This was confirmed on March 2 and 3 also. The Director believes that the "bridge" in question is a permanent feature of *Syrtis Major*, as it was discovered by Dr. Cerulli in 1898–1899,† and was admirably seen by the Director with the great Meudon equatorial in 1909.‡


FIG. 13.—A bank of thin cloud veiling *Syrtis Major* along the equator, according to Gale's observation of 1903, May 3.

On May 2, 3, and 4, Gale made a most interesting observation of "bright bridges," which "were conspicuous across the "W. edge of *Syrtis Major*, from about the *Typhon* to *Nepenthes* "canals." No doubt, this phenomenon (Fig. 13) is due to cloud on Mars, and it is interesting to note that Mr. W. F. Denning, F.R.A.S., saw something identical 17 days after Gale's last

* This last sentence recalls to memory Mr. A. Stanley Williams's belief, expressed in 1899, that "if we could approach Mars to within a few miles, the "appearance presented by these so-called 'canals' would be so changed "that we should not recognise them at all." (*The Observatory*, 1899, June.)

† *Nuove Osservazioni di Marte*, Collurania, 1900.

‡ *Journal*, B.A.A., Vol. XX., Plate facing p. 80, Fig. 1.

record of May 4,* while the late Dr. Kibbler of our Section saw the very same thing in 1901.†

MŒRIS LACUS is always drawn as a sharp indentation of *Syrtis Major* by Gale, Molesworth, and Phillips. Attkins, Corder, and the Director could not see the "lake" itself, but only the "bay" formed by the *Syrtis* in its vicinity. Molesworth furnishes us with the following data : It was "visible as "a deep bay, somewhat deeper than last year," but was "still "joined to the *Syrtis*." On March 29, "now that the *Syrtis* "is passing off, *Lacus Mœris* at times near the limb appears "almost detached from the *Syrtis*, being only joined by a "narrow dark line with the N. point." On April 2, "with "750 *Mœris* repeatedly appeared to be not round, but to have "a small darker projection," while on the following day "two "small dark horns" were seen.

LIBYA was shaped as in Lowell's drawings to Attkins, Molesworth, and the Director, although all three observers agree in showing also Molesworth's *Abyssinia* of 1896,‡ limited to E. by the dusky knot ι of the Chart. *Abyssinia* is also shown by Gale, who otherwise draws *Libya* round to S., as on Schiaparelli's charts. Corder, Killip, and Phillips also depict the rounded outline to S., but deny the existence of the *Abyssinia* promontory. *Libya* was "prominent" to Attkins, "bright and conspicuous" to Gale, to Phillips, and to the Director. Corder and Killip show it neither brighter nor duskier than other "continental" regions; but Molesworth found it "decidedly shaded."

It is possible, or even probable, that *Libya* is always shaded, and that its occasional brightness might be due to haze on the planet.§

The brightening of *Libya* with obliquity is shown by Molesworth, Phillips, and the Director.

A small white spot, 13 of our Chart, was seen by Molesworth on *Libya*.

ISIDIS REGIO was seen to whiten under oblique illumination by Attkins, Gale, Molesworth, Phillips, and the Director.

A bright spot, 12 of the Chart, was observed bordering *Syrtis Major* on *Isidis Regio* by Gale and Molesworth. Possibly a contrast effect.

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* *Monthly Notices*, R.A.S., Vol. LXIII., p. 500. Mr. Denning saw the *Syrtis* "bridged" by very bright cloud on 1903, May 21, while on May 23 that illustrious observer found the great "sea" exhibiting "a faintness and "indefiniteness of outline which were immediately evident," as if the bright material of May 21 had "drifted rapidly northwards and occasioned the "faintness of that marking on May 23 and 24."

† *Mars Report* for 1901, p. 124, Fig. 10. Compare also Gledhill's drawing of 1871, in Flammarion's *Mars*, Vol. I., p. 208, Fig. 129.

‡ *Mars Report* for 1896, p. 92, Fig. 11.

§ The student should avoid attaching too much importance to the invariably bright *Libya* of Prof. Lowell, as the Flagstaff charts, as long ago pointed out by the Director, do not show at all the delicate shadings of the planet.

*NILI PONS* was seen by Attkins on May 21, and suspected perhaps by Gale, who inclines to attribute its visibility to "imperfect seeing." Molesworth, Phillips, and the Director show it more or less well.

*MEROE INSULA* appeared "slightly shaded" to Molesworth.

On February 23 Molesworth saw a "very small, very bright "spot near the centre of the terminator," towards $\Omega = 302°$, $\Phi = +15°$. This coincides with white spot 14 of our Chart, often seen by Molesworth on the C.M., and by Gale on May 5.

*COLOE PALUS* was observed as a dark spot by Attkins on April 8, and was described "large, darkish, and 'smudgy,' "seeming to be triangular," on April 9. On May 1 it was elliptical to Gale, 12° long, 6° broad, elongated S.E. to N.W. Molesworth generally saw it "very dark, large, and diffuse at "edges," also "circular," 5° in diameter (Plate IV., 4). Phillips had a good view of it on April 9, when it seemed to have 5° in length, from E. to W., and 4° in breadth, from N. to S.

*NEITH REGIO* was shaded between *Nilosyrtis, Boreosyrtis,* and *Asclepius,* according to Attkins, Gale, Molesworth, Phillips, and the Director.

*NUBIS LACUS* is drawn as the mere apex of the triangular *Utopia* shading by Attkins, Corder, and Gale; but Molesworth, Phillips, and the Director all saw a dark, big "lake" here, some 7° in diameter.

*COPAIS PALUS* appears very confuse in *Utopia* shades on the drawings of all those Members of the Section who have sketched this region.

A smaller dark knot, *k* of our Chart, was seen by Molesworth a few degrees N. of *Copais Palus.* This is described by him as "very dark and diffuse."

*UTOPIA,* as usual, is represented shaded by all Members who have drawn it. On April 16, Attkins found this region "greyish "with tinge of red"; on April 18 "dark with impressions of "darker nuclei." Corder shows it shaded (Plate IV., 6). Gale compares the whole shading limited by *Casius* and *Alcyonius,* and prolonged to S.E. by *Eunostos,* to "the *Syrtis Major* and "*Nilosyrtis* reversed." Slight differences of tone were detected here by our Australian co-worker. The shading is also recognisable on Killip's drawing of May 21 (Plate IV., 5). Molesworth found a "decided blue tinge" in this shading. Finally, *Utopia* appeared as heavily shaded to Phillips and to the Director.

## STREAKS.

*ADAMAS.*—Molesworth: 1½° wide, faint.

*AMENTHES.*—Attkins: April 16, 4° wide, obvious; 18, faint shading.—Gale: June 9, "strongly suspected."—Molesworth: 1½° wide, faint.—Phillips: 3° wide, dusky.—The Director: 4° wide, diffuse, edge of shade to W.

*ASCLEPIUS*.—Attkins: April 16, $2\frac{1}{2}°$ wide, edge of shade to N.—Gale: April 27, edge of shading to N.—Killip: May 21, 3° wide, dark edge of shade to N.W.—Molesworth: 2° wide, edge of shade to N.W.—The Director: 3° wide, edge of shade to N.W.

*ASTABORAS*.—Molesworth: 2° wide, fairly dark.—Phillips: 2° wide, very faint.

*ASTUSAPES*.—Molesworth: slightly convex to W., $1\frac{1}{2}°$ wide, faintish.—Phillips: 2° wide, faint.

*BOREOSYRTIS*.—Attkins: confuse in *Utopia* shading.—Gale: the form of the streak is confuse, width 7°.—Molesworth: 6° wide, very dark, doublish, bands 4° apart, and a bit convex to N.W.—Phillips: 5° wide, "very dark and conspicuous."—The Director: 4° wide, diffuse.

*CASIUS*.—Attkins: April 16, dark, ruddy edge of *Utopia* shading; 18, "*Boreosyrtis-Utopia* shading dark with impressions of darker nuclei."—Corder: dark, edge of *Utopia* shading.—Gale: March 28, April 3, 27, and 30: edge of *Utopia* shading.—Molesworth: 3° wide, "very dark, diffuse, knotted, "and tapering," and "with a very chequered, uneven appearance" (Plate IV., 4). Also, anomalously double, bands 2° apart to S.E., 6° apart to N.W.—Phillips: edge of *Utopia* shading.—The Director: 3° wide, composed, on

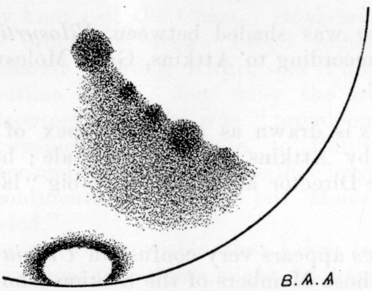


FIG. 14.—The *Casius*, resolved into knots, on 1903, April 11^d 19^h 21^m, $\omega = 260°$. (The Director.)

April 11, of four knots of unequal size (Fig. 14), and the intensified edge of the shading about *Utopia*. These knots, combined with those of Molesworth, result in the group *e*, *f*, *g*, and *h* of our Chart.

*HOR*.—Molesworth: 2° wide, very faint, edge of shade to N.W.—Phillips: curved, 2° wide, faint.

*NEPENTHES*.—Molesworth: convex to S., $1\frac{1}{2}°$ wide.—Phillips: seen only between *Mœris Lacus* and *Syrtis Major*, $2\frac{1}{2}°$ wide.

*NILOSYRTIS*.—Attkins: April 8, curved, 3° wide, dusky; 16, curved, 3° wide, dark.—Corder: curved, diffuse.—Gale: March 28, curved, very diffuse, width varying from 2° to 5°; April 3, width 4°, diffuse; 27, edge of shade to E.; 30 bifurcating into a fork before reaching *Syrtis Major*; May 1, this last feature invisible, streak 3° wide to S., 4° to W.; 3, width 3°; 5, wavy, width varying from 2° to 5°; 10, 2° wide to S., 5° wide to W., edge of shade to N.E.—Molesworth: "very dark and knotted," and often "angular, not "curved." On April 4 and 5 Molesworth saw the *Nilosyrtis* under a very curious form; the canal "from the point of the *Syrtis* to the bend is "certainly double [1° wide bands, 2° apart]. At the bend is a small lake." This is knot *i* of our Chart, and it was strongly suspected to be double on April 5. "The other section of the *Nilosyrtis*, from the bend to *Colœ Palus*, "is very dark and knotted," and $1\frac{1}{2}°$ wide.—Phillips: curved, 3° wide, very dark, edge of shade to N.E.—The Director: 3° wide, darkish, edge of shade to N.E.

*PALLAS.*—Molesworth: curved, convex to N.E. edge of shaded *Libya.*—Phillips: curved, convex to N.E., 2° wide, faint, probably illusory. "Only the edge of shading round *Libya.*"

*RHESUS.*—Molesworth: 2° wide, faint.

*TRITON.*—Molesworth: edge of shaded *Hesperia.*

### NEW STREAK.

*SELINUS.*—Molesworth saw this streak uniting *Sithonius Lacus* to *Asclepius*, convex to N., 2° wide, diffuse. Christened by the Director.

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## SECTION VII.

### The South Polar Region.

$\Omega = 0°$ to $360°$; $\Phi = 60°$ to $-90°$.

An ill-defined hazy whiteness was seen frequently to extend all over the visible part of the S. polar region, as well as in lesser latitudes, by Gale and Molesworth.

As to the S. polar snows, these were seen to reappear in September 1903 by the Ceylon observer.

## SECTION VIII.

### The North Polar Region.

$\Omega = 0°$ to $360°$; $\Phi = +60°$ to $+90°$.

The sectional results of the 1903 apparition are particularly valuable on account of the satisfactory examination of the N. polar region of Mars.

According to Molesworth, all the country beyond *Granicus*, *Gyndes*, *Alcyonius*, *Casius*, *Pierius*, *Callirrhoe*, *Tanais*, *Clarius*, and *Eurotas*, as far as the N. pole, was slightly shaded.

Our stereographic projection of the N. polar regions, as given in Plate II., should be consulted in connection with the following descriptions:—

*ORTYGIA* appeared to Molesworth darker in March and April than in May.

A white spot, 1 of the polar chart, was seen by Molesworth towards $\Omega = 8°$, $\Phi = +74°$. Gale seems to have seen this also on April 28, with a power of 700.

*THERA* is the name now given to the bright, irregularly oval spot, N. of *Mare Acidalium.* It was often seen by Molesworth, and occasionally by Phillips, in 1903. Traces of this marking seem to have been caught by Attkins and Gale also.

*BALTIA* is generally shown as heavily shaded by Attkins, although on May 4 it looked disconnected from *Mare Acidalium,* an appearance which receives some support from Gale on April 28 (Fig 15). The shading is further shown by Corder and Hall, the last named of whom represents it dusky brick red. It was also drawn by Molesworth, by Phillips, and by the Director.

*NERIGOS* appears shaded on the delineations of Attkins, Corder, Hall, Molesworth, Phillips, and the Director.

*ABALOS* was shaded, according to Attkins, Hall and Molesworth.

A white spot, 2 of Plate II., was seen *f Lacus Hyperboreus* by Molesworth and Gale.

*HYPERBOREUS LACUS* is described as "very dark" by Attkins on May 7. Gale saw this feature distinctly on April 28 as a very dark spot *f* the snows, and bridged off from *Baltia* by whitish material (Fig. 15); on May 5 he saw it *p* the snow; on "May 14 he wrote: "On the E. side of cap there is a very dark "marking in contact. It is almost black alongside the brilliant "patch, and is without question the darkest marking I have ever "seen on Mars." Gale's further drawings of *Lacus Hyperboreus* on May 15 and 18 are given in Figs. 16 and 17. Molesworth describes this "lake" on February 24 "as dark as anything on "the disc, almost like a blot of ink." It was invariably very dark to the Ceylon observer, while on March 27 "the outline "towards *Mare Acidalium*" was "rather diffused and indistinct."

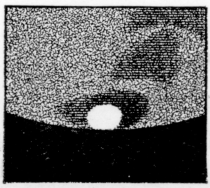

FIG. 15.
April 28, $\omega = 22°$.

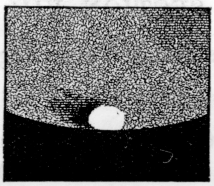

FIG. 16.
May 15, $\omega = 154°$.

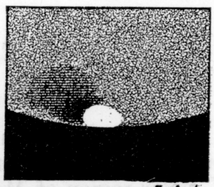


FIG. 17.
May 18, $\omega = 106°$.

Views of *Lacus Hyperboreus* in 1903, after Gale.

Phillips always saw it when on the disc, describing it as a "very "dark and large swelling on band surrounding polar cap."

*IERNE* had a fairly white spot, 3 of Plate II., *p* the *Deucalidonius Lacus*, according to Molesworth.

*DEUCALIDONIUS LACUS* is drawn by Molesworth as a dark knot, situated towards $\Omega = 160°$, $\Phi = +80°$.

*SCANDIA* was slightly shaded, as indeed, all circumpolar regions in 1903.

*ARSENIUS LACUS* was seen by Gale on April 16, $\omega = 124°$, as "a "dark marking of forked form, just S. and W. of N. pole"; also on May 17, $\omega = 130°$, as a large dark marking lying "S. and W. "of the N.P. cap." Molesworth draws it as a small, diffused shading.

*Panchaia*, shaded to Attkins, Gale, Phillips, and the Director, is shown less grey than the other circumpolar country by Molesworth.

*Uchronia* is drawn very dusky by Attkins, Corder, Gale, Molesworth, Phillips, and the Director.

*Cecropia* appeared shaded to Attkins, Corder, Gale, Killip, Molesworth, and the Director. Molesworth further found it darker in March and April than in May.

A white spot, 4 of Plate II., was seen by Molesworth towards $\Omega = 321^\circ, \Phi = +73^\circ$.

*Aria Fons* was observed by Molesworth, as in 1901,* in the approximate position of $\Omega = 352^\circ, \Phi = +67^\circ$, and as a small diffuse knot, on the junction of several streaks.

## STREAKS.

*Arius.*—Molesworth : $1\frac{1}{2}^\circ$ wide, faint.

*Cedron.*—Molesworth : $1^\circ$ wide, faint.

*Choaspes.*—Molesworth : $4^\circ$ wide, edge of shading to S.—Phillips: $3^\circ$ wide, faintish.

*Cydnus.*—Molesworth : $3^\circ$ wide, knotted (Plate IV., 4) and diffuse.

*Gyndes II.*—Molesworth : $3^\circ$ wide, edge of shade to S.—Phillips: $4^\circ$ wide, darkish.

*Heliconius.*—Gale : June 12, suspected.—Phillips : $4^\circ$ wide, edge of shaded *Utopia.*

*Hippalus.*—Molesworth : $1\frac{1}{2}^\circ$ wide, faint.

*Hebrus.*—Molesworth : $2^\circ$ wide, darkish.—Phillips : $3^\circ$ wide, dark.

*Iaxartes.*—Molesworth : $2^\circ$ wide, very dark.—Phillips : very dark, merely the *p* edge of *Mare Acidalium.*—The Director : $3^\circ$ wide, edge of shaded *Baltia.*

*Kison.*—Molesworth : $2^\circ$ wide, faint, running to left of polar cap, as in 1886.†

*Magnes.*—Phillips : convex to E. perhaps, $3^\circ$ wide, dark, curved.

*Pyramus.*—Molesworth : $4^\circ$ wide, fairly dark.

## NEW STREAKS.—Named by the Director.

*Aetos.*—Molesworth : $1\frac{1}{2}^\circ$ wide, faint.

*Eridanus.*—A name given to a long band running almost all along the 68th N. parallel of Mars. Molesworth : $2^\circ$ wide, diffuse, extending from *Pyramus*, through *Aria Fons*, to *Arsenius Lacus.*—Phillips : $3\frac{1}{2}^\circ$ wide, diffuse, E. and W. of *Mare Acidalium.*—The Director : $2^\circ$ wide, faint, seen only under the *Propontides.*

*Phœnix.*—Molesworth : $1\frac{1}{2}^\circ$ wide, faint.

*Selas.*—Molesworth : $1\frac{1}{2}^\circ$ wide, faint.

*Sythas.*—Molesworth : $2^\circ$ wide, faintish.

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* *Mars Report* for 1901, p. 129, and Plate II.

† Compare Prof. Schiaparelli's *Memoria Quinta*, Rome, 1897, Plate I. and II., to his *Memoria Sesta*, Rome, 1899, Plate I. and II., and pp. 15-22. See also our *Mars Report* for 1899, p. 78.

## THE NORTHERN SNOWS.

THE POLAR BAND is shown often knotted by Molesworth, who frequently described it as "a dark pencil line." Phillips also depicts it dark. Attkins represents it faint, being supported here by Killip and the Director. On the other hand, Corder, Gale, and Hall do not show it at all. It must be remembered that photography does not confirm the objectivity of the dark band,* and that its uniform width does not obey perspective.† Hence its at least partial subjectivity, due to contrast, cannot be seriously questioned.

THE NORTH POLAR SNOW CAP exhibited some very remarkable phenomena, which will be examined shortly. The diminution of its area went on as follows in 1903 :—

$\alpha$ in this Table is the areocentric arc subtended by the cap ; $d$ the number of days before (—) or after (+) the summer solstice of the Martian N. hemisphere.

| Date. | $\omega$ | $\alpha$ | $d$ | Observer. |
|---|---|---|---|---|
| 1903. Jan. 17 | 346°, 9 | 26° | −41 | Molesworth. |
| Feb. 5 | 170, 188 | 20 | −22 | „ |
| „ 9 | 145 | 23 | −18 | „ |
| „ 13 | 115 | 23 | −14 | „ |
| „ 15 | 79 | 24 | −12 | „ |
| „ 16 | 72, 90 | 22 | −11 | „ |
| „ 17 | 68, 75 | 21 | −10 | „ |
| „ 18 | 52 | 22 | − 9 | „ |
| „ 19 | 44, 57 | 17 | − 8 | „ |
| „ 20 | 31 | 14 | − 7 | „ |
| „ 21 | 25, 36 | 14 | − 6 | „ |
| „ 22 | 21 | 13 | − 5 | „ |
| „ 23 | 12 | 13 | − 4 | „ |
| „ 24 | 2 | 16 | − 3 | „ |
| „ 25 | 353 | 14 | − 2 | „ |
| „ 26 | 339, 352 | 13 | − 1 | „ |
| „ 27 | 336 | 14 | 0 | „ |
| „ 28 | 327 | 13 | + 1 | „ |
| „ 28 | 344 | 33? | + 1 | Hall. |
| Mar. 1 | 319 | 15 | + 2 | Molesworth. |
| „ 3 | 289, 302 | 15 | + 4 | „ |
| „ 6 | 272 | Haze | + 7 | The Director. |

| Date. | $\omega$ | $\alpha$ | $d$ | Observer. |
|---|---|---|---|---|
| 1903. Mar. 7 | 245° | Haze | + 8 | The Director. |
| „ 8 | 295, 255 | 14° | + 9 | „ |
| „ 9 | 229 | 20 | +10 | „ |
| „ 10 | 216, 231 | 15 | +11 | „ |
| „ 12 | 218 | Haze | +13 | „ |
| „ 18 | 158 | 14 | +19 | „ |
| „ 21 | 117 | 13 | +22 | „ |
| „ 22 | 120 | 15 | +23 | „ |
| „ 28 | 70 | 20 | +29 | Corder. |
| „ 28 | 306 | 10 | +29 | Gale. |
| „ 30 | 50 | 15 | +31 | The Director. |
| „ 31 | 33 | 11 | +32 | „ |
| „ 31 | 43 | 17 | +32 | Attkins. |
| „ 31 | 52 | 7 | +32 | Hall. |
| Apr. 2 | 287 | 13 | +34 | Molesworth. |
| „ 3 | 253 | 8 | +35 | Gale. |
| „ 5 | 321 | 10 | +37 | The Director. |
| „ 6 | 311, 341 | 12 | +38 | „ |
| „ 7 | 247 | 13 | +39 | Molesworth. |
| „ 8 | 330 | 20 | +40 | Corder. |
| „ 8 | 341 | 16 | +40 | Attkins. |
| „ 9 | 302 | Haze | +41 | The Director. |
| „ 11 | 260, 299 | 13 | +43 | „ |

* This was shown by the Director (*A.N.*, No. 4,358).
† This too was stated by the Director (*A.N.*, No. 4,376).

| Date. | ω | a | d | Observer. |
|---|---|---|---|---|
| 1903. Apr. 12 | 317° | 14° | +44 | Phillips. |
| „ 13 | 270 | 23 | +45 | Corder. |
| „ 14 | 200 | 13 | +46 | Molesworth. |
| „ 15 | 280 | 20 | +47 | Killip. |
| „ 16 | 271 | 20 | +48 | Attkins. |
| „ 19 | 145 | 13 | +51 | Molesworth. |
| „ 19 | {215, 252} | 13 | +51 | Phillips. |
| „ 20 | 90 | 11 | +52 | Molesworth. |
| „ 22 | 200 | 13 | +54 | Phillips. |
| „ 22 | 207 | 16 | +54 | Attkins. |
| „ 24 | 167 | 13 | +56 | Phillips. |
| „ 27 | 72 | 13 | +59 | Molesworth. |
| „ 27 | {330, 22} | 5 | +59 | Gale. |
| „ 29 | 130 | 13 | +61 | Phillips. |
| „ 30 | 289 | 9 | +62 | Gale. |
| „ 30 | 9 | 13 | +62 | Molesworth. |
| May 1 | 105 | 13 | +63 | Phillips. |
| „ 1 | 306 | 9 | +63 | Gale. |
| „ 2 | 334 | 8 | +64 | „ |
| „ 3 | 288 | 10 | +65 | „ |
| „ 4 | 63 | 13 | +66 | Phillips. |
| „ 4 | {77, 103} | 15 | +66 | Attkins. |
| „ 5 | 323 | 6 | +67 | Gale. |
| „ 7 | {36, 80} | 12 | +69 | Phillips. |
| 1903. May 7 | 50° | 16° | + 69 | Attkins. |
| „ 9 | 239 | 6 | + 71 | Gale. |
| „ 10 | 275 | 8 | + 72 | „ |
| „ 12 | 5 | 10 | + 74 | Phillips. |
| „ 14 | {171, 344} | 9 | + 76 | Gale. |
| „ 14 | 346 | 12 | + 77 | Phillips. |
| „ 15 | 154 | 8 | + 77 | Gale. |
| „ 18 | 107 | 8 | + 80 | „ |
| „ 19 | {191, 247} | 12 | + 81 | Molesworth. |
| „ 20 | 220 | 13 | + 82 | „ |
| „ 21 | {162, 202} | 12 | + 83 | „ |
| „ 21 | 288 | 16 | + 83 | Killip. |
| „ 24 | 188 | 11 | + 86 | Molesworth. |
| „ 25 | 135 | 10 | + 87 | „ |
| „ 28 | 123 | 11 | + 90 | „ |
| „ 29 | {96, 144} | 11 | + 91 | „ |
| June 1 | {78, 106} | 12 | + 94 | „ |
| „ 3 | 93 | 13 | + 96 | „ |
| „ 4 | 46 | 13 | + 97 | „ |
| „ 7 | 20 | 10 | +100 | „ |
| „ 19 | 298 | Haze | +112 | „ |
| „ 27 | {184, 293} | 8° | +120 | „ |
| July 6 | 17 | Haze | +129 | Gale. |

The comparison of these data to those of the 1899 and 1901 apparitions is interesting and instructive; and by plotting all these with respect to the summer solstice of the N. hemisphere of Mars, as done for the S. snows by Prof. Barnard in 1904,* we have Figs. 18, 19, and 20, in which the ordinates represent the areocentric arc of the N. cap, and the abscissæ the days preceding and following the summer solstice of the N. hemisphere.

An examination of these results will show that, as pointed out by Major Molesworth, "the decrease in area [of the polar "cap] was much more rapid this year, and its diameter at the "summer solstice much smaller than in previous years";† and that, whilst in 1899 and 1901 the cap still subtended some 24° at the summer solstice, it did not measure more than 18° at the same time in 1903. Nor will the apparent increase in size of the cap through irradiation, consequent on the greater distance

* For the apparitions of 1892 and 1894 (*The Astrophysical Journal*, Vol. XVII., No. 4, pp. 252-253 *et seq.*).

† *Monthly Notices*, R.A.S., Vol. LXV., p. 833.

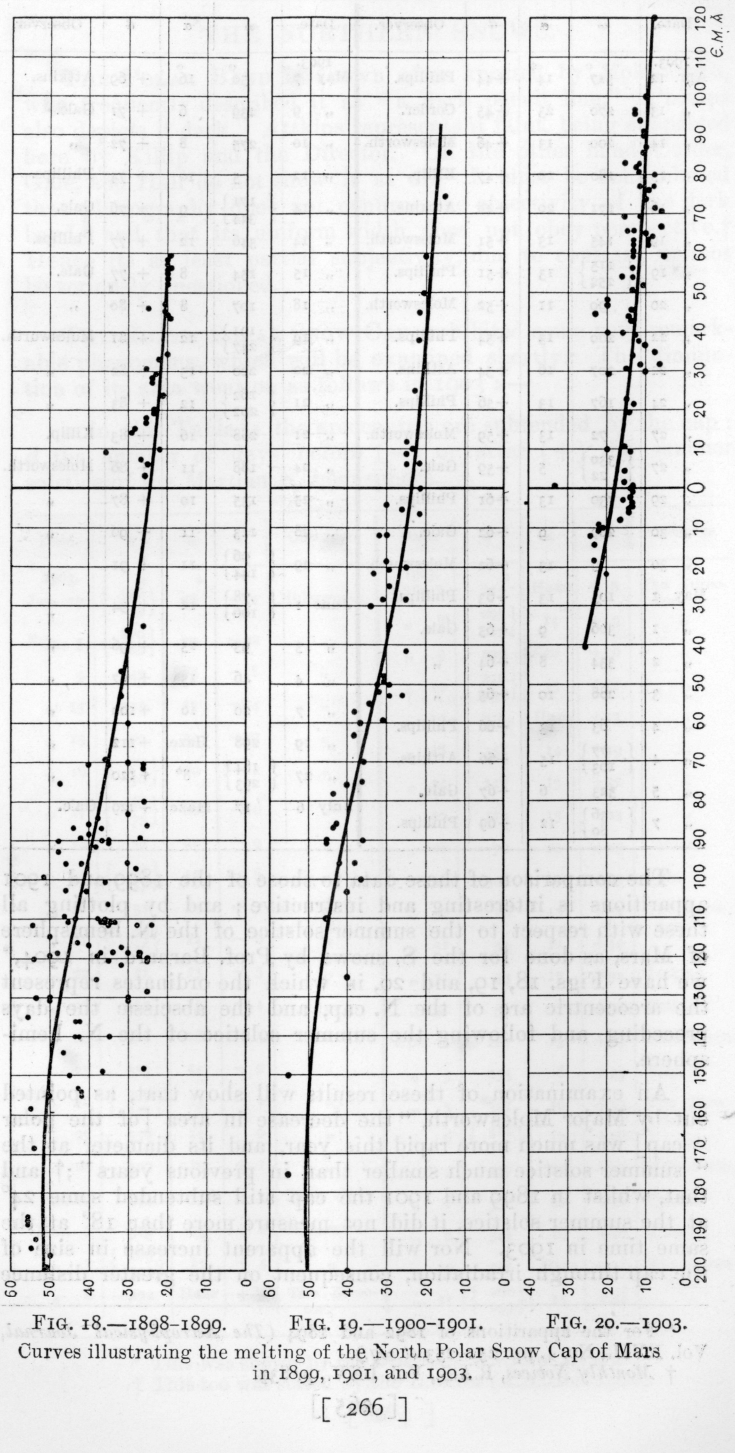

FIG. 18.—1898–1899. FIG. 19.—1900–1901. FIG. 20.—1903.

Curves illustrating the melting of the North Polar Snow Cap of Mars in 1899, 1901, and 1903.

of Mars at the summer solstice of his N. hemisphere in 1899 and 1901,* very materially affect the veracity of the above conclusion.

THE GREAT ISOLATED SNOW MASS, *OLYMPIA*.—On March 14 Phillips made an observation of quite unusual interest, when he saw the N. polar cap attended with "a somewhat similar, but "less bright, region adjoining it," at about $\Omega = 220°$. He again remarked this spot on April 22 (Fig. 21) and 24, and on May 14.

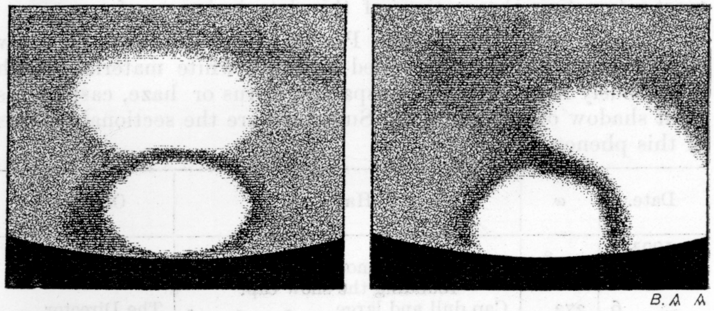

FIG. 21.—April 22, $\omega = 200°$. (Phillips.) FIG. 22.—May 24, $\omega = 188°$. (Molesworth.)

Appearances presented in 1903 by the great snow mass *Olympia* in the neighbourhood of the N. polar cap of Mars.

Molesworth independently detected the bright marking a month later, on April 14, under $\omega = 187°$, when he wrote that there was "a very bright curved marking near central, the "outlines of which are concentric with the cap, from which it "is separated by a dark knotted line" (Plate IV., 2). On April 16 he suspected "its constitution [to be] . . . the same "as that of the cap itself," and he saw the spot almost always when on the disc (Fig. 22), as late as June 27, $\omega = 184°$, when it was observed at Ceylon for the last time.

Under $\omega = 171°$, on May 13, Gale also quite independently found "a bright hazy area surrounding the N.P. cap. The "cap is closely edged by a narrow dark fringe, conspicuously "dark on the E. side, with the bright area encircling it outside "the narrow border." This feature was not seen on May 11 and 14.

These observations lead to the inference that a large snow mass, separated from the cap by a dark rift, was visible quite plainly already a fortnight after the summer solstice of the N. hemisphere; and that it remained in view for 106 days, being still recognisable 120 days after the solstice.

This white spot, which probably corresponds to a high table-land, was named *Olympia* by the Director, while the dark rift separating it from the main snow mass was called *Rima borealis* (Plate II.). There can be no doubt that the apparition of *Olympia* and its rift is a constant feature of the melting of the

* At the time of the summer solstice of the N. hemisphere of Mars, the diameter of the planet was 6″·0 in 1899, 10″·8 in 1901, and 12″·3 in 1903.

N. snows, just as *Novissima Thyle* detaches itself on a lesser scale from the melting S. cap of the planet. In fact, we find *Olympia* and its cleft on the drawings of Schiaparelli,* Terby,† and Perrotin,‡ made during the kindred opposition of 1888. At that time Schiaparelli saw *Olympia* from 82 to 150 days after the solstice, so that, by combining the 1888 with the 1903 data, we conclude that *Olympia* must be visible during at least 135 days, from less than 15 to at least 150 days after the summer solstice of the N. hemisphere of Mars.

Great credit is due to Phillips and Molesworth for their most interesting observations of this detached mass of snow.

HAZE ABOUT THE NORTH POLAR CAP.—As usual, the snow cap appeared occasionally veiled by a dull white material, which is obviously more or less transparent, cirrus or haze, casting its faint shadow on the surface. Subjoined are the sectional records of this phenomenon :—

| Date. | $\omega$ | Haze. | Observer. |
|---|---|---|---|
| 1903. March 5 | 270° ± | "A certain amount of fog surrounding the snow cap." | Phillips. |
| " 6 | 272 | Cap dull and large - - - | The Director. |
| " 7 | 250 ± | "Much fog round the N. pole" - | Phillips. |
| " 7 | 245 | Cap dull and large - - - | The Director. |
| " 8 | 240 ± | "Large patch at N. pole" - - | Phillips. |
| " 10 | 230 ± | "Fog diminishing" - - - | " |
| " 12 | 218 | Cap dull - - - - - | The Director. |
| " 28 | 306 | Polar cap "not now easily seen, it lacks definiteness and brilliance." | Gale. |
| " 30 | 42 | Cap large and faintish - - - | The Director. |
| April 9 | 302 | Do. do. - - - | " |
| June 9 | 261 | Cap "small and not brilliant" - | Gale. |
| " 10 | 262 | Cap "larger than last night" - | " |
| " 12 | 236 | Cap "small and not brilliant" - | " |
| " 19 | 292 | "Cap is decidedly fainter now" - | Molesworth. |
| " 21 | 273 ± | Do. do. - | " |
| " 27 | 184 | "All lustre has departed from the cap. But I keep suspecting a small brighter point in the centre of the white area." Also, "the dull white area may be due to vapour from the melting of the last traces of the cap." | " |
| July 2 | 160 ± | A dull white area on N. pole in which a bright "nucleus" is suspected. | " |
| " 11 | 320 | "The cap is at centre of a bright, hazy area." | Gale. |
| " 23 | 294 | "Cap very indefinite and nebulous" | Molesworth. |
| Sept. 4 | 230 | Dull white region on N. pole - | " |
| " 14 | 132 | Do. do. - | " |
| " 17 | 99 | Do. do. - | " |
| " 21 | 45 ± | Do. do. - | " |

* *Memoria Sesta*, Plate III., Figs. III.–V.; Plate IV., Fig. X.; Plate V., Figs. XI.–XIV.; and pp. 87–102.

† Flammarion, *Mars*, Vol. I., pp. 419–421, Figs. 220 and 223.

‡ *Ibid.*, pp. 404, 405, and 407, Figs. 209, 210, and 213.

Similar cloudy veilings of the N. polar snow cap were revealed by the sectional work of 1896, 1899, and 1901* ; and the dull white appearance of that thin haze or cirrus establishes that there exist whitish clouds on Mars.

Molesworth calls attention to the fact he has observed, that the cap, after its disappearance, "was replaced by a large "indefinite very dull lightening of fog or mist, with no definite "boundaries."

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* *Mars Reports*, for 1896, pp. 98-99 ; for 1899, p. 102 ; for 1901, p. 130.

# PART III.

## CHART OF MARS IN 1903.

The Charts (Plates I. and II.) at the end of the present Report are, as usual, a combination of the results given in the drawings supplied by the Members of the Section.

The areographical co-ordinates of the centre of the disc, on the various drawings, have been computed from M. Crommelin's excellent "Ephemeris for Physical Observations of Mars, 1902–"1903"*; and the transit of the Zero Meridian was found to occur in fair agreement with the data of the ephemeris. The positions of the markings are generally those of Major Molesworth, as given in his Report to the Royal Astronomical Society.†

### I.—NEW "LAKES" OF 1903.

| Name or Symbol. | Discoverer. | Named or Lettered by | Approximate Position. Ω | Φ |
|---|---|---|---|---|
| *Acidalia Fons* | Molesworth | The Director | 60° | + 56° |
| *Anubidis Fons* | " | Molesworth | 319 | + 19 |
| *Aphnitis Fons* | " | The Director | 168 | + 28 |
| *Artynia Fons* | " | " | 126 | + 54 |
| *Ascania Palus* | Phillips | " | 151 | + 31 |
| *Callirrhoes Fons* | Molesworth | " | 344 | + 53 |
| *Tatta Lacus* | " | " | 133 | + 7 |
| *Trichonis Lacus* | " | " | 118 | + 26 |
| *d* | " | " | 167 | + 23 |
| *i* | " | " | 283 | + 33 |
| *k* | " | " | 284 | + 60 |

### II.—LIST OF STREAKS SEEN BY THE SECTION IN 1903.

#### 1. SCHIAPARELLI'S CHARTS (1877-1888).

| | | |
|---|---|---|
| *Acheron.* | *Anubis.* | *Callirrhoe.* |
| *Adamas.* | *Arnon.* | *Casius (d).* |
| *Agathodæmon.* | *Asclepius.* | *Cedron.* |
| *Alcyonius.* | *Astaboras.* | *Ceraunius (d).* |
| *Amenthes.* | *Astusapes.* | *Cerberus I. (d).* |
| *Anian.* | *Boreas.* | *Cerberus II.* |
| *Antæus.* | *Boreosyrtis (d).* | *Chaos.* |

* *Monthly Notices*, R.A.S., Vol. LXII., pp. 604–615.
† *Ibid.*, Vol. LXV., pp. 827–829.

| | | |
|---|---|---|
| *Choaspes.* | *Hebrus.* | *Pactolus.* |
| *Chrysorrhoas.* | *Heliconius.* | *Phasis.* |
| *Clarius.* | *Hephæstus.* | *Phison.* |
| *Cyclops.* | *Hiddekel.* | *Phlegethon ?* |
| *Cydnus.* | *Hippalus.* | *Pierius.* |
| *Dardanus.* | *Hyblæus.* | *Protonilus* (*d*). |
| *Deuteronilus.* | *Hydaspes.* | *Pyramus.* |
| *Eosphoros.* | *Hydraotes.* | *Pyriphlegethon.* |
| *Erebus.* | *Iamuna.* | *Scamander.* |
| *Eumenides.* | *Iaxartes.* | *Simois.* |
| *Eunostos.* | *Indus.* | *Sirenius.* |
| *Euphrates.* | *Iris.* | *Styx.* |
| *Eurotas.* | *Kison.* | *Tanais.* |
| *Fevos.* | *Læstrygon.* | *Tantalus ?* |
| *Ganges* (*d*). | *Magnes.* | *Tartarus.* |
| *Gehon I.* (*d*). | *Nectar.* | *Titan.* |
| *Gehon II.* | *Nepenthes.* | *Triton.* |
| *Gigas.* | *Nilokeras* (*d*). | *Tritonilus.* |
| *Gorgon.* | *Nilosyrtis* (*d*). | *Typhonius.* |
| *Granicus.* | *Nilus* (*d*). | *Uranius.* |
| *Gyndes I.* | *Orcus.* | *Xanthus.* |
| *Gyndes II.* | *Orontes.* | *Xenius.* |
| *Hades.* | *Oxus.* | |

## 2. "CANAL" DISCOVERED BY MR. A. STANLEY WILLIAMS IN 1890.

*Pallas.*

## 3. "CANALS" OF LOWELL'S CHARTS (1894–96).

| | | | |
|---|---|---|---|
| *Cantabras.* | *Eulæus.* | *Hyscus.* | *Thyanis.* |

## 4. STREAKS OF DR. CERULLI'S CHART (1898–99).

| | | |
|---|---|---|
| *Marsyas.* | *Sitacus.* | *Ulysses.* |

## 5. STREAKS OF THE SECTIONAL CHART (1901).

| | | |
|---|---|---|
| *Arius.* | *Myrmidon.* | *Sinnys.* |
| *Damastes.* | *Rhesus.* | *Zephyrus.* |
| *Hor.* | | |

## 6. NEW STREAKS OF 1903.

| Name. | Discoverer. | Named by | Extent. From Ω | Extent. From Φ | Extent. To Ω | Extent. To Φ |
|---|---|---|---|---|---|---|
| *Aetos* - - - | Molesworth | The Director | 293° | + 56° | 308° | + 78° |
| *Charadrus* - - | " | " | 100 | + 34 | 140 | + 11 |
| *Crius* - - - | " | " | 32 | + 16 | 44 | + 36 |
| *Eous* - - - | " | " | 83 | − 11 | 86 | − 23 |
| *Eridanus* - - | " | " | 276 | + 69 | 165 | + 68 |
| *Oaxes* - - - | " | " | 88 | + 18 | 95 | + 30 |
| *Phœnix* - - | " | " | 332 | + 39 | 354 | + 66 |
| *Selas* - - - | " | " | 45 | + 55 | 51 | + 78 |
| *Selinus* - - | " | " | 229 | + 58 | 268 | + 50 |
| *Sythas* - - | " | " | 170 | + 66 | 173 | + 52 |

This makes a total of 114 streaks, as already mentioned on p. 60. The double streaks are indicated by a (*d*) in the foregoing tables.

The "canals" *Agathodæmon, Casius, Cerberus, Cydnus, Granicus, Gyndes I., Indus, Nilokeras, Nilosyrtis, Phlegethon* (?), *Protonilus, and Tritonilus,* were all resolved into knots.

III.—STREAKS IN THE DARK REGIONS.—These are 12 in number, and are marked with the capitals A to M on the Chart. They have all been seen by Molesworth.

IV.—THE LANDS WHITENING WITH THE OBLIQUITY are indicated by the symbol (*b*) on our Chart.

V.—WHITE SPOTS, 1903.—The following 17 bright spots were seen in the tropical and temperate regions of the planet:—

| No. | Length. | Position. Ω | Position. Φ | Observer. |
|---|---|---|---|---|
| 1 | 10° | 2° | + 46° | Phillips. |
| 2 | 5 | 12 | + 41 | Molesworth. |
| 3 | 17 | 12 | + 4 | " |
| 4 | 12 | 14 | + 59 | Phillips. |
| 5 | 20 | 43 | − 3 | Attkins. Molesworth. Phillips. |
| 6 | 19 | 48 | + 48 | Attkins. Molesworth. Phillips. The Director. |
| 7 | 5 | 73 | + 27 | Molesworth. |
| 8 | 14 | 89 | + 5 | Phillips. |
| 9 | 16 | 114 | + 13 | " |
| 10 | 3° | 140° | + 15° | Phillips. |
| 11 | 14 | 211 | + 22 | Attkins. Molesworth. Phillips. The Director. |
| 12 | 13 | 285 | + 18 | Gale. Molesworth. |
| 13 | 2 | 288 | + 5 | Molesworth. |
| 14 | 12 | 303 | + 14 | Gale. Molesworth. |
| 15 | 3 | 306 | − 25 | Molesworth. |
| 16 | 11 | 308 | + 48 | " |
| 17 | 10 | 351 | − 2 | Attkins. Molesworth. Phillips. |

The following four white spots were seen in the N. polar zone :—

| No. | Length. | Position. Ω | Position. Φ | Observer. | No. | Length. | Position. Ω | Position. Φ | Observer. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 6° | 8° | + 74° | Gale (?). Molesworth. | 3 | 4° | 137° | + 78° | Molesworth. |
| 2 | 5 | 82 | + 77 | " | 4 | 4 | 321 | + 73 | " |

The dimensions of these spots are given, as usual, in equatorial degrees.

VI. BRIGHT PROJECTIONS ON THE TERMINATOR.—The Chart shows two of these, corresponding to white spots 7 and 15. They are indicated by the Latin term "*tumor*." Both were observed by Molesworth. It has been stated already that the Ceylon observer saw another projection near the N. pole on April 16,* but the position of this marking is too uncertain to allow of its location on our maps.

## CHARACTERISTICS OF THE 1903 APPARITION.

A summary of the most striking features of the opposition we have been considering may be given as follows :—

(1) The inky blackness of *Lacus Hyperboreus*, strongly contrasting with the intense whiteness of the snows ;

(2) The darkness of the triangular shading in *Utopia*, which, notwithstanding the negative evidence of Schiaparelli and Lowell, is a permanent feature of these regions, as shown already by the drawings of the XVIIth century, and by the photographs of the planet ;

(3) The dusky shading of *Titania ;*

(4) The Lowellian form of *Syrtis Major ;*

(5) The visibility of *Mœris Lacus* as a mere small "gulf" of the *Syrtis*, and by no means as a large "lake," such as seen by several observers in the past ;

(6) The visibility of *Abyssinia*, to the W. of Libya ;

(7) The development of *Pambotis Lacus* as a dark "lake";

(8) The existence of *Stygia Palus*, which gave rise to the duplication of *Trivium Charontis* in 1896 ;

(9) The reappearance of *Tritonilus* under the form it had in 1886 ; that is, as a streak uniting *Lacus Ismenius* with *Margaritifer Sinus ;*

(10) The resolution of 12 "canals" into their larger components ;

(11) The great number of white spots which Phillips especially saw about the limb ;

* *See* above, p. 59.

(12) The frequent evidence of cirrus or haze, veiling apparently the surface markings, and particularly so in the polar regions;

(13) The quick melting of the snows of the N. pole, as compared to what our Members observed in 1898–1899 and in 1900–1901; and

(14) The visibility, during at least 100 days, of the great isolated snow mass *Olympia*, bordering the polar snows from $\Omega = 140°$ to $250°$, and the proof that the detachment of this white area from the N. polar cap is a normal phenomenon in the melting of the N. snows of the planet.

E. M. ANTONIADI,
Director of the Section.

Paris, 74, Rue Jouffroy,
1910, March 14.

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*Published, April* 22, 1910.

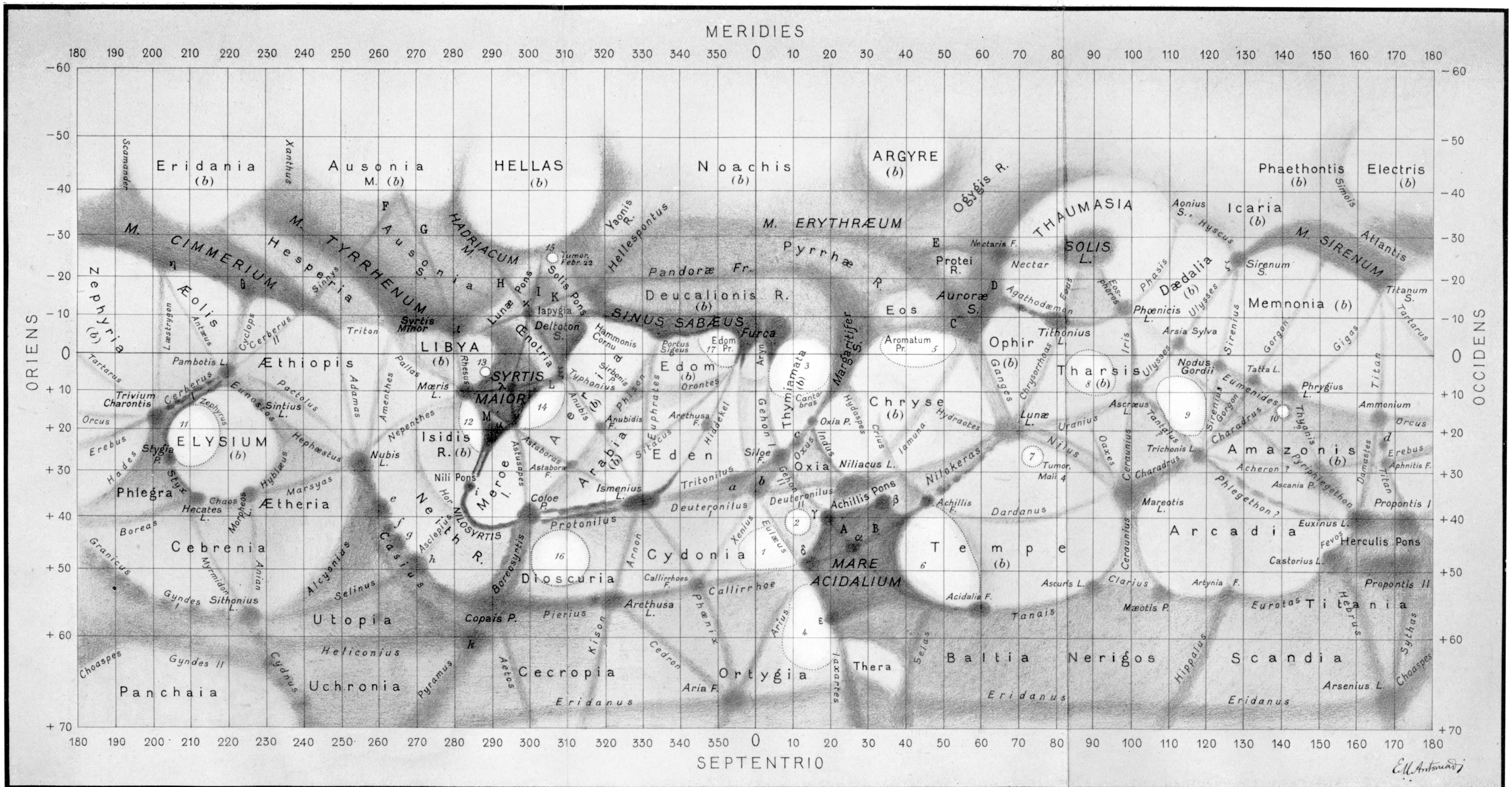


CHART OF MARS ON MERCATOR'S PROJECTION.

Prepared from the Observations of the Section in 1903.

[Abbreviations :—M. = *Mare* ; S. = *Sinus* ; Fr. = *Fretum* ; L. = *Lacus* ; P. = *Palus* ; F. = *Fons* ; R. = *Regio* ; I. = *Insula* ; Pr. = *Promontorium*.]

Plate II.

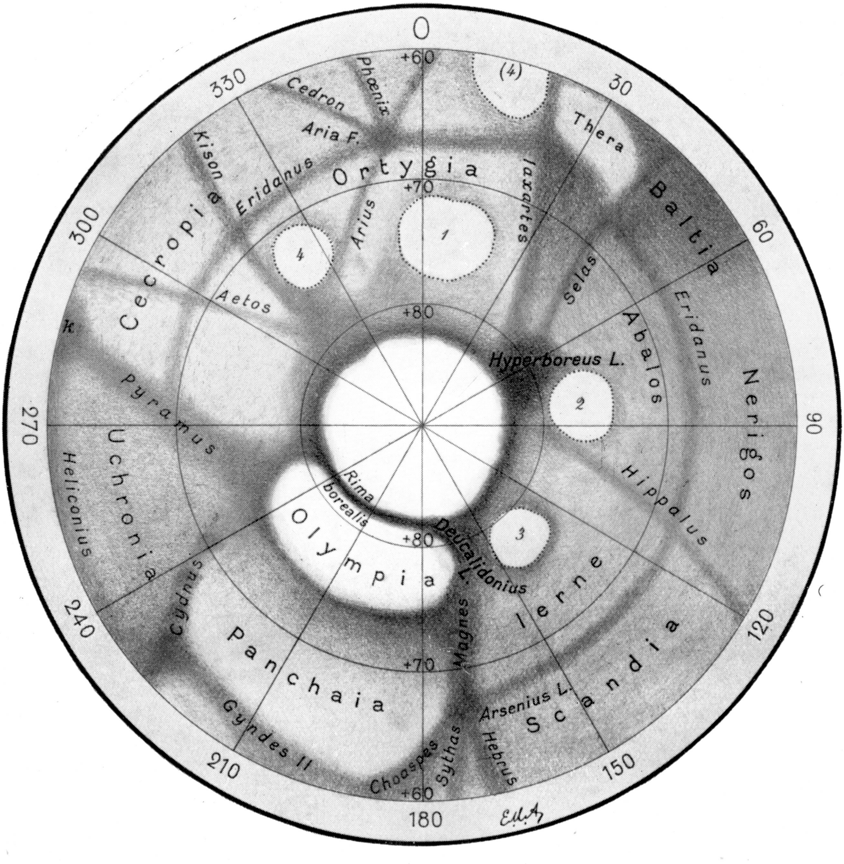


Chart of the N. Polar Regions of Mars.

Prepared from the Observations of the Section in 1903.

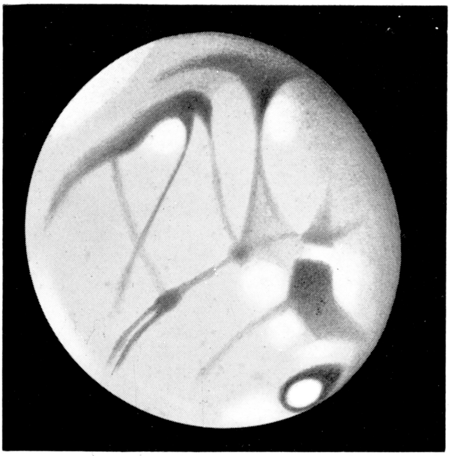

FIG. 1.—T. E. R. PHILLIPS. $9\frac{1}{4}$-in. spec.
1903, May 12. $\omega = 5^\circ$. $\phi = +25^\circ{\cdot}2$.

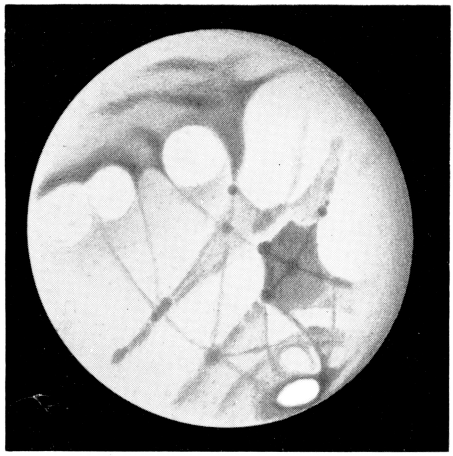

FIG. 2.—P. B. MOLESWORTH. $12\frac{3}{4}$-in. spec.
1903, April 30. $\omega = 9^\circ$. $\phi = +24^\circ{\cdot}7$.

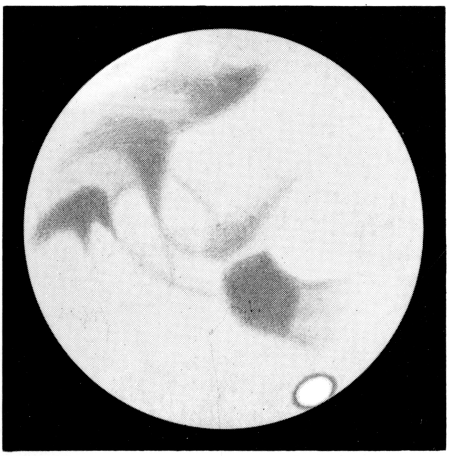

FIG. 3.—E. M. ANTONIADI. $8\frac{1}{2}$-in. spec.
1903, March 31. $\omega = 33^\circ$ $\phi = +22^\circ{\cdot}8$.

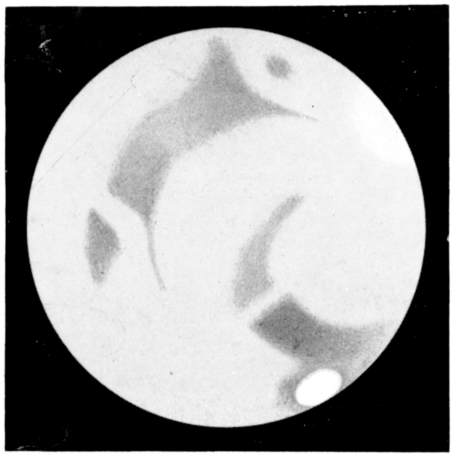

FIG. 4.—E. A. L. ATTKINS. $6\frac{1}{2}$-in. spec.
1903, March 31. $\omega = 43^\circ$. $\phi = +22^\circ{\cdot}8$.

FIG. 5.—W. J. HALL. $6\frac{3}{8}$-in. spec.
1903, March 31. $\omega = 52^\circ$. $\phi = +22^\circ{\cdot}8$.

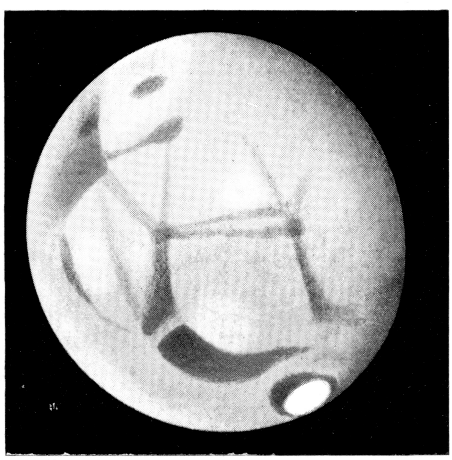

FIG. 6.—T. E. R. PHILLIPS. $9\frac{1}{4}$-in. spec.
1903, May 7. $\omega = 80^\circ$. $\phi = +25^\circ{\cdot}0$.

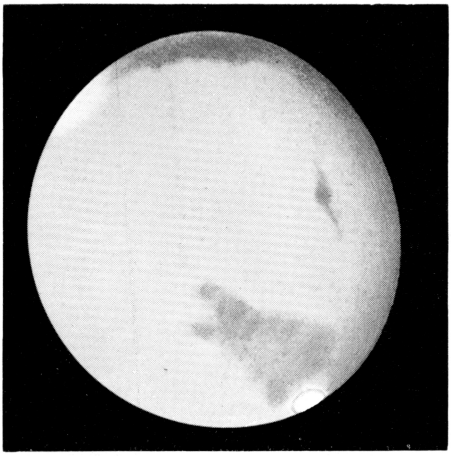

FIG. 1.—W. F. GALE. $8\frac{1}{2}$-in. spec.
1903, May 14. $\omega = 171^\circ$. $\phi = +25^\circ \cdot 3$.

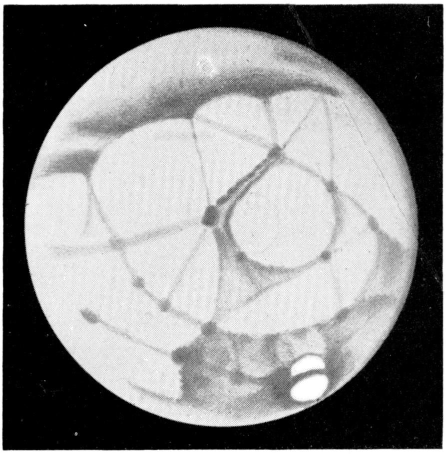

FIG. 2.—P. B. MOLESWORTH. $12\frac{3}{4}$-in. spec.
1903, April 14. $\omega = 200^\circ$. $\phi = +23^\circ \cdot 8$.

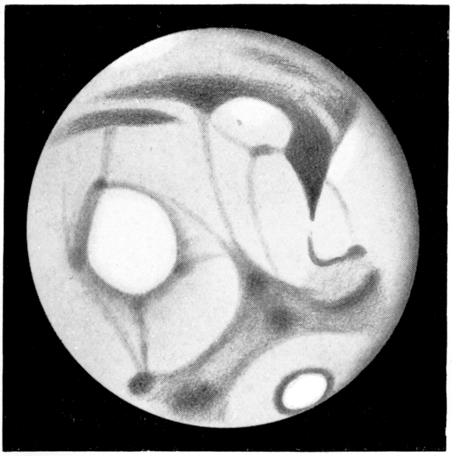

FIG. 3.—T. E. R. PHILLIPS. $9\frac{1}{4}$-in. spec.
1903, April 19. $\omega = 252^\circ$. $\phi = +24^\circ \cdot 1$.

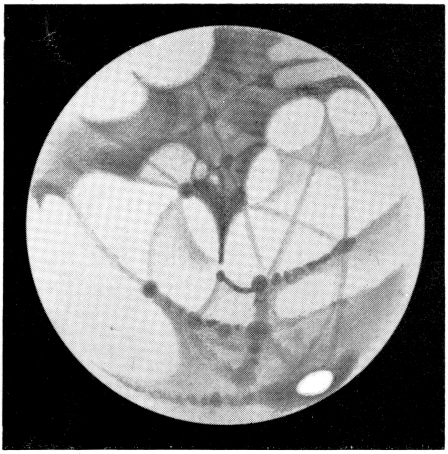

FIG. 4.—P. B. MOLESWORTH. $12\frac{3}{4}$-in. spec.
1903, April 2. $\omega = 287^\circ$. $\phi = +22^\circ \cdot 9$.

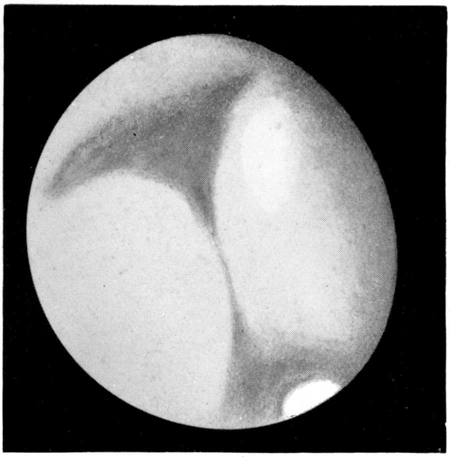

FIG. 5.—R. KILLIP. 5-in. O.G
1903, May 21. $\omega = 288^\circ$. $\phi = +25^\circ \cdot 6$.

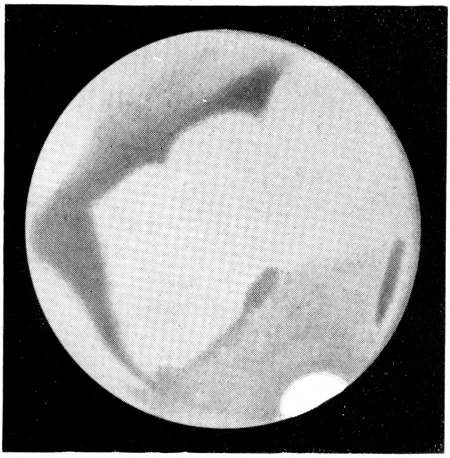

FIG. 6.—H. CORDER. $6\frac{1}{2}$-in. spec
1903, April 8. $\omega = 331^\circ$. $\phi = +23^\circ \cdot 3$.

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