

SECTION FOR THE OBSERVATION OF M A R S.

DIRECTOR.—BERNARD E. CAMMELL, F.R.A.S.

REPORT OF THE SECTION, 1894.

Introduction.

The following Table gives the alphabetical list of the Members forming the Section, together with particulars of the instruments used :—

TABLE I.

| Name. | Place. | O.G. or Spec. | Aperture in Inches. | Draw- ings. |
|-----------------------------------|---------------------------|---------------------|---------------------------|----------------|
| Antoniadi, E. M. - | France - | O.G. | $9\frac{1}{2}$ | 12 |
| Baikie, Rev. J., F.R.A.S. - | Roxburghshire - | O.G. | $4\frac{1}{2}$ | |
| Brown, G. L. - | Stirling - | Spec. | $10\frac{1}{4}$ | 7 |
| Cammell, Barnard S., F.R.A.S. | Wokingham - | Spec. | $12\frac{1}{2}$ | 6 |
| Cottam, Arthur, F.R.A.S. - | Watford - | Spec. | $12\frac{1}{2}$ | 6 |
| Davis, G. T. - | Reading - | O.G. | $3\frac{1}{2}$ | 20 |
| Ellis, Henry - | London - | Spec. | $12\frac{1}{2}$ | 5 |
| Henderson, Arthur - | Liverpool - | Spec. | $10\frac{1}{2}$ | 7* |
| Kemphorne, Rev. P. H. - | Wellington Col- lege. | Spec. | $8\frac{1}{2}$ | 7 |
| Mauder, E. W., F.R.A.S. | Greenwich - | O.G. | 28 | 5 |
| Mears, T. Willoughby - | Brighton - | O.G. | $3\frac{1}{2}$ | 5 |
| Mee, Arthur, F.R.A.S. - | Cardiff - | Spec. | $8\frac{1}{2}$ | 13 |
| Noble, Capt., F.R.A.S. - | Sussex - | O.G. | $4\frac{1}{2}$ | 5 |
| Patterson, A. Gordon, M.D. | Ascot - | Spec. | 10 | 7 |
| Roberts, C. - | Bournemouth - | Spec. | $6\frac{1}{2}$ | 22 |
| Saul, Rev. R. Beamish - | Weston - super - Mare. | Spec. | $8\frac{1}{2}$ | 8 |
| Smart, Dr. D., F.R.A.S. - | Bermondsey, S.E. | Spec. | 10 | 1 |
| Stewart, W. C. - | York - | Spec. | 10 | 1 |
| Taylor, C. A. - | London - | O.G. | 2 | 6 |
| Waugh, Rev. W. R., F.R.A.S. | Portland - | Spec. | $12\frac{1}{2}$ | 3 |
| Williams, A. Stanley, F.R.A.S. | West Brighton - | Spec. | $6\frac{1}{2}$ | 8 |
| Wood, J. T. - | Nottingham - | O.G. Spec. | $3\frac{1}{2}$ 10 | 3 |

* In addition to eight diagrams, and six drawings of Solis Lacus.

TABLE II.

List of drawings made by Members of Mars Section during the opposition of 1894, arranged in order of longitude.

| Longitude of Central Meridian. | Date. | Name of Observer. | Reference to Plates. |
|--------------------------------------|----------|-------------------|----------------------------|
| 0 | Dec. 16 | - Wood. | |
| 1 | Oct. 2 | - Beamish Saul. | |
| 3 | Aug. 30 | - Roberts. | |
| 5 | Sept. 1 | - Roberts. | |
| 11 | Dec. 15 | - Davis. | |
| 13 | Oct. 1 | - Baikie. | |
| 19 | " 1 | - Wood. | |
| 22 | Dec. 18 | - Davis. | |
| 25 | Oct. 2 | - Mee. | |
| 30 | Aug. 27 | - Beamish Saul. | |
| 33 | Sept. 28 | - Davis. | |
| 34 | Aug. 27 | - Antoniadi. | |
| 35 | Sept. 26 | - Roberts. | |
| 35 | " 27 | - Roberts. | - Plate II., Fig. 7. |
| 35 | Aug. 28 | - Roberts. | |
| 38 | Oct. 1 | - Henderson. | |
| 43 | Aug. 29 | - Roberts. | |
| 47 | Sept. 29 | - Ellis. | |
| 49 | Aug. 27 | - Antoniadi | - Plate II., Fig. 8. |
| 50 | Sept. 29 | - Waugh. | |
| 52 | " 28 | - Kempthorne. | |
| 55 | " 26 | - Baikie. | |
| 55 | " 26 | - Kempthorne | - Plate II., Fig. 9. |
| 57 | Aug. 23 | - Antoniadi | |
| 58 | Sept. 29 | - Henderson. | |
| 59 | " 26 | - Davis. | |
| 71 | " 28 | - Henderson | - Plate II., Fig. 10. |
| 76 | " 27 | - Cammell | - Plate II., Fig. 11. |
| 91 | Oct. 30 | - Antoniadi. | |
| 97 | " 31 | - Antoniadi. | |
| 100 | Nov. 1 | - Antoniadi | - Plate II., Fig. 12. |
| 104 | Sept. 28 | - Roberts. | |
| 112 | Oct. 27 | - Taylor. | |
| 115 | Sept. 18 | - Davis. | |
| 116 | " 17 | - Roberts. | |
| 118 | Aug. 16 | - Meares. | |
| 118 | Oct. 27 | - Kempthorne. | |
| 130 | Sept. 18 | - Davis. | |
| 131 | " 27 | - Roberts | - Plate III., Fig. 13. |
| 135 | " 19 | - Mee | - Plate III., Fig. 14. |
| 145 | Oct. 23 | - Antoniadi. | |
| 153 | Sept. 15 | - Antoniadi | - Plate III., Fig. 15. |
| 153 | Oct. 25 | - Taylor. | |
| 154 | " 21 | - Brown | - Plate III., Fig. 16. |
| 157 | Nov. 30 | - Beamish Saul | - Plate III., Fig. 17. |
| 160 | Oct. 15 | - Davis. | |
| 167 | " 22 | - Kempthorne. | |
| 167 | Sept. 14 | - Baikie. | |
| 170 | " 16 | - Henderson | - Plate III., Fig. 18. |
| 177 | Nov. 25 | - Mee. | |

| Longitude of Central Meridian. | Date. | Name of Observer. | Reference to Plates. |
|--------------------------------------|--------------|---------------------|----------------------------|
| 180 | Sept. 12 | - Cammell. | |
| 180 | " 19 | - Roberts. | |
| 180 | Oct. 21 | - Patterson. | |
| 182 | Nov. 25 | - Stanley Williams. | |
| 185 | Sept. 13 | - Mee. | |
| 186 | Oct. 14 | - Henderson. | |
| 187 | Sept. 11 | - Davis. | |
| 190 | Oct. 18 | - Brown. | |
| 193 | Sept. 12 | - Baikie. | |
| 194 | " 19 | - Stanley Williams. | |
| 197 | " 11 | - Roberts. | |
| 200 | " 12 | - Mee. | |
| 207 | Nov. 25 | - Mee. | |
| 210 | Oct. 21 | - Patterson. | |
| 210 | " 21 | - Kempthorne. | |
| 213 | Aug. 5 | - Antoniadi. | |
| 213 | Sept. 11 | - Stanley Williams. | |
| 214 | Oct. 19 | - Stanley Williams. | |
| 214 | Sept. 20 | - Roberts. | |
| 216 | Oct. 16 | - Patterson. | |
| 217 | Sept. 9 | - Roberts. | |
| 217 | Oct. 22 | - Henderson. | |
| 220 | Sept. 10 | - Mee. | |
| 220 | 1895, Jan. 1 | - Roberts. | |
| 224 | Sept. 9 | - Meares. | |
| 224 | Nov. 18 | - Taylor. | |
| 225 | Sept. 7 | - Davis. | |
| 226 | Nov. 22 | - Brown. | |
| 226 | Oct. 17 | - Stanley Williams | - Plate IV., Fig. 19. |
| 228 | " 13 | - Waugh. | |
| 228 | July 1 | - Antoniadi. | |
| 229 | Sept. 8 | - Roberts. | |
| 230 | Oct. 16 | - Mee. | - Plate IV., Fig. 20. |
| 235 | Dec. 27 | - Beamish Saul. | |
| 237 | Nov. 19 | - Meares. | |
| 240 | Sept. 9 | - Stanley Williams. | |
| 240 | Oct. 15 | - Stanley Williams. | |
| 240 | " 16 | - Smart. | |
| 241 | Sept. 6 | - Roberts. | |
| 242 | Oct. 16 | - Davis. | |
| 242 | Sept. 7 | - Ellis. | |
| 244 | Nov. 23 | - Davis. | |
| 244 | Oct. 15 | - Patterson. | |
| 250 | " 16 | - Kempthorne | - Plate IV., Fig. 21. |
| 252 | " 14 | - Patterson | - Plate IV., Fig. 22. |
| 252 | " 15 | - Noble. | |
| 252 | " 14 | - Wood. | |
| 255 | Sept. 6 | - Mee. | |
| 255 | Dec. 31 | - Davis. | |
| 257 | Oct. 15 | - Cammell | - Plate IV., Fig. 23. |
| 260 | Nov. 21 | - Noble. | |
| 263 | Oct. 12 | - Beamish Saul. | |
| 265 | " 14 | - Kempthorne. | |
| 266 | " 11 | - Brown | - Plate IV., Fig. 24. |
| 266 | " 12 | - Patterson. | |
| 267 | " 11 | - Baikie. | |
| 275 | Nov. 17 | - Davis. | |

| Longitude of Central Meridian. | Date. | Name of Observer. | Reference to Plates. |
|--------------------------------------|----------|----------------------|----------------------------|
| 276 | Oct. 10 | - Baikie - - | Plate V., Fig. 26. |
| 276 | Sept. 5 | - Cammell - - | Plate V., Fig. 25. |
| 277 | " 7 | - Antoniadi - - | Plate V., Fig. 27. |
| 283 | " 5 | - Meares. | |
| 285 | Nov. 18 | - Mee. | |
| 286 | Sept. 5 | - Maunder. | |
| 286 | Dec. 27 | - Davis. | |
| 287 | Oct. 8 | - Baikie. | |
| 287 | Sept. 1 | - Ellis. | |
| 290 | Nov. 18 | - Meares. | |
| 293 | " 18 | - Noble. | |
| 293 | Sept. 5 | - Maunder - - | Plate V., Fig. 28. |
| 295 | " 11 | - Roberts. | |
| 296 | Aug. 31 | - Davis. | |
| 296 | July 29 | - Ellis. | |
| 296 | Nov. 19 | - Davis. | |
| 299 | " 15 | - Taylor. | |
| 301 | Oct. 7 | - Beamish Saul. | |
| 302 | " 8 | - Noble. | |
| 302 | Sept. 10 | - Roberts. | |
| 303 | Oct. 7 | - Patterson. | |
| 304 | Nov. 14 | - Mee. | |
| 305 | Sept. 4 | - Henderson. | |
| 305 | Oct. 8 | - Brown - - | Plate V., Fig. 29. |
| 306 | Dec. 18 | - Waugh. | |
| 309 | Oct. 8 | - Beamish Saul. | |
| 309 | Aug. 30 | - Ellis. | |
| 311 | " 22 | - Davis. | |
| 315 | Oct. 7 | - Cammell. | |
| 320 | " 8 | - Mee - - | Plate V., Fig. 30. |
| 321 | Nov. 15 | - Noble. | |
| 328 | Aug. 31 | - Maunder. | |
| 329 | " 29 | - Cammell - - | Plate I., Fig. 1. |
| 330 | Dec. 20 | - Beamish Saul. | |
| 330 | Nov. 15 | - Beamish Saul. | |
| 340 | Sept. 5 | - Roberts. | |
| 341 | Aug. 28 | - Antoniadi - - | Plate I., Fig. 2. |
| 341 | Sept. 6 | - Roberts. | |
| 341 | Oct. 2 | - Brown - - | Plate I., Fig. 3. |
| 342 | " 7 | - Taylor. | |
| 343 | Aug. 29 | - Maunder - - | Plate I., Fig. 4. |
| 347 | Nov. 15 | - Taylor. | |
| 348 | Aug. 29 | - Maunder. | |
| 350 | " 30 | - Roberts - - | Plate I., Fig. 5. |
| 352 | Oct. 2 | - Davis. | |
| 354 | Aug. 30 | - Roberts. | |
| 357 | Oct. 2 | - Davis. | |
| 358 | Aug. 29 | - Stanley Williams - | Plate I., Fig. 6. |
| | Nov. 15 | - Mee. | |

The Director, in issuing this Report, wishes to convey the thanks of the Members of the Section to Dr. Marth for having so kindly assisted them by forwarding his valuable ephemerides, from which all the longitudes of the drawings have been calculated. Also indirectly to Messrs. Percival Lowell, A. E. Douglas,

W. E. Pickering, observing at the Lowell Observatory, Arizona, for their valuable and instructive articles and drawings, which have appeared from time to time in "Astronomy and Astro-Physics," also in "Popular Astronomy." To Mr. J. W. Schaeberle at the Lick Observatory for his beautiful drawings of the *Solis Lacus* region, to Herr Leo Brenner for his drawings in the "English Mechanic," and last, but not least, to M. Camille Flammarion for his valuable contributions to Areography in "L'Astronomie."

The Director also wishes personally to thank Mr. Maunder for his assistance so kindly given in helping him with his great experience to draw up the list of instructions issued to Members at the commencement of the apparition, and also by placing at his disposal the list of instructions issued by him when Director of the Section in 1892. And also to Mr. Stanley Williams for his most valuable suggestions and criticisms given from time to time. Coming from one who is so well qualified to speak on everything connected with Mars, they have been of great assistance.

The number of drawings sent in amounts to 156. Mr. Henderson, besides, sent in eight diagrams and six drawing of the *Solis Lacus*, and Mr. Stanley Williams eight diagrams, all of which appear in his report.

No doubt a much larger number would have been available had it not been for the very unpropitious state of the weather; in fact, had not the Members been full of enthusiasm and a determination, in spite of the wretched weather, not to let such a favourable opposition of Mars pass without some good work being done, the Director feels that this Report would have been much curtailed.

The Section may be congratulated on having such skilled observers as Mr. Stanley Williams and Mr. Antoniadi among their number. The latter gentleman was fortunate in having at his disposal, during a part of the season, the fine 9 $\frac{3}{4}$ -in. O.G. of the Juvisy Observatory. The drawings, however, which he made later in the season, and the observations as well, with only a 4 $\frac{1}{4}$ -in. O.G. are worthy of great praise.

The present apparition of Mars seems to have fully demonstrated the accuracy of Schiaparelli's observations and maps, a large number of his canals and lakes having been seen, and in some instances canals not hitherto recorded. One noteworthy fact, which seems to be well established, is, that during the present apparition certain well known markings on the planet have been either totally obscured or very much altered in form.

The Director begs to thank all the Members for their very willing assistance and co-operation. He wishes that a more experienced observer than himself had been chosen for the post of Director, as he can only claim to be comparatively a beginner in the study of Mars.

He trusts that any shortcomings on his part will be kindly considered.

Syrtis Minor.

This sea has been drawn unusually large by a great many observers. The smallest instruments have not failed to show this. In fact, in many cases it might easily be mistaken for the *Syrtis Major*.

In the preliminary report issued in Vol. V., No. 3, of the "Journal of the British Astronomical Association" on the work of the Section, attention was called to this point. There seems now to be no doubt that this great enlargement of the *Syrtis Minor* was due to the enormous proportions which the *Canal Amenthes*, leading out of it, assumed. Most of the observers call this canal the *Lethes*, but after due consideration, there appears to be little doubt that it was the *Amenthes* (see preliminary report referred to above). It is also remarkable that this extraordinary increase in size of this canal should have taken place about the same time as the "great cloud formation" over *Mare Cimmerium* and Herschel I. Continent did, namely in October. Also that the *Syrtis Minor* should have begun to regain its normal appearance about the same time as the *Mare Cimmerium*. This point is discussed by Mr. Stanley Williams in his report.

Solis Lacus and neighbouring Region.

The dark spot, *Solis Lacus*, received much attention during the Opposition of 1894. Mr. Henderson made several observations of it, and sent six diagrams to illustrate the changes it underwent.

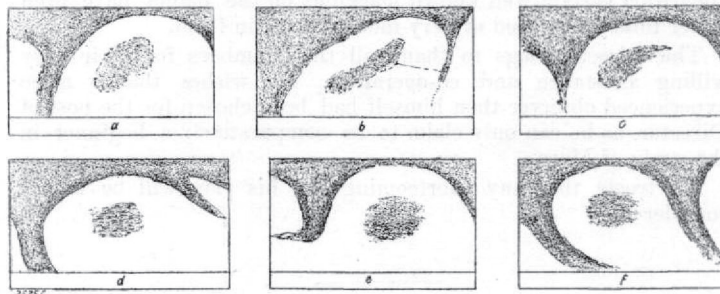
Fig. a., August 22, mere faint diffuse blur; N. of this a reddish-yellow shading which is much duller further N.

Fig. b., September 27, elongated S.E. to N.W., and narrower in the middle portion. *Eosphorus* strongly suspected. *Thaumasia* very bright, where it borders *Mare Erythræum*; the northern portion much duller.

Fig. c., September 28, faint, slightly elongated, narrower towards the E.

Fig. d., September 29, faint, almost round; N. of this a pronounced red tinge as observed before.

Fig. e., October 1, very vague, circular; red tint to N. again prominent.



Changes in the *Solis Lacus*, 1894. (Henderson.)

DR. HENDERSON, in report the *Solis Lacus* as appearing elongated E. to W., although the latter on several occasions reports it as circular.

Mr. Antoniadi reports, October 30, *Solis Lacus* central, exceedingly dark, almost black.

The *Aonius Sinus* seems to have been very faint, indeed at times invisible. There is no doubt that the appearance here was quite abnormal. All the above observers agree in this, Mr. Henderson, in two drawings of this region, September 29 and September 28, giving no sign of it. Both Mr. Stanley Williams and Mr. Antoniadi about the same time report that it is either wholly or nearly obscured. This has also since been confirmed by some of the American observers. Herr Leo Brenner, on the other hand, a great many of whose drawings have lately appeared in the "English Mechanic," always draws the *Solis Lacus* circular, and the *Aonius Sinus* quite distinct, as it appears in Schiaparelli's maps. This disappearance was no doubt due to cloud. (See remarks on this region in preliminary report).

The Director had noticed about the same date that the *Solis Lacus* appeared nearer the p. end of *Thaumasia*, and this no doubt might be accounted for by the *Aonius Sinus* being absent, thereby giving it the appearance of being situated nearer the p. end.

But on careful examination of the drawings to hand, and also from some remarks by Mr. Antoniadi (in "L'Astronomie," November 1894, p. 410) and by Mr. Lowell (in "Astronomy and Astro-Physics," October 1894, p. 650), it appears that the region called by Schiaparelli "*Aurea Chersonesus*" has partially if not wholly vanished. If the drawings of this apparition are compared with those of Green in 1877, and also with those of Schiaparelli, it seems impossible to avoid the conclusion that a large part of the continent bordering on *Aurora Sinus* has disappeared, and it would, therefore, tend to make the *Solis Lacus* appear out of the centre of *Thaumasia*. Indeed it would actually be so.

Some drawings by Prof. Holden with the Lick telescope, published in the "Publications of the Astronomical Society of the Pacific," show *Thaumasia* extremely narrow on the preceding side.

Herr Leo Brenner, however, shows the lake situated as usual in the centre of *Thaumasia*.

Syrtis Major.

The Rev. W. R. Waugh, on December 18, and J. T. Wood on October 14, both show a small bay, extending into *Aeria*, on the f. side of the *Syrtis Major*, at a point where the *Typhon Canal* debouches. Something similar, although not quite the same, was drawn by Green in 1877.

Mr. Wood shows this bay dark and large.

The Rev. W. R. Waugh shows it smaller and fainter.

Mare Cimmerium.

During October the *Mare Cimmerium* and a large part of *Herschel I.* continent presented quite an unusual appearance; many observers reporting the *Mare Cimmerium* as quite blotted out, while others again, in attempting to draw this region, report that they were quite unable to satisfactorily identify any of the markings.

There can be very little doubt that those abnormal appearances of the *Mare Cimmerium* and neighbourhood were due to the presence of cloud on Mars.

There seems too, from comparison of the different observations and drawings made about this time, to have been partial openings or thinning of the cloud envelope, especially about the f. end of the *Mare Cimmerium*.

Thus the *Rev. P. H. Kempthorne*, under date October 16, gives the *Mare Cimmerium* as having vanished all but a fragment at the f. end; and on October 22, *Mare Cimmerium* invisible.

Dr. Gordon Paterson gives the *Mare* absent under date October 14, faint October 15, the middle portion absent on October 21, and the rest very indistinct.

Mr. J. T. Wood, on October 14, and *Dr. Smart*, on October 16, also concur as to the disappearance of the *Mare*.

Satellites.

No observations of these minute bodies have been recorded, although one or two observers have suspected faint points of light. When we hear of these most difficult objects being seen at the Manora Observatory by Herr Brenner, with a 7-in. O.G., without even especially looking for them, or taking any means to hide the glare of the planet, in fact being seen quite easily, it appears or might be considered rather a curious circumstance that none of the instruments of the Members of the Section, with the exception, of course, of the 28-in. refractor used by Mr. Maunder, have been equally fortunate in detecting them.

The Weather.

Mr. Cammell (Wokingham) remarks, that "such a wretched autumn for astronomical observations could hardly be conceived; in most parts of the country the heavens were obscured for weeks together by a high bank of clouds, which completely shrouded the sun by day and the stars by night. Definition, which in the early part of the season had at times been fair, seemed in the late autumn to get worse, and night after night the appearance of Mars suggested a boiling mass of red light."

Mr. Maunder (Greenwich) writes on September 26, "Image boiling furiously, the planet very bright, but merely a great flaring naphtha lamp. It was hopeless to attempt a sketch."

Mr. Mee (Cardiff) remarks that "definition was never first-rate, whilst between October 16 and November 14 the

"atmospheric conditions were so bad as to render all seeing
"hopeless."

Mr. Davis (Reading) speaks of the definition on October 2 as very good, and that the details were seen like a picture.

Mr. Antoniadi, observing at Juvisy, France, was favoured with much better weather, and speaks of "Very fine seeing" on August 5, "Very fine weather" on August 27 and 28, and on September 15 "the air is very calm and steady." His last remark on the weather is, on November 1, "Beautiful definition."

Colours of Mars.

There is a general agreement amongst the various observers in their remarks on the colours of Mars. All describe the larger continents as more or less orange in tone, and the seas as blue or gray blue, some of them slightly greenish, but, from the bright orange or pink of *Hellas*, to the dusky orange, and faint red grays of other portions of supposed land, there is no great difference in the reports of colour. *Mr. Cammell's* words are these: "On August 30, 1894, Beer continent—orange and bright orange. October 7, *Syrtis Major*, beautiful blue gray, the darker seas a beautiful greenish blue of great purity, very difficult to imitate. On November 19, *Hellas* was bright orange when on central meridian."

Mr. Mee describes *Hellas* on the 14th November as fiery red, but on the 16th October as colourless.

Mr. Maunder writes on August 29, that Beer continent was the reddest region visible, and was of a full orange, and describes the seas as a natural gray, the *Sinus Sabæus* being the darkest.

Mr. Davis observed *Hellas* white on the 2nd October and afterwards always ruddy, but the continental regions lost their rosy red tint after the end of November.

Mr. Wood reports colours of continents a decided pink, and the dark blue black or blue gray.

Mr. Roberts saw on September 19 "a very marked green tint on the *Mare Cimmerium*."

Changes of Colour.

As in former oppositions, there is a general agreement amongst observers that certain districts change colour as they pass from the central meridian to the terminator. Especially is this the case with regard to the very distinct marking *Hellas* (Lockyer Land). When fully presented, it is, perhaps, the ruddiest region on the planet; when on the terminator it becomes white, sometimes brilliantly so.

On this point the report of the Director, *Mr. Cammell*, may be quoted. "The larger islands in the southern hemisphere, such as *Hellas*, *Argyre*, and *Noachis*, &c., are often a dull greyish orange, but when near the limb are very bright." The following

are detailed observations:—*Hellas*, August 29, very bright, near terminator; August 30, less bright, more on disk; October 7, dull orange; October 15, near limb, rather bright; November 19, bright orange, on central meridian. *Argyre*, August 26, a whitish patch; September 27, dull orange; October 7, dull orange. *Noachis*, August 26, a whitish patch; August 31, dull greyish orange; October 7, dull orange.

Mr. Mee's observations also supply the following notes with regard to *Hellas*:—*Hellas*, October 7, ill-defined, reddish; October 8, ruddy, smaller than usually drawn; October 12, apparently joined *Ausonia*; October 16, colourless; November 14, very red; November 15, less red when near terminator.

So *Mr. Davis* also reports *Hellas* white and bright on the terminator on September 26 and 28, but later on, in observations at the latter end of October, he mentions that *Hellas* then always appeared ruddy.

The South Polar Cap.

Mr. Cammell observes that the rapid decrease in the size of this cap has been well noted. By the end of October it had practically disappeared. No rifts or outstanding points of light similar to those seen by *Mr. Green* in 1877 have been observed, but nearly all the Members of the Section have recorded the existence of a dark zone or belt surrounding the cap, and some Members mention that on occasions the cap seemed to extend beyond the limb.

Mr. Antoniadi writes on July 1, "S. polar cap is very white and of enormous dimensions, occupying at least 40° areocentric arc, and on November 1 it was glimpsed as a small white speck separated from the limb."

Mr. Henderson describes the polar cap as very brilliant, August 22.

Mr. Maunder remarks that on September 5 the cap was very small and difficult to see.

Mr. Mee, that the cap was very bright between September 19 and October 12, after which it was not observed.

Mr. Henderson, on September 29, describes the S. polar cap as "vivid and very large, and on October 1 seeming to project beyond the limb."

Mr. Antoniadi reports, on October 23, no south polar cap visible.

Mr. Davis says that the S. pole diminished up to October 2, and was not observed again till December 31. He considers that the cap lies towards 60°.

The North Polar Cap.

Mr. Mee speaks of a whitish region towards the north pole on October 2.

Mr. Cammell reports that this cap was visible on December 1 as a brilliant arc of light.

White Spots.

Mr. Cammell remarks that, in addition to those recorded in the preliminary Report, white spots have been observed on the terminator by *Mr. Waugh*, and on December 18 two were seen; one, at about 50° S. latitude, would be situated on the following end of *Argyre*, this spot seemed a narrow streak with a small speck of light, S. of it, and separated from it. On the same night another white spot was suspected at about 20° N. latitude, which would be about the northern end of *Chryse*. On January 1st a small white speck was seen about 65° S. latitude, and on same night a similar spot in the northern hemisphere about latitude 50° .

On January 7, a bright spot was seen on the following end of *Thyle I*.

A careful note of a similar spot and projection will be found in the commencement of *Mr. Williams'* report.

Mr. Henderson describes, on September 4, a very bright spot on terminator, N. latitude about 15° , almost appearing to protrude into unilluminated portion. "Can this be *Nix Atlantica*"? Also, on September 10, some very confused light patches on western terminator.

Mr. Waugh reports, on September 19, a very bright patch N.E. of cap, as if cloud; and on September 29, a similar patch on S.W. On October 13, three irregular white markings in the southern portion of disk, and on November 19, two bright spots on the terminator; seen again on December 18 and January 1.

Mr. Roberts reports, on September 6, a bright spot on *Ausonia*, and on either side of S. end of *Euphrates*, and on September 9, three others visible.

Mr. Henderson writes on October 14, 12^h , 186° . The cloud-like white patches to-night have quite prevented the identification of the markings. October 21, 11^h , 214° . The details blurred out of all identity. October 22, 217° . Details hard to identify through the light patches. With regard to these observations of *Mr. Henderson*, the Director, *Mr. Cammell*, remarks, "the three observations above are worthy of attention, as at this period that portion of the planet which would come well into view under the longitudes given was very much obscured by cloud."

List of Canals and Observers.

(When D follows a name that observer saw it double, or suspected it to be so.)

| | | | |
|--------------------|---|---|--|
| <i>Aethiops</i> | - | - | Roberts. |
| <i>Agathodæmon</i> | - | - | Antoniadi, Cammell, Kempthorne, Roberts, Williams, D. |
| <i>Alpheus</i> | - | - | Antoniadi, Baikie, Cammell, Williams. |
| <i>Ambrosia</i> | | - | Antoniadi. |
| <i>Amenthes</i> | | - | Baikie, Cammell, Smart, Williams, D. |

| | | | |
|---------------------|---|---|---|
| <i>Anubis</i> | - | - | Cammell. |
| <i>Araxes</i> | - | - | Antoniadi, Cammell, Roberts, Williams, D. |
| <i>Astaboras</i> | - | - | Cammell, Roberts. |
| <i>Astapus</i> | - | - | Antoniadi, Cammell, Henderson, Williams. |
| <i>Astusapes</i> | - | - | Antoniadi, Cammell. |
| <i>Cerberus</i> | - | - | Antoniadi, Brown, Cammell, Roberts, Williams, D. |
| <i>Charontes</i> | - | - | Brown, Cammell, Saul. |
| <i>Chrysorrhoas</i> | - | - | Antoniadi, Kempthorne, Williams, D. |
| <i>Cyclops</i> | - | - | Antoniadi, Brown, Williams. |
| <i>Dardanus</i> | - | - | Roberts. |
| <i>Deuteronilus</i> | - | - | Roberts. |
| <i>Eosphorus</i> | - | - | Antoniadi, Henderson, sus. D. |
| <i>Eumenides</i> | - | - | Antoniadi, Williams, D. |
| <i>Eunostos</i> | - | - | Roberts, Williams, D. |
| <i>Euphrates</i> | - | - | Antoniadi, Cammell, Roberts. |
| <i>Euripus</i> | - | - | Antoniadi. |
| <i>Fortuna</i> | - | - | Antoniadi. |
| <i>Ganges</i> | - | - | Antoniadi, Cammell, Kempthorne, Mee, Roberts, Williams. |
| <i>Gehon</i> | - | - | Antoniadi, Cammell, Roberts, Saul, Williams. |
| <i>Gigas</i> | - | - | Antoniadi, Brown, Cammell, sus. D. Roberts, Saul. |
| <i>Hercules</i> | - | - | Antoniadi, Cammell. |
| <i>Hydchel</i> | - | - | Antoniadi, Brown, Cammell, Roberts. |
| <i>Hydaspes</i> | - | - | Roberts. |
| <i>Hydrastes</i> | - | - | Antoniadi, Roberts, Williams. |
| <i>Indus</i> | - | - | Antoniadi, Brown, Henderson, Roberts. |
| <i>Iris</i> | - | - | Roberts. |
| <i>Jamuna</i> | - | - | Antoniadi, D. Cammell, D. Henderson, Kempthorne, Roberts, D. Saul Williams. |
| <i>Lethes</i> | - | - | Antoniadi, Baikie, Kempthorne, Roberts, Saul, Williams. |
| <i>Læstrygon</i> | - | - | Antoniadi, Brown, Saul. |
| <i>Nectar</i> | - | - | Antoniadi, Kempthorne, Williams. |
| <i>Nepenthes</i> | - | - | Antoniadi, Cammell, Henderson, Williams. |
| <i>Orcus</i> | - | - | Antoniadi, Brown, D. Roberts, Williams, sus. D. |
| <i>Orontes</i> | - | - | Antoniadi, Brown, D. Cammell, Patterson, Roberts, Williams. |
| <i>Oxus</i> | - | - | Roberts. |
| <i>Peneus</i> | - | - | Antoniadi, Williams. |
| <i>Phasis</i> | - | - | Antoniadi, Cammell, Henderson, Roberts, Williams. |
| <i>Phison</i> | - | - | Antoniadi, Roberts, Williams. |
| <i>Phlegethon</i> | - | - | Roberts. |
| <i>Pyrophlethon</i> | - | - | Antoniadi. |
| <i>Sirenum</i> | - | - | Antoniadi, Brown, Cammell, sus. D. Roberts. |
| <i>Tartarus</i> | - | - | Antoniadi, Brown, Cammell, Roberts. |
| <i>Thoth</i> | - | - | Williams. |
| <i>Titan</i> | - | - | Antoniadi, Brown, Henderson, Roberts, Saul, Williams, D. |
| <i>Triton</i> | - | - | Cammell, Roberts, Williams. |

| | | | |
|------------------|---|---|--|
| <i>Typhon</i> | - | - | Cammell, Maunder, Patterson, Saul, Wood. |
| <i>Typhonius</i> | - | - | Antoniadi, Brown, D. Williams. |
| <i>Cranius</i> | - | - | Antoniadi, Cammell, sus. D. |
| <i>Xanthus</i> | - | - | Antoniadi, Patterson, Roberts. |

The Director, Mr. Cammell, remarks that the number of canals seen was 27. The *Jamuna* was the only canal distinctly seen double, *Gehon* and the *Ganges* were suspected double. *Anubis*, *Astusapus*, and *Astaboras* were seen as one shaded patch. The canals were never seen very sharp or dark with the exception of the *Ganges*, which on several occasions was almost black.

Mr. Roberts speaks of the markings being hard and sharply defined when definition was good.

Mr. Antoniadi, after enumerating 42 canals, mentions a new canal, seen on November 1, not figured by Schiaparelli, but seen by the Lick observers in 1892.

The most exact observations of the canals are by Mr. Stanley Williams. His report is printed in full.

Report of A. Stanley Williams, F.R.A.S.

The telescope employed was a 6½-in. Calver reflector, the usual powers being 225 and 320. Place; West Brighton, Sussex.

Irregularities of the Terminator.—On three occasions irregularities were noticed at the terminator of the planet when in phase. As these irregularities have been exciting considerable attention lately, it may be as well to give the observations relating to them pretty fully.

(a.) 1894, August 18, 13^h 20^m G.M.T.—A brilliant little projection was observed at the terminator, its appearance and approximate position relative to the S. polar cap being as shown in Fig. A. The bright little arm projected obliquely with respect

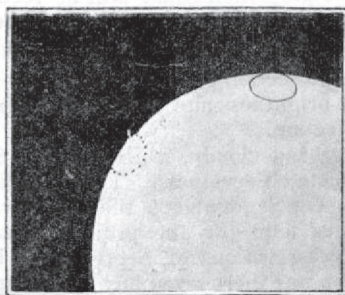


Fig. A. 1894, Aug. 18, 13^h 20^m.

Bright projection on the terminator of Mars.

to the line of the terminator, and the surface adjacent to it just within the terminator was also bright. Cloud coming up almost directly, rendered it impossible to fix the position of this projection with any exactness. It was probably situated somewhere about the south part of *Argyre*.

(b.) 1894, August 29, 12^h to 17^h.—The curve of the terminator was distinctly not regular on this night, though no projections

could be seen. In particular, at one time, when the *Syrtis Major* must have been upon the terminator and just passing off the disk, the limb at this place seemed distinctly flattened. This could not have been an effect of contrast, for none of the dark surface of the *Syrtis Major* could then be seen, the bright continental region *Aeria* apparently extending right up to the limb.

(c.) 1894, September 6, 12^h 7^m.—A minute bright projection was visible at the terminator. At 12^h 23^m its position angle, measured by the micrometer from the apparent centre of the illuminated disk was 243°·4.

12^h 37^m.—The projection seemed more difficult. Besides being very bright, it was very white. It distinctly projected beyond the terminator, almost at right angles to it, but with a slight inclination towards the south. There was a small very white spot just within the terminator, from which the projection seemed to start. See Fig. B.

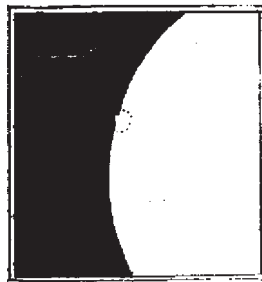


Fig. B. 1894, Sept. 6, 12^h 23^m.
Bright projection on the terminator of Mars.

12^h 46^m.—The projection could still be seen. The S. coast of *Hesperia* pointed just south of it. *Hesperia* seemed to go right up to the white spot at the base of the projection.

13^h 3^m.—The projection could no longer be seen, though there was still a slight brightness and whiteness at the terminator, at the place of the projection.

September 7 proved cloudy, whilst on the 8th definition was too poor for delicate observations. The projection was suspected feebly at times. On September 9 the seeing was very fair, and a careful watch was kept for the projection at the time corresponding to the observations of September 6, but no trace of it could be seen, nor was there even any white spot visible at the terminator.

The invisibility of either the white spot within the terminator or of the projection on September 9, seems to indicate that the latter was due to a mass of cloud, and not to any actual permanent irregularity at the surface of Mars. This is rendered more probable from the circumstance that this region of the planet was undoubtedly densely obscured by cloud in October.

Syrtis Minor.—This region, selected by Mr. Cannell as one of the points requiring special attention, proved in 1894 the scene of some very extraordinary changes.

In September the *Syrtis Minor* was very well-defined, but seemed to be about in a normal state, as shown in Schiaparelli's map. The canals *Lethes* and *Amenthes*, which fall into it, were seen, but they were not conspicuous. When, however, this region came under observation again in October, the *Amenthes* had assumed enormous proportions, so as quite to alter the appearance of this part of the planet, as will be seen from the following observations:—

1894, October 12, 9^h 40^m to 9^h 50^m.—Cloud nearly continuous, so that only a few glimpses could be obtained. The *Syrtis Minor* was continued northward by a very prominent canal (*Amenthes*), which appeared to be double as roughly shown in Fig. C. The

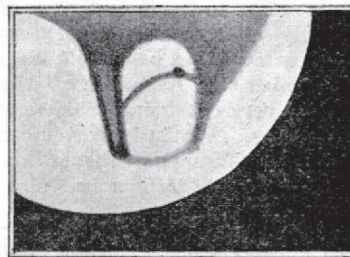


Fig. C. *Syrtis Minor*.—1894, Oct. 12, 9^h 40^m.

duplicity of this canal was of the kind termed "anomalous" by Schiaparelli, the component streaks not being parallel, but wider apart on the south. The space between the two streaks was also strongly dark. The canal *Nepenthes* appeared extremely dark and definite, like a line ruled with pen and ink.

October 14, 10^h 10^m to 10^h 45^m. The appearance on this night is shown in Fig. D, in which *a* = *Mare Cimmerium* with a darker

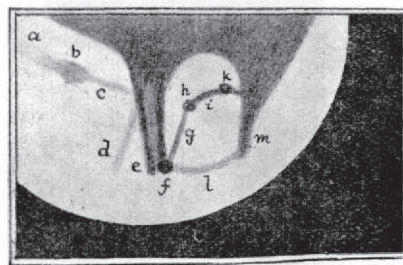


Fig. D. *Syrtis Minor*.—1894, Oct. 14, 10^h 45^m.

spot *b* at its f. end, *c* = *Triton*, *d* = *Lethes*, *e* = *Amenthes*, *f* a minute dark spot or lake, *g* = *Thoth*, *h* = *Lacus Tritonis*, *i* = *Nepenthes*, *k* = *Lacus Maris*, *l* = *Astapus* (or *Boreosyrtis*?), *m* = *Syrtis Major*. The *Lethes*, however, was not quite certain.

October 15, 9^h 45^m to 10^h 15^m. The *Amenthes* was seen as a very broad, very dark, well defined streak, and was plainly double,

much as on the 14th, with the *Thoth* narrow, dark, and definite. At 11^h 50^m *Lethes* was seen going off at a slight angle to the double *Amenthes* to a faint dark spot, which was probably *Hephæstus*.

October 16, 10^h 15^m. Although def. was bad the *Amenthes* was seen double.

At its third apparition in November the *Syrtis Minor* region had nearly regained its normal aspect. On several occasions the *Amenthes* was visible, but it was feeble and inconspicuous. Only upon one night (November 21, 10^h 0^m) it was described as appearing broad and dark, and perhaps double. In considering the probable cause of such extraordinary changes, it is important to bear in mind that in October, when the abnormal variations occurred, the whole region to the E. of *Syrtis Minor* was evidently more or less thickly obscured or affected by cloud. And, as Mr. Maunder has pointed out in his article on the Canals of Mars in the November number of "Knowledge," the presence of cloud might easily produce very considerable *apparent* changes simply by altering the contrasts. Whilst in November, when the clouds had nearly if not entirely disappeared from this part of the planet, the region about the *Syrtis Minor* had also resumed in great measure its normal aspect.

Atlantis.—The curious narrow bright streak thus named in Schiaparelli's map was well seen upon several nights, though on September 19 at 15^h 40^m it was incomplete, the westernmost half only being visible. Atlantis has always appeared most conspicuous when close to the preceding limb of Mars. This was particularly the case in November 1894, when the Martian atmosphere seems to have been exceptionally clear over this part of the planet. The appearance as seen on November 23 at 9^h 45^m is shown in Fig. E, Atlantis being broad and remarkably bright and well defined.

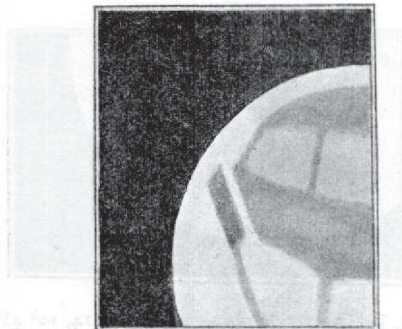


Fig. E. *Atlantis*.—1894, Nov. 23, 9^h 45^m.

Hellas.—The canal *Alpheus* traversing this island from N. to S. was often visible, the other canal, *Peneus*, being less frequently seen. Only upon rare occasions were both canals visible together. Upon several nights a small dark spot or lake was also observed

in the middle of *Hellas*, at the point of intersection of these two canals. On one or two occasions the preceding mouth of the *Peneus* appeared bell-shaped. Fig. F. represents the appearance

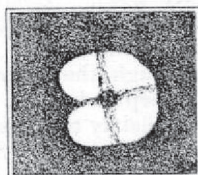


Fig. F. *Hellas*.—1894, Nov. 16.

of *Hellas* as seen on November 16 during a few glimpses through nearly continuous cloud. On this night, contrary to its usual custom, the *Peneus* was more easily seen than the *Alpheus*.

Canals.—About 60 canals were observed in 1894, including most of those shown on Schiaparelli's map that are situate S. of N. lat. 30° . The most remarkable instance of invisibility of a known canal occurred in the case of the *Hydaspes*. Although often looked for, not the slightest trace of this canal could ever be seen. The canals seen differed greatly in their appearance from one another. Indeed, it may be said that no two of them were exactly alike. Some appeared as narrow, very definite streaks, so dark as to appear almost black, and nearly uniform in width. *Phison*, *Orontes*, *Typhonus*, and *Nepenthes* were of this appearance. The last-named, as seen in October, bore considerable resemblance to the Cassini division of Saturn's ring when well open, on account of its curved form, and probably was not very much more difficult to see. Others, whilst retaining the blackness and definiteness of the former class of canals, had yet considerable breadth. As instances, *Nectar* and that part of *Agathodæmon* which runs in a s.p. direction from *Lacus Tithonus* may be mentioned. A third kind appeared as a more or less faint, indefinite, and often obviously irregular streak. This was, in fact, the appearance of the *average* canal as seen in 1894.* They were of very various degrees of breadth, ranging from broad, diffuse bands, like the *Ganges*, to mere lines of no visible breadth. Most of these canals, when observed under favourable circumstances, were obviously irregular on the edges and of uneven intensity. Thirteen canals were seen double in 1894. As everything connected with the duplication of the canals is of special importance, the details concerning them are given below.

Agathodæmon.—See under *Solis Lacus*.

Amenthes.—See under *Syrtis Minor*, *supra*.

Araxes.—See under *Solis Lacus*.

Cerberus, *Cyclops*.—These two canals constitute the greater part of the Huggins Inlet of Proctor's "Map of Mars."

* Although the average canals are here called "faint," it must not be supposed that they were very difficult objects. On the contrary, these average canals were easily seen upon any pretty good night.

September 8, *Cyclops* and *Cerberus* seen plainly, and though def. was very poor they were suspected double. September 9, both canals plainly double. *Cerberus* was very intense, almost blackish; *Cyclops* considerably fainter, though quite evident. September 11, def. pretty good. *Cyclops* rather faint, but distinctly double. It made a considerable angle with *Cerberus*. At its mouth there was a distinct bay. *Cerberus* rather dark and plainly seen double, though the interval between the components was very small. September 18, though def. was very bad, both canals were seen plainly towards the f. limb, and were, moreover, seen double quite distinctly. September 19, *Cyclops* moderately dark, broad, clearly double, yellowish grey in tint; *Cerberus* dark, broad, very plainly double, more blackish than *Cyclops*. In October this portion of Mars was enveloped in cloud, and both canals were invisible. Only on October 19 the mouth of *Cyclops* could be faintly seen. The November observations were unsatisfactory, but on the 23rd *Cyclops* was noted as being very faint.

Chrysorrhoas.—August 26, seen distinctly, narrow and definite. September 26, dark, well defined, rather broad, plain, almost certainly double. September 28, quite plain, though not certainly double, def. very poor. September 29, def. very fair, canal certainly double, the s.p. component being rather narrower and fainter than the n.f. one. A bright yellow streak was visible crossing the canal almost at right angles. At first sight this bright yellow streak seemed to obliterate the double *Chrysorrhoas*, but on closer scrutiny the two bands of the canal could just be traced across the yellow streak. Rather curiously traces of the yellow streak were still visible a month later. November 4, *Chrysorrhoas* plain, moderately dark, certainly double. November 5, distinctly double, though narrower, and not so conspicuous as the *Ganges*. The component lines were distinct, and the space between them bright (see Fig G.). When best seen both components of this

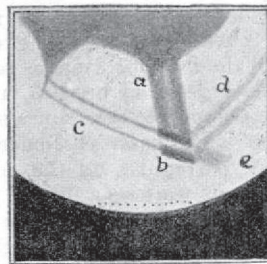


Fig. G. *Lacus Lunæ*.—1894, Nov. 5.

canal were obviously irregular on the edges, and spotty in appearance.

Eumenides-Orcus.—On September 23 and 26 *Eumenides* was seen, but it was faint, indefinite, and inconspicuous. On November 23 and 24 *Orcus* was rather dark, broad, and definite, and strongly suspected to be double. On November 25 the duplicity of the *Eumenides-Orcus* was certain, though not very distinct.

Eunostos.—Seen plainly double on September 9 and 11 from its junction with *Cyclops* as far as the end of *Elysium*. From thence it was narrower, feebler, and single. It was greyish, and not very dark.

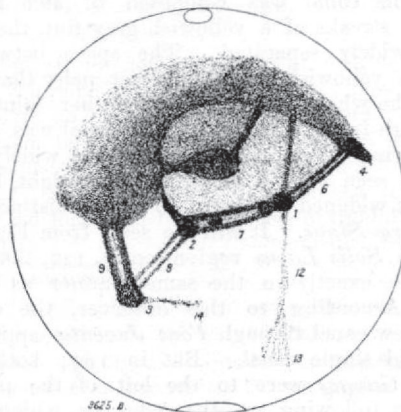
Ganges.—This canal was composed of two rather broad, diffuse, parallel streaks of a yellowish grey tint, the two streaks being rather widely separated. The space between was not bright, but of a yellowish grey, somewhat paler than the streaks themselves. The whole formation was rather faint, diffuse, and indefinite, though from its large size the canal was a conspicuous object; and owing to its components being widely separated it could easily be seen double on almost any night, however bad. At its mouth it widened out, so as to form a distinct bay or inlet from the *Auroræ Sinus*. It will be seen from Fig. G. and the drawing of the *Solis Lacus* region on p. 126, that the *Ganges* was not double exactly in the same manner as described by Schiaparelli. According to this observer, the duplicity was formed by a new canal through *Fons Juventæ* appearing to the right of the old single canal. But in 1894 both components of the double *Ganges* were to the left of the place of *Fons Juventæ*. The following are the dates on which the *Ganges* was seen double distinctly in 1894:—August 29; September 26, 27, 28, 29, 30; November 4, 5. At the N. end of the *Ganges*, *Lacus Lunæ* appeared as a small, definite, dark spot. On November 5 this lake was seen clearly double, as shown in Fig. G. The duplication was rather curiously not related to the conspicuously double *Ganges*, but to the relatively very feeble double *Hydrastes*, the double lake appearing merely as thickenings and intensifications of the two lines of the latter.

Gehon.—Seen double clearly with power 320 on August 29. The new component started from the p. inlet of Dawes' Forked Bay, and continued parallel to the original canal, following the curve of the latter. The space between the two components appeared greyish, and this greyish appearance also affected *Fastigium Aryn*, rendering the forked character of Dawes' Forked Bay less obvious at this time than usual. The bay itself appeared almost black, immensely darker than the two streaks of the *Gehon*. The p. streak was slightly more feeble than the f. one. The canal was also seen double on October 3 and 7.

Hydrastes.—Distinctly double on September 29, the component canals being narrow and well separated, but not very dark. Also double on September 30, when it was thought to be plainer than on the 29th. On November 5 it was seen clearly double, as shown in Fig. G, in which *a* = *Ganges*, *b* = *Lacus Lunæ*, *c* = *Hydrastes*, *d* = *Chrysorrhœas*, *e* = *Nilus*. The last-named appeared dark and plain, but it was too close to the limb to say if it was double or not.

Titan.—Strongly suspected double on November 23, but def. was bad. On November 25 a large, faint, indefinite, dark patch was seen at the place where the canals *Orcus*, *Eumenides*, *Avernaus*, and *Titan* meet or cross. S. of this patch *Titan* was faint, but broad and distinctly double. N. of it the canal was

very faint, and probably, though not certainly, double. In an interesting drawing by Mr. Lowell, made with an 18-in. refractor,* the above-mentioned patch is resolved into a triangle of three small dark spots or lakes.



Longitude about 90° .

Fig. H. *Solis Lacus*.—1894, September 23, 26, and 29.

- | | |
|------------------------------|---------------------------|
| 1 = <i>Lacus Phœnicis</i> , | 8 = <i>Chrysorrhoas</i> . |
| 2 = <i>Lacus Tithonius</i> . | 9 = <i>Ganges</i> . |
| 3 = <i>Lacus Lunæ</i> . | 10 = <i>Nectar</i> . |
| 4 = <i>Mare Sirenum</i> . | 11 = (Unnamed canal.) |
| 5 = <i>Phasis</i> . | 12 = <i>Iris</i> . |
| 6 = <i>Araxes</i> . | 13 = <i>Ceraunius</i> . |
| 7 = <i>Agathodæmon</i> . | 14 = <i>Uranus?</i> |

Solis Lacus and neighbouring region.—Some pretty good views were obtained of this part of the planet on several nights in the latter part of September. The principal markings then seen have been laid down in the drawing published on p. 150, Vol. V., of the "Journal," which drawing is also reproduced here. Further details are given in the following notes.

September 23, 11^h to $12^h 10^m$.—Def. pretty good, but cloud nearly continuous. *Solis Lacus* appeared rather dark and of a peculiar inky tint. It was pear-shaped, the stalk of the pear being formed by the *Nectar*, which was dark and definite. The unnamed canal 11 was also dark, definite, and well marked. This canal was discovered by Burton in 1879, in which year it was strangely missed by Schiaparelli.

September 26, $11^h 20^m$ to $12^h 20^m$.—Def. fair, but unsteady. *Solis Lacus* very dark and inky-looking, but its surroundings were so dusky that it was not a very prominent object. *Thaumasia* between the *Nectar* and the unnamed Canal 11 was dark and strongly reddish. *Nectar* broad, very dark, very well defined. Canal 11 plain, dark, very well defined.

*"Astronomy and Astro-physics," December 1894, Plate XLII., Fig. 7.

September 29, 14^h to 15^h.—Def. fair, but obs. interrupted by cloud. *Solis Lacus* very dark and inky-looking, but owing to *Thaumasia* being dark and ruddy, it was not very prominent. It was much elongated E. and W. *Nectar* broad, very dark, very well defined. Canal 11 moderately dark, well defined. The *Eosphorus* was invisible, and no other canals could be seen issuing from the lake.

October 28, 7^h 35^m to 7^h 50^m.—Def. pretty good, but obs. interrupted by cloud. *Solis Lacus* only moderately dark, though blackish in tint. Once it appeared double, or divided into two by a light streak running from n.p. to s.f., and making an angle of about 45° with a meridian line through the centre of the lake. Owing to cloud it was impossible to confirm this. The *Eosphorus* plainly visible, though in September it could not be seen. It was dark, well defined, conspicuous.

November 4, 9^h 50^m to 10^h 30^m.—*Thaumasia* quite dull and inconspicuous, and not clearly defined on its s.p. side. *Solis Lacus* inconspicuous on account of the dulness of *Thaumasia*.

December 1, 5^h 45^m to 6^h 50^m.—Def. poor. *Solis Lacus* seen as a very black-looking spot, with *Nectar* as a very black-looking streak.

It sometimes happens that certain markings, probably from some peculiarity of appearance, are more easily apparent to some observers than to others. This has been the case here with the canal *Ambrosia*, of which I could never see a trace, although it has been well observed by both M. Antoniadi and Herr Brenner. On the other hand neither of these two observers appears to have seen the unnamed canal 11 more to the E.; and, as already mentioned, this last-mentioned canal was missed by Schiaparelli in 1879, although seen by Burton.

The following notes relate to the double canals *Agathodæmon* and *Araxes* :—

September 23.—*Agathodæmon* distinctly double, the component lines being very dark and definite. *Araxes* also double, but not so plain or so dark.

September 26.—*Agathodæmon* broad, dark, very clearly double, well-defined. *Araxes* seen beautifully double, but closer than the other. It was broad, dark, well-defined.

September 27.—*Agathodæmon* very intensely double, the duplicity being obvious, although def. was poor.

September 29.—*Agathodæmon* broad, very dark, well-defined, double. *Araxes* narrower, very dark, very well-defined, also double.

October 28.—*Agathodæmon* very dark, definite, and double; but *Araxes* was quite faint and inconspicuous, in great contrast to its September appearance. It was slightly suspected to be double. *Lacus Phoenixis* too was faint compared with what it was in September. The faintness of these two markings was perhaps due to thin cloud, the remains of some of that which blotted out the f. part of the *Mare Sirenum* and the *M. Cimmerium* earlier in the month.

In September the *Phasis* was extremely feeble, and the *Aonius Sinus* almost invisible, the surface about here being bright and white, and I quite agree with M. Antoniadi in ascribing this abnormal appearance to the presence of clouds on Mars. Cloud appears in fact to be much more common upon Mars than has been supposed to be the case by some observers of late years, though when present it may not always be dense or continuous enough to absolutely hide the surface markings.

Report of E. M. Antoniadi.

I. JUVISY OBSERVATIONS.

9 $\frac{3}{4}$ in. O.G. Power 220.

Greenwich Mean Time is used in all cases.

July 1, 15^h 50^m, diameter 10''·9, $\lambda = 228^\circ$.—Good def. The S. polar cap is very white and of enormous dimensions; its diameter occupying at least 40° (areocentric arc). *Mare Cimmerium* is on the central meridian. To the right, *Hesperia*, also *Syrtis Minor* and *Mare Tyrrhenum*. *Ausonia* is badly defined and very white in the vicinity of E. limb. (The canals *Cyclops* and *Cerberus* are easily seen. Drawing made.)

August 5, 12^h 50^m, diameter 14''·0, $\lambda = 213^\circ$.—Very fine seeing. The S. polar cap is not very brilliant. *Mare Cimmerium* is on the central meridian. To the E. *Mare Tyrrhenum* with *Hesperia*. To the W., the eastern extremity of *Mare Sirenum* with *Atlantis*. All the region to the S. is badly defined. *Zephyria* looks very white on terminator; so also *Ausonia*. (The canals *Cyclops*, *Cerberus*, and *Lacstrygon*, are visible without difficulty. Drawing made.)

August 23, 11^h 50^m, diameter 16''·1, $\lambda = 28^\circ$.—Good def. The S. polar cap is now very reduced, and is bordered by a dark belt. *Aromatum Prom.* is almost on the central meridian. *Aurora Sinus* is dark, *Margaritifer Sinus* considerably lighter, *Noachis*, *Argyre*, *Ogygis Regio* are seen as one land extending up to the terminator. The *Ganges* is much darker than the *Indus*. Drawing made.

August 27, 14^h 50^m, diameter 16''·7, $\lambda = 34^\circ$.—Very fine weather. The S. polar cap is roughly triangular; subtends some 12° (areocentric arc). *Aurora Sinus* is dark, *Lacus Niliacus* is a plain feature near the N. limb, where the snow extends down to $+55^\circ$ of latitude in *Tempe*.

August 27, 15^h 50^m, $\lambda = 49^\circ$.—Def. good. *Margaritifer Sinus* with the *Indus* is setting on the terminator, while *Aurora Sinus* is now central. The N. snows on *Tempe* are very brilliant, though reduced to a simple arc. Drawing made.

August 28, 11^h 50^m, diameter 16''·8, $\lambda = 341^\circ$.—Fine weather. *Sinus Sabaeus* is very dark, especially towards "Dawes' Forked Bay" and the mouth of the *Euphrates*. *Deucalionis Regio* is easy, but *Pyrrhae Regio* is almost invisible. Drawing made.

September 7, 13^h 51^m, diameter 18".3, $\lambda = 277^\circ$.—Very fine seeing. The S. polar cap is very small. *Syrtis Major* is very dark, especially towards its N. end and the *Nilosyrtis*. *Ausonia* indistinct. *Hellas* a little better defined, shows from time to time the curious cross formed by the intersection of the canals *Alpheus* and *Peneus*. The *Syrtis Minor* is dark, receiving the *Lethes* from the N. *Lacus Maris* is easy. Drawing made.

September 15, 10^h 21^m, diameter 19".3, $\gamma = 153^\circ$. The air is very calm and steady. Fine seeing. The S. polar cap is very narrow and difficult; it is probably excentric to the areographic pole, being now on the other side of it. *Electris* and *Eridania* are white on E. limb. Drawing made.

October 31, 9^h 51^m, diameter 20".4, $\lambda = 97^\circ$.—Good def. The S. polar cap is almost invisible. *Solis Lacus* has passed the central meridian; it is very dark, and elongated from E. to W., or rather from E.S.E. to W.N.W. *Aurora Sinus* appears lighter than usual, and the *Mare Australe* S. of *Thaumasia* is almost indistinct. *Thaumasia* is probably shaded, presenting a colour fully comparable to the dark brick red of *Deucalionis R.*, *Noachis*, &c. *Aonius Sinus* is quite invisible, and as much might be said of all the region S.E. of *Solis Lacus*.

November 1, 10^h 51^m, diameter 20".2, $\lambda = 100^\circ$.—Beautiful def. The S. polar cap is glimpsed from time to time as a small white spec separated from the limb. The *Solis Lacus* is so dark that it appears sometimes black near the central meridian; it is distinctly elongated from E. to W. (E.S.E. to W.N.W.). *Aurora Sinus* and *Mare Australe* well defined, but the *Aonius Sinus* and *Icaria R.* are scarcely recognised as compared with Schiaparelli's maps. *Thaumasia* somewhat dusky. *Argyre* is very white near the S.W. limb, and so are the northern snows in *Tempe* also. Drawing made.

II. PARIS OBSERVATIONS.

4 $\frac{1}{4}$ -in. O.G. Power 200.

October 23, 8^h 21^m, diameter 21".5, $\lambda = 145^\circ$.—Glorious night. No S. polar cap visible. *Mare Sirenum* is on the central meridian. *Sinus Titanum* very dark.

October 30, 8^h 51^m, diameter 20".5, $\lambda = 91^\circ$.—Air very steady. No S. polar cap visible. *Solis Lacus* central, it is exceedingly dark, almost black by moments. *Aurora Sinus* looks lighter, also the sea surrounding *Thaumasia*.

Report of E. Walter Maunder, F.R.A.S.

Instrument used, 28-in. Refractor.

August 29, 13^h 20^m and 13^h 40^m. Power 360.—Two sketches made. Dawes Forked Bay distinctly seen, the two estuaries being clearly discovered, but the two canals flowing into them were not seen.

Deucalionis R. was also distinctly seen, and the isthmus fully made out. The marking appeared as shown by Schiaparelli and not like Phillips Island in Green's map.

The *Terminator* was diffused and quite unlike the full limb in appearance. No irregularity or projection was, however, detected upon it.

The polar cap was of a perfectly regular elliptical outline; very bright, no indentations. The sea round it was dark for a narrow space.

Herschel II. Strait was the darkest marking on the planet. It was closed at the following end by *Deucalionis Regio*.

The entire district between the pole and *Herschel II.* strait was less bright than Beer Continent, and at the first casual view appeared of one uniform tint. Closer inspection showed that the region was filled with markings of perfectly definite outline, but of such delicate differences of tone and shade as to defy reproduction.

The *Fastigium Aryn*, though distinctly seen, was of a lighter tint than the neighbouring Continent, and the old representation of *Mädler* showing the strait ending in a circular knob would have been quite justified if the planet had been less well seen.

Similarly Phillips Island, though clearly and distinctly united by a well defined isthmus to Beer Continent, was occasionally seen as a cigar shaped island as in Green's chart, owing to the isthmus being fainter than the island.

So too the De la Rue Ocean to the south of *Chryse* showed at least two regions of definite outline but of delicate differences of tone.

Proctor Cape was very bright = W_3 ; *Argyre* whitish = W_1 ; the polar cap being W_4 .

Noachis was of a half tint. Beer Continent was the reddest region visible and was of a full orange. The *Terminator* was not so bright or so white as the full limb.

August 31, 13^h 32^m. One sketch made. Power 500.—The polar spot was not so sharp and well defined as on August 29. A few ill-defined white markings were seen close below the polar spot near the central meridian. The markings were of W_3 intensity, but small and with diffused edges, so that they were very difficult to hold, and the few scratches put in to represent them are simply to give their general effect.

The Hook at the *Hammonis Cornu* was only suspected, not steadily seen, so is not given in the sketch.

Proctor Cape was less bright than on August 29, and less distinctly white, say W_2 . Miss Russell, who observed the planet at the same time, but who made no sketch, detected a narrow white line stretching across the *Sabaes Sinus* from Proctor Cape. I could detect nothing of the kind.

Beer Continent was more distinctly ruddy than on August 30.

The difference in aspect between the terminator and the limb was very marked. The former diffused, and no brighter or whiter than the general disk; the latter sharp and quite W_1 if not W_2 as to whiteness, and very distinctly brighter than the general disk.

The seas appeared a natural grey, the *Sinus Sabaes* being the darkest. In the region to the S. the contrasts are much less marked, the grey spots are lighter, the bright spots duller than

near the equator. It is, therefore, a matter of difficulty to separate one from the other.

Def. fair, but inferior to what it was on August 30.

September 5.—Two sketches made, 13^h 49^m and 14^h 20^m. Power 360. Def. very bad at midnight, but improving later, though only poor at the best.

Polar cap very small, smaller than drawn, difficult to see, not very bright. *Hellas* showed its northern coast line = W_1 or W_2 ; the brightest part of the planet after the polar cap or limb. Terminator better defined than on August 31, but still not so bright or well defined as the limb.

A faint diffused marking was noted in the centre of *Hellas*, possibly a trace of a canal. Beer Continent was ruddy. One canal was seen in it, Typhon? Several faint diffused patches were seen in the De La Rue Ocean, but they were too faint and diffused to locate or draw.

The *Hammonis Cornu* was again suspected, but not drawn. So the *Lacus Maeris* likewise was suspected, but not drawn.

September 26.—Def. very bad. Image boiling furiously. The planet very bright, but merely a great yellow flaring naphtha lamp. The seas were the faintest possible markings, but so far as anything could be made out at all, Hussey's and Keeler's drawings of the region of the Terby Sea in 1892 was confirmed.

It was utterly unlike anything I had ever seen in this region before. It was hopeless to attempt a sketch, the image being so diffused and unsteady.

November 5.—Observed from 10^h 30^m to 13^h 30^m. Def. bad, light vapour continually passing over the planet. No markings were seen on the planet; it was just a ruddy blur. A fair set of measures of both *Deimos* and *Phobos* were, however, secured.

October 25.—In a brief note on Mars for this date it is recorded that the planet showed no markings whatever.

General Notes by Members of the Section.

The preceding reports are given in full. The following notes are derived from the reports or drawings of the remaining observers, and refer principally to points not touched upon in the general summary. In some cases also matters referred to in the summary are here treated at slightly greater length.

The following Members contributed drawings or reports or both:—

Capt. W. Noble, F.R.A.S., the Rev. Jas. Baikie, F.R.A.S., P. H. Kempthorne, F.R.A.S., Beamish Saul, and W. R. Waugh, F.R.A.S.; Drs. Gordon Paterson and D. Smart, F.R.A.S.; and Messrs. G. L. Brown, Bernard Cammell, F.R.A.S., G. T. Davis, Henry Ellis, A. Henderson, Willoughby Meares, Arthur Mee, F.R.A.S., C. Roberts, F.R.A.S., and C. A. Taylor, F.R.A.S.

At times the details were so blurred and covered with numerous white patches, as to force me to the belief of extensive areas of Martian cloud. No maps or drawings were consulted until all the drawings had been made. The longitudes of the central meridian were then computed, and the aid of Schiaparelli's maps called in, to identify as far as possible the various workings. A very pale neutral tint cap was frequently used with great success to reduce the glare of the planet. July 29, 14^h 20^m, $\lambda = 301^\circ$. Def. fair, p. 150-210. S. polar cap smaller and less conspicuous than when last seen (July 11, 15^h, when it was the only prominent feature, being extremely large and bright). *Hellas* very bright, especially just E. of central meridian, and when it borders the *Hadriaticum Mare*, a bright marking W. of this to limb very diffuse and not so bright as *Hellas*. *Sinus Sabæus* traced to limb as a diffuse greyish marking, and darkest just in E. limb, when it is faintly mottled. *Ausonia* in W. limb appears as a very bright patch, much fainter and diffused into neighbouring sea. *Libya* and *Aeria* very bright. *Nilosyrtis* rather faint. *Hadriaticum Mare* darkly mottled. August 22, 13^h 20^m, $\lambda = 58^\circ$. Def. poor, p. 150-415. S. polar cap very brilliant. *Icaria* in S.E. limb ill-defined, more like a convex brightening of the limb. *Argyre* dull, an ill-defined oval spot. *Thaumasia* bright and conspicuous, boldly out-lined, especially near *Aonius Sinus*. *Protei R.* suspected. *Chryse* very faint, best seen with high power. *Aromatum Prom.* the best defined and brightest portion of *Chryse*. *Margaritifer Sinus* greyish tint. *Deucalionis R.* and *Pyrhæ R.*, bright and conspicuous. *Noachis* very bright in terminator, fainter towards central meridian. September 4, 13^h 55^m, $\lambda = 305^\circ$, Def. unsteady, p. 210 to 415, drawing made. S. polar cap small but intense. *Hellas* extremely bright. *Deucalionis R.* in E. limb bright and prominent. *Aeria* reddish in tint. *Libya* and *Ausonia* not very bright. *Syrtis Major* dark grey. *Tyrrhenum Mare* faint ill-defined spot. *Mare Australe* faint, greyish tint. September 8, 14^h, $\lambda = 270^\circ$, def. sharp, p. 210 to 415. S. polar cap very small but intense. In S. hemisphere a bright zone extending from proximity of *Promethei Sinus* to S. confines of *Aeria*, where it widens out brightest just E. and W. of C. M. The *Mare Australe* thrown into contact by this band (Martian Cloud). *Libya*; with high power. *Lacus Maris* seen with *Nepenthes* canal; difficult object, ill defined. *Isidis R.* extremely bright N. of *Nepenthes*. *Syrtis Minor* conspicuous and dark. *Eridania* very bright in terminator with p. 415. Suspected to be serrated. Has this been independently observed? September 10, 13^h 25^m, $\lambda = 243^\circ$. Def. good, p. 210 to 415. S. polar cap very difficult. The bright stripe in S. hemisphere has partially cleared. S.E. side of *Hellas* very bright. *Aeria* brightest in wedge, confused in S. *Syrtis Minor* very dark and greenish grey in tint. September 12, 12^h 35^m, $\lambda = 212^\circ$. Def. poor, p. 225. S. polar cap only suspected. Details very indistinct, the broad stripe across S. hemisphere broadest and brightest in about long. 182° . *Syrtis Minor* the darkest and sharpest feature in disk. Just S. *Hadriaticum Mare*

PART IV.] REPORT OF THE MARS SECTION. 133
 daily motion. September 10, 12^h 12^m, $\lambda = 170^\circ$.—Def. poor, p. 210 to 262. S. polar cap very small. *Thyle* and *Mare Chronium* visible. *Mare Sirenum* and *Mare Cimmerium* fairly dark; faint and diffused into *Icaria* and *Phaetontis*. *Zephyria* very bright in its S. edge near C. M. In best moments of def. canal *Titan* seen. September 27, 12^h 40^m, $\lambda = 78^\circ$.—Def. bad, p. 150 to 262. S. polar cap very small, faint dark shading encircling it. *Aonius Sinus* faint and sharp. *Icaria* bright but diffuse. *Phasis* only seen in best moments of definition. *Deucalionis R.* conspicuous. S. of this the W. limb is bordered by indefinite white patches. September 28, 12^h 50^m, $\lambda = 71^\circ$.—Def. poor, p. 150 to 262. S. polar cap only suspected. White patch still in S. hemisphere. *Pyrrhæ R.* bright. *Protei R.* as faint light spot. September 29, 12^h 30^m, $\lambda = 58^\circ$.—Def. good, p. 210 to 415. S. polar cap vivid and very large, faint dark zone surrounding it. The stripe in S. hemisphere narrower. *Icaria* bright to limb. Portion of *Phasis* visible. A bright spur between the *Sinus* and *Thaumasia* clear from surrounding light marking, divided by narrow sharp line from *Thaumasia*, which was bright in S. edge. *Aurora Sinus* distinct, bordered brightly by *Aurea Cherso* (?). *Protei R.*, *Pyrrhæ R.*, seen as one. *Deucalionis R.* dull and towards W. limb, brightest at E. edge. *Argyre* and *Ogygis R.* very faint. October 1, 12^h 25^m, $\lambda = 38^\circ$.—Def. good, p. 150 to 262. S. polar cap very bright, seeming to project beyond limb; no dark encircling zone. Bright S. patch duller, and broken with shading. *Aonius Sinus* narrow. *Thaumasia* and *Icaria* bright on W. edges. *Aurora Sinus* small and dark. *Margaritifer Sinus* has a dark spot joined by a faint connexion with *Aurora Sinus*, see Obs., September 29. *Protei R.* rather dull. *Deucalionis R.* very bright at limb. *Noachis* vague. *Argyre* and *Ogygis R.* faint.

BERNARD E. CAMMELL, F.R.A.S., supplies the following additional notes:—

S. polar cap, August 26, surrounded by narrow dark zone, wider on the p. side; August 29–30, observation repeated; August 31, September 5, 26, getting smaller; October 7, very faint; October 15, very indistinct if seen at all. *Syrtis Major*, August 29, apparently connected with S. pole by a dark sea; August 30, greyish blue in colour; September 5, blue grey; *Mæris Lacus* seen as a faint spot, joined to *Syrtis* by a faint shading; October 7, well-defined, beautiful blue grey. *Syrtis Minor*, September 5, well seen, blue-grey in colour; October 15, large and dark, with *Amenthes* leading out almost due N. *Solis Lacus*, September 26, very dark, joined to *Mare Erythræum* by a faint shading near the preceding end of *Thaumasia* and elongated in the E. to W. direction; September 27, observations repeated.

The Rev. J. BARKIE, F.R.A.S.—September 12, 11^h—11^h 30^m, $\lambda = 193^\circ$.—A bright patch where *Atlantis I.* joins *Zephyria*. September 14, 10^h 45^m—11^h 15^m, $\lambda = 167^\circ$.—S. polar cap small. *Mare Sirenum*, a bright patch s. p. end *Dædalia*. September 26, 10^h 30^m—11^h, $\lambda = 55^\circ$. Definition good. *Pyrrhæ R.* and *Protei R.* bright, *Deucalionis R.* passing off disk. S. polar cap very small. October 8, 9^h—9^h 50^m, $\lambda = 287^\circ$.—

Syrtis Major with small dark bay on p. side, extending in direction of *Lacus Maris*. *Hellas* divided by a faint shading, probably *Alpheus Canal*. October 10, 9^h 30^m—10^h, $\lambda = 276^\circ$.—*Syrtis Minor* dark, *Syrtis Major* with same dark bay on p. side. *Ausonia, Hellas*. October 11, 9^h 30^m—10^m, $\lambda = 267^\circ$.—*Syrtis Minor* large, with *Lethes* projecting northwards some distance. *Syrtis Major* with same dark bay on p. side. The dark markings in the planet, as a rule, were of a slaty greenish grey. A map was never consulted before going to telescope. October 2, 8^h—9^h 20^m. The regions between long. 320° — 20° .—The most prominent part here was the bright line of coast on the S. of *Edom*, which appeared broken up into a number of small bays. The high lights had a beaded appearance. A faint long patch between *Edom* and *Deucalionis Regio*, the latter being larger and brighter. The shading was very delicate at its extremities, the outline being very hard to distinguish. The whole of these regions had a beautiful streaky appearance, in colour cool and shaded ivory. October 8, 9^h 5^m—10^h 50^m, long. 220° — 320° .—*Hellas* when definition was good appeared divided into three parts. The division of *Hellas* (*Alpheus* probably) several times glimpsed. N. of it several faint patches of light. Similar markings seen near *Hammonis Cornu*. On one occasion this cape appeared detached from the mainland. November 22, 7^h—8^h 8^m.—Definition very fine. The long island of *Cimmeria* and *Hesperia* well defined. The latter seemed to join the mainland, but was narrower here than Schiaparelli draws it. *Elysium* seen. When definition was extra good small angular patches of shade were seen on the continents. November 26, 10^h 20^m—11^h 5^m.—Air steady. Detail well seen. The fine surface marking seen on the 21st October and 22nd November on *Zephyria* and *Aeolis*, not seen on this occasion. It had then appeared as an extremely delicate and faint irregular network of lines, principally on *Memnonia* and *Zephyria*, and was very difficult to sketch.

These observations have shown us in a very conclusive manner the correctness of Schiaparelli's maps. Eighteen canals were seen altogether. Unfavourable weather prevented me from seeing several interesting parts of the planet, especially the *Solis Lacus* region.

G. T. DAVIS.—September 26 and 28, *Argyre, Noachis* and *Deucalionis Regio* seen, October 2, definition very good; polar cap barely visible at 9^h 50^m; it seems to lie towards $\pm \lambda = 60^\circ$; *Hellas* white and bright on terminator; *Deucalionis, Pyrrha R.* and *Argyre* all very well seen—like an engraving.

In observations later than October, *Hellas* always appeared ruddy. The rosy red tint of the most conspicuous continental regions was not so apparent after the end of November. Mr. Davis considers that it was a favourable opposition for small apertures.

THE REV. P. H. KEMPTHORNE, F.R.A.S.—September 26th. 10^h 30^m $\lambda = 55^\circ$. *Jamuna, Ganges* seen; *Solis Lacus* faint; light streak above *Thaumasia*; *Lunæ Lacus*; part of *Uranus* seen; *Aonius Sinus* invisible. September 28th. 11^h 30^m $\lambda = 52^\circ$.

Lacus Tithonius with *Agathodæmon* canal. *Solis Lacus* small and dark. *Nectar*. Dark sea above *Thaumasia*. *Protei Regio* light, *Deucalionis R.* dull. *Lacus Niliacus*, *Lunæ Lacus*. October 14th $\lambda = 265^\circ$. Visible *Syrtis Minor* dark, with part of *Lethes*. Bright patch on *Cassini Land* and *Eridania*. October 16th. $\lambda = 250^\circ$. Polar cap just distinguishable. Not a trace of *Mare Hadriaticum*. *Syrtis Minor* dark with *Lethes*. *Mare Cimmerium* has vanished all but a fragment at the f. end. *Æthiops* and *Cassini Land* very bright. October 22nd 9^h 15^m $\lambda = 167^\circ$. Markings in disk very faint. *Mare Cimmerium* invisible. Dark patch below S. pole.

ARTHUR MEE, F.R.A.S.—In observations of September 6, 10, 12, 13, 14, and 18, the S. polar cap is not noted; September 19, very small and bright; trace of shading on each side September 26, bright; October 2, 7, and 8, visible; October 12, very faint; not seen subsequently. *Deucalionis R.* was ill defined on October 2; whitish October 7, *Xisuthri R.* suspected October 7. *Aeria*, when on limb, September 6, was very bright; reddish on October 7, and unlike the maps in shape; reddish, October 8.

CAPTAIN W. NOBLE, F.R.A.S.—October 15, 10^h 45^m $\lambda = 252^\circ$. *Syrtis Minor* large with the *Lethes* branching due north from it; detail much fainter and less well defined towards the eastern limb than towards the western or on the centre of the disk, November 26. Captain Noble remarks “during the present opposition it has “always seemed to me that detail has been hazier and less distinct “towards the following limb of the planet.”

DR. GORDON PATERSON.—October 7, 9^h 30^m, $\lambda = 303^\circ$.—*Aeria* deep orange colour, with the *Typhon* and *Orontes* canals visible. A large circle of light surrounding S. polar cap. October 12, 10^h, $\lambda = 266^\circ$.—*Syrtis Minor* small, *Lethes* not seen. S. polar cap well seen. October 14, 10^h 15^m, $\lambda = 252^\circ$.—*Syrtis Minor* rather small, *Lethes* not visible. *Syrtis Major* rather narrow, f. edge of *Libya* bright. October 15, 9^h 15^m, $\lambda = 244^\circ$.—Def. fluttering. *Hesperia* and *Eridania* large and bright. *Tyrrhenum Mare* dark; *Syrtis Minor* small. Same bright streak on f. edge of *Libya* as on 14th instant. October 21, 9^h 30^m, $\lambda = 180^\circ$.—*Mare Sirenum* very faint, with the faintest suspicion of *Titanum Sinus*. S. polar cap invisible.

C. ROBERTS, F.R.A.S., reports:—*Deucalionis Regio*, August 30, one of the brightest parts of the whole disk; September 1, very bright, extends over *Indus*. *Iapygia* and *Argyre*, September 5, bright. *Ausonia*, September 6, 8, and 11, bright spot. Bright spots, September 6, on either side of S. end of *Euphrates*; September 9 and 11, on *Phætonis* at S. end of *Atlantis I.* *Solis Lacus*, Sept. 27, the dark spot in the corner of this lake is in almost exactly the same position as one on a drawing by Prof. Schæberle at Lick, September 1, 1894; also the canal from it northwards. The region to the N. of the lake between *Ganges* and *Sirenum* very like, on September 28, the drawings of Mr. Lowell, at Flagstaff this opposition, but quite unlike Schiaparelli's map. *Indus*, September 27, very dark and continued

into the *Mare Erythraeum*. Twenty-two drawings were made. Altogether, 35 canals were seen, of which 22 were well seen; 10 only part was seen; three were glimpsed; one canal, the *Jamuna*, was seen double. A map was never used for comparison while drawing at this telescope. When def. was good; the outlines of the markings always appeared very hard and sharply defined.

The Rev. BEAMISH SAUL.—August 27, 2^h, $\lambda = 30^\circ$. 6 $\frac{1}{2}$ reflector.—*Auroræ Sinus* shown well defined, with the *Jamuna* leading out of it. A line of broad shading crosses the *Jamuna* from S.E. to N.W., probably *Lacus Niliacus* and *Lunæ Lucus*. Faint shading round S. polar cap, which is large. October 2, 10^h 30^m, $\lambda = 1^\circ$. 10-in. reflector.—Shows the two forks of *Fastigium Aryn*, the p. one very small. The f. one much larger, with the commencement of *Gehon* leading out of it. *Deucalionis R.* visible, but not joined to *Thymiamata*. S. polar cap, with faint shading round, especially noticeable on p. edge. October 7, 9^h 30^m, $\lambda = 301^\circ$.—*Syrtis Minor* faint. *Sabæus Sinus*, with a glimpse of *Fastigium Aryn*. Trace of *Xisuthri R.* Part of *Deucalionis R.* S. polar cap well seen, with trace of shading round. October 12, 10^h 30^m, $\lambda = 263^\circ$. 8 $\frac{1}{2}$ reflector.—S. polar cap a mere speck. *Syrtis Minor* rather small. *Chromium Mare* rather dark, and *Xisuthri R.* The following part of the planet was very ill-defined, November 10–20.

DR. D. SMART, F.R.A.S.—October 16, $\lambda = 240^\circ$. Drawing shows unmistakably the peculiar aspect of the planet at this time. *Syrtis Minor* was drawn large, and extending some distance north, which extension is evidently the *Lethes*? (*Amenthes*) canal. The *Mare Cimmerium* is quite blotted out. Dr. Smart reports that he was much puzzled with the aspect of the planet at the time, and that he noticed during the latter part of October an almost total absence of markings, also that the S. polar cap was invisible. The weather, especially towards the end of the Autumn, was very unfavourable.

REV. W. R. WAUGH, F.R.A.S.—September 19, 10^h. S. polar cap seen; a very bright patch to N.E. of cap as if cloud. Limb of planet all round unusually bright. October 13, 9^h 30^m. Three irregular white markings in the southern portion of the disk which could not be identified. November 19, 9^h. Two bright spots glimpsed on the terminator. December 18, 5^h. Two bright spots on terminator plainly seen.

Note by Director.—This drawing shows the *Kaiser Sea* very well with a small bay extending into *Aeria* on the *f* side of the *Kaiser Sea*, at a point where the *Typhon* debouches. A similar bay was shown in a drawing by J. T. Wood on October 14.

January 1, 8^h. The two bright spots on the terminator were again seen during the evening. The southern one somewhat elongated.

J. T. WOOD. The colour of the continents was a decided pink, the dark markings a blue-black or blue-grey in colour; the colours seen well with reflector but not with refractor.

October 1, 11^h, $\lambda = 19^\circ$. Moments of splendid definition phase just perceptible, S. polar cap bright. October 14, 10^h, $\lambda = 252^\circ$. Seeing good. S. polar cap not seen or very doubtful. Of the *Mare Cimmerium* on p. edge of disk, there does not appear any trace. On f. side of *Syrtis Major*, there is shown a very dark bay extending into *Aeria* at a point where the *Typhon* canal debouches. (See note by Director above.)

The COUNCIL of the Association regret the great delay which has taken place in the publication of the present report. The discussion and collation of the drawings and reports on the planet Mars must always be a laborious task, and proved a specially heavy one in the present instance. Mr. Cammell, the Director, prepared a report with great industry and care, but it proved to be too voluminous for the Council to undertake to publish in the form in which it was presented to them. Unfortunately Mr. Cammell was unable to spare the time necessary for a recasting of the materials in his hands, and the report was necessarily laid on one side, until Mr. N. E. Green, with his usual devotion to the interests of the Association, undertook the task of giving it its present form.

The Council feels that the Association owes a very great debt to Mr. Green for undertaking so heavy a work, especially as he was already Director of an important Section, and for the skill and promptness with which he has brought it to a successful conclusion.

Mr. Green has altered the Report, which Mr. Cammell, the Director of the Section, had prepared, as little as was consistent with the imperative necessity of curtailing it very considerably.
