

ROYAL OBSERVATORY, GREENWICH.

SPECTROSCOPIC OBSERVATIONS

MADE AT THE

ROYAL OBSERVATORY, GREENWICH,

1877.

POSITION-ANGLES AND HEIGHTS OF SOLAR PROMINENCES, observed with the SPECTROSCOPE, at the ROYAL OBSERVATORY, GREENWICH, in the Year 1877.

Note.—The Heliographic N.P.D. is reckoned from the North Pole of the Sun's Axis along the limb, either through the East or the West point.

The Ten-prism Spectroscope was used till 1877, July 25, and after that date Mr. Christie's Half-prism Spectroscope. With the latter the Roman numerals denote the number of Half-prisms (each composed of a crown prism cemented on to a "half-prism" of flint, so as to form a Direct-vision compound-prism). With one Half-prism the Spectroscope is equivalent to a Spectroscope with four flint prisms of 60° , and with two to one with about fifteen.

Observer, M.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m Feb. 23.	10	o / o /	"	No prominences were seen. The chromosphere was very irregular and serrated in outline, the average height being about 11". The limb was examined on the C line from W. 165° to E. 50° , through the S. point.
Feb. 27. 23. 30 to 28. 2. 0	10 & 6			No prominences were seen. The chromosphere was very irregular and undulating. The Sun was enveloped in haze, and the limb "boiling," so that no sketch of the outline could be obtained. The entire limb was examined on both the C and b lines with 10 prism train, and on the C line with 6 prism train, the slit being radial; and part of the limb was examined from E. 176° to W. 74° , with the slit tangential, on the C line.
Mar. 16. 1. 30	10	W.112. 9	27	Small prominence. The limb was examined on the C line from E. 114° to W. 101° , through the S. point.
Mar. 24. 1. 0 to 24. 2. 0	10 & 6			No prominences were seen. The day was very variable, and the Sun was often hidden by light cloud. The chromosphere was never well defined, and sometimes was quite invisible. The entire limb was examined on the C line with the slit tangential, once with 10 prisms and once with 6.
Mar. 27. 1. 0	4			No prominences were seen, but chromosphere, 10" in height, was noted everywhere. The limb was examined on the C line from E. 179° to W. 153° , through the S. point.
Mar. 30. 22. 30		E. 49. 1 — 51. 1 E. 41. 46 — 42. 16	42 45	The entire limb was examined on the C line with the slit radial.
Apr. 19. 23. 0 to 20. 1. 0	10 & 6	W.125. 25 — 124. 20	60	The prominence could not be detected on any other line than the C line, and was very faint on that. The Sun was not sufficiently clear for the prominence to be sketched with the slit tangential. The limb was examined from W. 160° to 60° , with the slit radial, on the C line. The neighbourhood of the prominence was examined with the slit both radial and tangential, and on the entire length of the spectrum.
Apr. 22. 21. 15 to 22. 21. 45	10			No prominences were seen. The Sun was enveloped in much white haze, and the chromosphere was very faint and ill-defined, and could only be detected to a distance of 3" to 5" from the limb. The entire limb was examined on the C line with the slit radial.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m Apr. 24. 22. 0 to 25. 0. 0	10 & 6	o / o /	"	No prominences were seen, the Sun being enveloped in light cloud. The chromosphere was faint, and could only be traced to a height of 7", as a rule. Occasionally, when the limb was a little clearer, it could be traced as high as 12" or 13". The definition of the Fraunhofer lines in the general spectrum of the disk was very fair. The entire limb was examined on the C line with the slit radial.
May 6. 21. 0 to 6. 23. 0	10			No prominences were seen, the Sun being enveloped in thick white haze. The chromosphere could be seen, but faintly, to an average height of 8". The entire limb was examined once, and from E. 107° to W. 73°, through the S. point, a second time. The slit radial on the C line.
7. 0. 20 to 7. 0. 45	8			A second examination with 8 prisms showed no prominences, but the chromosphere was more distinct. The limb was examined from E. 107° to W. 73°, through the S. point.
May 10. 0. 0 to 10. 1. 0				No prominences were seen. The limb was examined from W. 73° to W. 163°, through the W. point.
June 3. 23. 5	10	E. 42. 52 — 45. 32	49	The prominence was much bent and broken. Chromosphere, 8" in average height, was seen round the entire limb. The limb was examined from W. 90° to W. 160°, through the N. point. The slit radial on the C line.
4. 0. 20	10	W. 129. 40 — 129. 30	25	A straight narrow jet. The prominence seen at the first examination was observed again, but no sketches could be made, the Sun being involved in too much haze to allow of a wide slit being used. The entire limb was examined with the slit radial on the C line.
				SPOT SPECTRUM.—The definition was very poor, but a considerable broadening over the nucleus was suspected in some lines near <i>b</i> . The D lines were slightly thickened, perhaps by one fourth of their normal breadth. The <i>b</i> lines—that is the Magnesium lines <i>b</i> ₁ , <i>b</i> ₂ , and <i>b</i> ₄ , not <i>b</i> ₃ ,—were decidedly broader, perhaps by a half or two thirds of their normal breadth. A number of Iron lines seemed to be double their usual breadth; among these were—K 1577, K 1570, K 1528, the E lines, K 1467, and both the lines K 1463. The coronal line, K 1474, and the iron line close to it, could not be separated, and the two seen together as one seemed, if anything, narrower and fainter than usual. The lines were distorted as well as broadened, a very slight displacement to the blue being noticed in one part, and to the red in another. As the sky clouded over, only the part of the spectrum from K 1463 to <i>b</i> ₄ and in the neighbourhood of D was examined. A train of four prisms employed.
June 7.	II.	W. 53. ±	30	A very thin jet was seen on C and D ₃ , but not on the D lines of sodium nor on the <i>b</i> lines of magnesium. The entire limb was examined twice, and much of it a third time. The new Half-prism Spectroscope was employed for the first time.
July 3. 22. 30 to 3. 23. 29	6			No prominences were seen. The chromosphere was seen very distinctly all the way round, except near E. 85°, where it was faint. Average height 13". The entire limb was examined twice with the slit radial on the C line. The Ten-prism Spectroscope was used.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
July 5. 0. 58 d h m	6	E. 134. 26—E. 135. 26 ° / ° /	42 "	Very faint prominence, apparently quite detached from the limb. Chromosphere was seen all the way round, averaging 12" to 14" in height. The entire limb was examined twice with the slit radial on the C line.
July 5. 21. 30 to 5. 23. 30	8 & 4			No prominences were seen. Chromosphere was seen all the way round, of average height 13", but always very faint, the Sun being in much haze. The entire limb was examined three times with the slit radial on the C line, twice with 8 prisms, and the third time with 4. A partial examination with 8 prisms, from W. 95° to W. 50°, was also made.
July 7. 1. 35	6	E. 58. 50—E. 59. 40	49	The chromosphere averaged from 12" to 13" in height. The entire limb was examined with the slit radial on the C line.
July 10. 0. 3 10. 0. 7 10. 0. 17 10. 0. 23 10. 0. 36	6	W. 111. 21—W. 110. 41 115. 21—112. 6 E. 67. 39—E. 69. 9 W. 52. 1—W. 51. 1 84. 21—83. 51	34 37 82 41 48	Faint prominence. Bright prominence. Moderately bright prominence. Very faint prominence. Detached cloud. The chromosphere here is 12" in height, the cloud about 19" broad, and the space between the two about 17". Average height of the chromosphere about 11"; it was very irregular in outline. The first three prominences were examined on D ₃ and F; all were seen on D ₃ , but the first could not be distinguished on F, most probably on account of its faintness. The entire limb was examined with the slit radial on the C line. The entire limb was also examined with the slit radial on K 1474. Only the prominence E. 67°. 39' to E. 69°. 9' was distinguished. It tapered to a point, and being very faint its height was very difficult to judge. It was roughly estimated at 20". On the red side of this line the spectrum appeared brighter than usual, suggesting a faint bright line by the side of the dark one. The appearance extended about 100" from the limb. A similar appearance, the effect of contrast, is often seen by the side of very dark lines, but it was not seen at all on the blue side of K 1474, and seemed brighter at times than any mere effect of contrast would account for. It disappeared when the Sun was moved a little distance off the slit.
July 19. 22. 30	6	E. 59. 15	20	A very small detached cloud. The entire limb was examined with the slit radial on the C line.
July 20. 22. 10 21. 1. 14	6 6	W. 146. 1—W. 145. 41 E. 0. 45—E. 2. 45	38 27	Very small prominence. Chromosphere averaged 11" in height. The prominence could not be detected at the later examinations. Very small prominence. A third examination at 2 ^h . 15 ^m . failed to show this prominence, but there was then much cloud about. The entire limb was examined three times with the slit radial on the C line.
July 24. 22. 4	6	W. 123. 21—W. 121. 56	49	There was much difficulty in seeing the chromosphere, as the Sun was constantly being hidden by cloud. It was only seen distinctly from E. 166° to W. 114°. From about W. 15° to E. 6° there was a faint appearance, as if the C line were reversed, but it may have been only an effect of contrast, and it did not seem to have any defined limits. The entire limb examined with the slit radial on the C line.
July 29. 23. 0 to 30. 1. 0	II.	E. 141. 36—E. 142. 36	50	The prominence was seen equally well on the C, D ₃ , and F lines. The entire limb was examined with the slit radial. NOTE.—From this date the Half-prism Spectroscope was regularly employed in the examination of the Sun's limb.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m July 30. 23. 0 to 30. 23. 52	II.	o / o /	"	No prominences were seen. The entire limb was examined twice with the slit radial on the C line.
Aug. 13. 22. 0 to 13. 23. 40	II.			No prominences were seen. The chromosphere, which was readily seen on C, D ₃ , and F, but not on the <i>b</i> lines, varied in height, but was lower than usual on the whole. The entire limb was examined with the slit radial four times on the C line, and once on <i>b</i> .
Aug. 15. 0. 0 to 15. 2. 0	II.	W.147. 41—W.147. 21	23	The chromosphere averaged 8" in height. The entire limb was examined with the slit radial on the C line.
Aug. 15. 22. 0	II.	E. 142. 22—E. 141. 42 W.148. 31—W.147. 11	18 23	The chromosphere averaged from 8" to 10" in height. The entire limb was examined three times with the slit radial on the C line.
Aug. 16. 22. 0 to 17. 0. 30	II.			No prominences were seen. The chromosphere was rather low, 6" to 8" being the average height. The entire limb was examined with the slit radial on the C line.
Aug. 17. 21. 40 to 17. 22. 30	II.			No prominences were seen. Definition only moderate. Much white haze round the Sun. The entire limb was examined with the slit radial on the C line.
Aug. 20. 0.	I. & II.			No prominences were seen. The Sun always in much haze. Chromosphere slightly higher than on the previous days, being from 8" to 10" and 12" in height. The entire limb was examined with the slit radial on the C line, once with one "half-prism," and twice with two.
Aug. 20. 23. 20 to 20. 23. 48	II.	E. 46. 0—E. 46. 40 W.119. 0—W.118. 20	25 56	A straight jet. A broken jet. Chromosphere averaged 10" in height. The sky very clear between the clouds, and the definition good. The entire limb was examined with the slit radial on the C line.
Aug. 21. 23. 30 to 22. 0. 30	II.	W.116. 35—W.115. 35	20	A straight jet. It is situated just over a small spot, and was seen on C, D ₃ , and F. Chromosphere averaged 10" in height. The entire limb was examined with the slit radial on the C line.
Aug. 22. 21. 20 to 22. 23. 10	II.	W.115. 57—W.114. 57 W.121. 5—W.121. 39	34 24	Partly detached. A straight jet. Chromosphere averaged 8" in height. The entire limb was examined twice with the slit radial on the C line.
Aug. 27. 23. 30 to 28. 0. 30	II.			No prominences were seen. Chromosphere was seen all round the limb, average height 10" to 12". The entire limb was examined with the slit radial on the C line.
Aug. 29. 0. 15	II.	W. 41. 7—W. 40. 34	32	Very narrow and faint jet. Chromosphere low, average height about 7"; about W. 154° it was a little higher, about 10". The entire limb was examined with the slit radial on the C line.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m Aug. 30. 22. 0 to 30. 23. 15	II.	E. 41. 20—E. 42. 20 151. 20— 152. 20 W. 36. 55 26. 40 E. 24. 29 28. 59 107. 39 152. 29 W. 132. 51 34. 21 27. 41 21. 41	" 18 20 12 35 15 28 12 24	A broken prominence. A broken prominence. Immediately before coming to this prominence in turning the circle, the edge of the C line towards the red showed a faint momentary flash, as if the prominence light was reflected from the edge of the slit before it actually came into the field. Very narrow jet. A slight elevation of the chromosphere. Slight elevation of chromosphere. A small detached cloud, perhaps 4" in height. Small elevation of chromosphere. Small elevation of chromosphere. The entire limb was examined five times with the slit radial on the C line, three times between 22 ^h . 0 ^m . and 23 ^h . 15 ^m ., and twice between 0 ^h . 30 ^m . and 1 ^h . 10 ^m . Of the prominences seen at the first three examinations, the first (that at E. 42°) was not visible at the fourth and fifth examinations, but instead a small prominence was seen at E. 29°. There seems a discrepancy in the position circle readings for the prominence at E. 29° or E. 24° between the fourth and fifth examinations. Perhaps, however, that at E. 29° had disappeared, and that at E. 24° was a small eruption which had been passed over before or had just sprung up. The sky clouded over before it could be determined whether this was correct, or whether one of the readings was in error.
Aug. 31. 23. 30 to Sept. 1. 1. 0	II.	E. 2. 3 102. 23 110. 36	13 15 15	Not seen at the second and third examinations. } Not seen at the first examination. Two slight elevations of chromosphere, each occupying about 45' of the limb. The entire limb was examined three times with the slit radial on the C line.
Sept. 3. 23. 0 to 3. 23. 45	II.	E. 57. 19 W. 133. 41 — 134. 21	12 28	A broken jet. The chromosphere was undulating, the minimum height being 6" and the maximum about 12". The entire limb was examined twice with the slit radial on the C line.
Sept. 4. 22. 0 to 4. 23. 15	II.	E. 82. 44 — 83. 42 W. 129. 18 — 128. 18 58. 43 — 60. 23 41. 54 — 40. 20	18 17 45 61	Seen only at the second examination. Not visible at 23 ^h . 15 ^m . Seen at the second and third examinations. Seen at the first examination. Seen at the first examination. Seen readily on C and D ₃ . It was not so bright on D ₃ as on C, but appeared 3" higher on D ₃ than on C. Seen with much difficulty on F. No trace on b, D ₁ , or D ₂ , nor on 1474 K, so far as could be perceived. The prominences at W. 60° and W. 129° were seen readily on C, but with difficulty on D ₃ , and just suspected on F. No trace on b, D ₁ , D ₂ , or 1474 K. Chromosphere 9" in height. The Sun was in much white haze; prominences faint. The entire limb was examined three times with the slit radial on the C line.
Sept. 20. 22. 0 to 20. 22. 45	II.	W. 112. 25	26	A glimpse was obtained of a faint feathery jet shooting up about 50" higher from the brighter portion of the prominence. The prominence was very narrow. The chromosphere averaged 8" in height, but near 180° was very billowy and often 12" in height. The entire limb was examined twice with the slit radial on the C line.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m Sept. 21. 23. 30 to 22. 1. 0	II.	° ' ° ' E. 9. 55 — 10. 33 W. 260. 30 — 261. 55	" 16 25	Chromosphere 8". The entire limb was examined twice with the slit radial on the C line.
Sept. 23. 22. 0 to 23. 23. 45	II.	E. 102. 22 W. 160. 38 75. 38	20—30 20—30 20—30	Each prominence was about 1° of the Sun's circumference in breadth. The chromosphere averaged from 8" to 10" in height. Measures rough; observation continually interrupted by cloud. The entire limb was examined several times with the slit radial on the C line.
Sept. 25. 1. 30 to 25. 2. 30	II.	W. 132. 23 — 133. 19 102. 23 — 104. 3 65. 53 — 67. 23	27 28 19	The entire limb was examined three times with the slit radial on the C line.
Sept. 27. 0. 50 to 27. 1. 50	II.	W. 101. 1 — 100. 39 66. 55 — 68. 46	41 35	Not seen at the first examination. Seen only at the first and second examinations. The chromosphere 8" in height. The limb was boiling very much, and the Sun enveloped in white haze; the definition was never good, sometimes very bad. The entire limb was examined three times with the slit radial on the C line.
Sept. 27. 21. 30 to 27. 22. 30	II.	W. 33. 57 — 34. 7	20	The chromosphere 8" in height. The definition was very bad, the Sun being in much white haze. The entire limb was examined twice with the slit radial on the C line.
Sept. 28. 22. 35 to 28. 23. 15	II.	W. 44. 2 — 43. 12	41	Small and faint. The chromosphere 8" in height. The entire limb was examined twice with the slit radial on the C line.
Sept. 30. 22. 0 to Oct. 1. 1. 15	II.	W. 74. 33 — 72. 9 71. 8 — 70. 8 36. 45 — 35. 23	27 25 30	The chromosphere 8" in height. The entire limb was examined three times with the slit radial on the C line.
Oct. 3. 0. 15 to 3. 1. 10	II.	W. 72. 41 — 71. 20	30	The chromosphere 8" in height. The entire limb was examined twice with the slit radial on the C line.
Oct. 4. 22. 0 to 4. 22. 45	II.	E. 173. 7 W. 45. 40 — 43. 38	16 40	Seen only at the third examination. Not seen at the first examination. At the second examination it appeared about 40" in height, but at the third, when the Sun was in white haze, it appeared only 17" or 18" high. The chromosphere 8" in height. The prominence at W. 45° was seen of equal heights on C, D ₃ , and F lines. No trace on D ₁ , D ₂ , the <i>b</i> lines, or 1474 K. The entire limb was examined three times with the slit radial on the C line.
Oct. 5. 22. 35 to 5. 23. 40	II.	E. 88. 27	25	Very narrow; too narrow to allow measurement of breadth. Seen on D ₃ of the same height as on C. Definition variable. The chromosphere averaged 8" in height. The entire limb was examined three times with the slit radial on the C line.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
Oct. 8. 0. 30 d h m	II.	E. 77. 55 — 77. 5	38	Small. The C line of the prominence was plainly displaced to the red, but the amount could not be measured, the interval of brightness being very brief. The aspect of the C line radial on the limb is exactly that of a narrow slit; the first token of the coming prominence was a red flush along the edge of the C line nearer the red. The prominence itself was only small, and did not seem so high as the red flush, which was plainly seen 10" above the prominence. The chromosphere averaged 8" in height. The entire limb was examined once with the slit radial on the C line.
Oct. 8. 23. 0 to 9. 0. 10	II.	E. 39. 40 — 42. 5 W. 106. 26 — 105. 55	46 39	Two thin straight jets. A thin jet, mainly detached from the limb. The chromosphere about 8" in height. The work was constantly interrupted by passing clouds, but the definition was occasionally very fine in the intervals, the feathery character of the upper surface of the chromosphere being very distinctly seen. The chromosphere was very level, only very gently undulating; but the actual surface was composed of an infinite number of very fine filaments, averaging perhaps 0".5 to 1" in height, above the mass of the chromosphere, giving it a very feathery or fringed appearance. These filaments are much fainter than the body of the chromosphere. The prominence at E. 40° was seen of equal heights on the C, D ₃ , and F lines, but only very faintly on 1474 K; the exact height of it, therefore, could not be made out. The prominence at W. 106° appeared at 0 ^h . 10 ^m . to be completely detached from the limb, and to be growing smaller and fainter rather rapidly. It was seen on C, faintly on D ₃ , but could not be found on F. It was suspected on 1474 K, not as a tiny detached cloud as on the other lines, but as a jet continuous from the limb. Neither prominence was seen on the E, the D, or the <i>b</i> lines. The entire limb was examined three times with the slit radial on the C line.
Oct. 10. 22. 0 to 10. 23. 0	II.	E. 38. 10 — 42. 31 W. 52. 14 — 50. 54	56 75	Seen well and easily on C and D ₃ , faintly on F, suspected on 1474 K, but on no other line. Seen well and easily on C and D ₃ , faintly on F, but on no other line. The chromosphere about 8" in height. Examined the chromosphere with tangential slit, and saw distinctly C, D ₃ , F, and 2796 K and 1474 K faintly. This last line seemed rather to vanish than to be reversed in the chromosphere. <i>h</i> was just suspected. This part of the spectrum is very faint. The <i>b</i> , D, and E lines were not reversed. The entire limb was examined twice with the slit radial on the C line.
Oct. 11. 21. 15 to 11. 22. 0	II.	W. 96. 3 — 95. 28 86. 13 — 85. 58	35 20	The chromosphere 8" in height. The entire limb was examined twice with the slit radial on the C line.
Oct. 12. 23. 10 to 12. 23. 30	II.	W. 73. 27 — 71. 49	35	The chromosphere 8" in height. The limb from W. 32° to E. 168°, through the W. point, examined once with the slit radial on the C line.
Oct. 14. 22. 0 to 14. 22. 30 and 15. 1. 0 to 15. 1. 30	II.	E. 103. 59 — 104. 51	30	Was seen of about equal height on C, D ₃ , and F lines. Was not seen on 1474 K, the <i>b</i> lines, E, D ₁ , or D ₂ . The chromosphere 8" in height. Examined also with the tangential slit, and saw C, D ₃ , and F all plainly reversed. 1474 K was reversed, but was only faint. The sky clouded over before the spectrum beyond F to the blue could be examined. The entire limb examined once with the slit radial on the C line.

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
Oct. 24. a h m	II.	E. 30. 52 — 32. 26 93. 12 — 93. 32 120. 50 — 122. 14	20 41 30	Much broken. Broken. Broken. The chromosphere averaged 8" in height. The entire limb was examined twice with the slit radial on the C line.
Oct. 30. 1. 50 to 30. 2. 10	II.			No prominences were seen. The chromosphere averaged 8" in height. The limb was examined from W. 30° to E. 20°, through the N. point, with the slit radial on the C line.
Oct. 30. 21. 40 to 30. 22. 20	II.	E. 101. 1 — 101. 28	25	Was seen very distinctly and of about equal heights on C, D ₃ , and F. No trace on D, b, E, or 1474 K. The chromosphere 8" in height. The entire limb was examined three times with the slit radial.
Nov. 2. 23. 40 to 3. 1. 30	II.			No prominences. Chromosphere averaging 8" in height was seen readily all the way round. The Sun was in a yellow mist all the time of search. The entire limb was examined twice with the slit radial on the C line.
Nov. 4.	II.	W. 111. 21 — 109. 21 72. 56 — 66. 16	61 30	Much broken. Broken. Both prominences were seen on C, D ₃ , 1474 K, and F; on 1474 K they could not be certainly traced higher than 10" in the one case and 20" in the other. On the other three lines they were sensibly of the same height. They were not seen on b or D. The chromosphere averaged 8" in height. The entire limb was examined twice with the slit radial.
Nov. 8.	II.	E. 63. 26 — 63. 46 138. 46 — 139. 6 W. 107. 29 — 107. 54 123. 14 — 125. 54	20 50 20 35	Small detached jet. A continuous jet. Small detached jet. A small jet, and a small detached cloud some little way to the south of it. The chromosphere averaged 8" in height. The entire limb was examined three times with the slit radial.
Nov. 10.	II.	E. 84. 28 — 85. 56 131. 58 — 133. 38 W. 129. 17 — 128. 57 80. 52 — 80. 2 38. 29 — 35. 42	20 25 41 25 90	} Very faint. The chromosphere averaged 8" in height. The entire limb was examined once with the slit radial on the C line.
Nov. 12.	II.	E. 45. 31 — 48. '1 135. 41 — 136. 21 W. 103. 9 — 102. 4 62. 4 — 59. 49 41. 41 — 36. 54	50 15 80 70 70	Much broken and twisted. Merely an undulation in the chromosphere, and perfectly regular in outline. Much broken and twisted. Do. do. Do. do. The chromosphere averaged 8" in height. The Sun in much haze; consequently the prominences appeared very faint; but from their being visible at all they were probably really unusually brilliant. The entire limb was examined twice with the slit radial on the C line.
Nov. 13. 21. 45 to 14. 0. 15	II.	W. 60. 59 — 59. 29	56	Seen on C, D ₃ , 1474 K, and F. Not on D or b. Much fainter on the third examination. The chromosphere averaged 8" in height. The entire limb was examined three times with the slit radial.

POSITION-ANGLES AND HEIGHTS OF SOLAR PROMINENCES, OBSERVED WITH THE SPECTROSCOPE, AND
EXAMINATION OF THE SPECTRUM OF A SUN SPOT,

1877, G.M.T.	No. of Prisms.	Heliographic N.P.D.	Height.	REMARKS.
d h m Dec. 12. 22. 0 to 12. 23. 45	I. & II.	° / ° / "		No prominences were seen. The chromosphere averaged 8" in height and was fairly bright everywhere, but very irregular in outline. An attempt was made to examine the limb on the D lines, but the sky was not sufficiently clear. The examinations were unsatisfactory, the sky being very misty. The entire limb was examined twice with the slit radial.
Dec. 14. 0. 3	I. & II.	E. 49. 23 — 50. 22	27	Seen on D₃ and F as well as on C, but on no other line. The chromosphere averaged 8" in height, and was serrated in outline. The Sun was very yellow, and the chromosphere faint. The entire limb was examined with the slit radial on the C line, twice with one prism, and once with two.
Dec. 31. 0. 15 31. 0. 27 31. 0. 20	II.	E. 56. 27 — 55. 5 W. 101. 33 — 100. 25 41. 53 — 40. 29	46 30 48	Very bright. Seen on D₃ and F as well as on C, but on no other lines. The day was misty and the Sun yellow. The entire limb was examined twice with the slit radial on the C line.

EXAMINATION of the SPECTRUM of the SUN SPOT of 1877, October 25—November 7,
made at the ROYAL OBSERVATORY, GREENWICH.

This fine spot was examined with the "Half-prism" Spectroscope, with a train of two "half-prisms reversed," to give great purity of spectrum, on 1877, October 31, November 3, and November 5. Observers W C and M.

The lines of the following elements suffered change over the nucleus of the spot :—

Element.	Number of Lines observed.	Character of Change.
Calcium	12	Very much darker and about doubled in breadth.
Sodium	2	Very much darker. The two D lines almost meet over the nucleus.
Titanium	11	Very much darker and about doubled in breadth.
Iron	30	Slightly broader, by about one-tenth, and decidedly darker, perhaps by one-half.
Barium	4	About twice as dark and twice as broad.
Magnesium	4	Much broader and darker.
Nickel	6	Broader by one-half, slightly darker.
Chromium	3	Somewhat darker, and broader by about one-tenth.
Hydrogen	3	Much fainter and less distinct. F line reversed in the neighbourhood of the spot, due north of the centre on November 5.
Coronal line	1	Much fainter over the spot.
D ₃	1	Not seen, either bright or dark, in spot or bridge.
Telluric bands	1	Band α broader and darker.

The following lines and bands were also altered :—

Line.	Wave-length, tenth-metres.	Character of Change.
K 588	6927	Darkened.
B	6869	Darkened and slightly broadened on the red side, by about 1 tenth-metre of wave-length.
K 712	6517	Double the usual breadth. This is probably one of the lines of Barium.
K 765±	6380±	An appearance as of a dark-shaded band, sharp towards the blue, and shaded off towards the red. Nothing seen on the general disk of the Sun to correspond to it.
K 1493	5297	A cluster of several lines, of which only those on the blue side are affected. Much darker, and wider on the blue side, by 0.3 tenth-metre of wave-length. Two of these probably belong to Titanium.

Lines from Kirchhoff's map are denoted by the letter K, and the No. on his scale.

The Wave-lengths are taken from Ångström's Normal Spectrum.

Besides the increase in breadth, displacements to the red or blue were noted, especially in the case of the F and D lines. On October 31 the F line was twisted, the part over the following half of the spot being displaced to the red, and the other half to the blue, by amounts corresponding respectively to a recession or downward motion of nine miles, and an approach or upward motion of three miles a second. On the darkest part of the spot the D lines were broadened on the red side to the extent of $\frac{1}{2}$ ($D_1 - D_2$), the more refrangible edge being sharp and not sensibly displaced. This would indicate a large downward motion of perhaps thirty miles a second. On other parts the haze appeared to be chiefly on the blue side.

The spot, which was first seen (after an interval of cloudy weather) on October 30, when it was well advanced on the disk, would appear to have passed off about November 7^d. 6^h; but clouds prevented any observations between November 5 and 8. On November 8 the only indication of the position of the spot was a small jet rising about 20" from the otherwise quiescent chromosphere. There was also a group of faculae near the limb.

MEASURES OF DISPLACEMENT OF LINES in the SPECTRA of STARS, as compared with those of
ROYAL OBSERVATORY, GREENWICH,

Note.—The motion corresponding to the displacement actually observed may be inferred from the Concluded Motion by adding the Earth's Motion algebraically.

The Ten-prism Spectroscope was used up to 1877, July 25, and the "Half-prism" Spectroscope from that date. Arabic numerals denote the number of prisms used with the former, and Roman numerals the number of "Half-prisms" used with the latter. Each "Half-prism" is compound, and is composed of a flint "half-prism," (*i.e.*, the half of an isosceles prism, cut by a plane perpendicular to the base,) and a crown prism, cemented on the emergent face, so as to form the half

Date, 1877, Greenwich Sidereal Time.	Observer.	Number of Prisms.	Position Circle.	Objects compared.	Micrometer Readings.	Displacement.		Width of Slit.
						Measured.	Estimated in Terms of the Breadth of the Comparison Line.	
d h m			°		r	r		a
Feb. 28. 7. 55	M	4	6	Sirius F.....	0.105			
				H β	0.216	+ 0.111	$\frac{1}{4}$ to red	5.1
28. 8. 15	"	"	"	Sirius F.....	0.114			
				H β	0.258	+ 0.144	$\frac{1}{3}$ to red	2.7
Feb. 28. 9. 0	M	2	6	α Orionis b_4	0.912			
				Mg ₃	0.975	+ 0.063	$\frac{1}{4}$ to red	1.4
28. 9. 20	"	"	"	α Orionis b_4	0.059			
				Mg ₃	0.213	+ 0.154	$\frac{1}{2}$ to red	2.0
28. 9. 35	"	"	"	α Orionis b_4	0.143			
				Mg ₃	0.219	+ 0.076	$\frac{1}{4}$ to red	2.0
Feb. 28. 10. 20	M	2	6	Pollux b_1	0.527			
				Mg ₁	0.407	— 0.120	1 to blue	1.0
28. 10. 35	"	"	"	Pollux b_1	0.146			
				Mg ₁	0.059	— 0.086	$\frac{1}{2}$ to blue	1.8
Mar. 5. 10. 20	M	2	10	Procyon F.....	0.368			
				H β	0.540	+ 0.172	$\frac{1}{2}$ to red	2.0
5. 10. 50	"	"	"	Procyon F.....	0.373			
				H β	0.485	+ 0.112	$\frac{1}{4}$ to red	2.0
Mar. 5. 11. 30	M	2	10	Regulus F.....	0.075			
				H β	0.170	+ 0.095	$\frac{1}{3}$ to red	1.7
Mar. 5. 12. 35	M	4	5 $\frac{1}{2}$	Areturus b_1	0.740			
				Mg ₁	0.624	— 0.116	$\frac{1}{2}$ to blue	2.5
5. 13. 0	"	"	"	Areturus b_1	0.803			
				Mg ₁	0.653	— 0.150	$\frac{2}{3}$ to blue	2.5
Mar. 10. 7. 35	M	4	2 $\frac{1}{2}$	Rigel F.....	0.501			
				H β	0.655	+ 0.154	$\frac{1}{3}$ to red	2.5
10. 7. 55	"	"	"	Rigel F.....	0.955			
				H β	1.128	+ 0.133	$\frac{1}{3}$ to red	2.5
Mar. 10. 8. 20	M	4	2 $\frac{1}{2}$	ϵ Orionis F.....	0.530			
				H β	0.217	— 0.313		
10. 8. 35	"	"	"	ϵ Orionis F.....	0.830			
				H β	1.065	+ 0.135		
Mar. 10. 8. 55	M	2	2 $\frac{1}{2}$	ϵ Orionis F.....	0.915			
				H β	0.856	— 0.059	$\frac{1}{2}$ to blue	4.6
	"	"	"	ϵ Orionis F.....	1.027			
				H β	0.893	— 0.134	$\frac{1}{3}$ to blue	4.6
Mar. 10. 9. 35	M	4	2 $\frac{1}{2}$	α Orionis b_4	0.985			
				Mg ₃	1.218	+ 0.233	$\frac{2}{3}$ to red	2.6
10. 9. 55	"	"	"	α Orionis b_4	0.042			
				Mg ₃	0.228	+ 0.186	$\frac{1}{4}$ to red	2.6

The velocity of light has been taken as 186,660 miles a second, and the distance of the Sun as 92,250,000 miles.

TERRESTRIAL ELEMENTS, and CONCLUDED MOTIONS in the LINE of SIGHT, from OBSERVATIONS at the in the Year 1877.

of a direct-vision prism. With one such half-prism, a dispersion of 20° from A to H, equivalent to four flint prisms of 60° , is obtained; and with a train of two, a dispersion of 75° , equivalent to fifteen flint prisms of 60° . 1 div. in the width of the slit corresponds to 0.0013 inch, or about $1''.3$. The weights are on a scale 1-5 for each observation.

The slit lies north and south, and the deviation of the ray by the prisms, in the case of the Ten-prism Spectroscope, is towards the east when the reading of the Position-Circle is 5° .

Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		Weight.	REMARKS.
	Measured.	Estimated.		
+ 12.2	+ 9.3	+ 14.5	2 3	Direct comparison. Direct comparison. Definition poor. Moon bright, and much haze.
+ 17.2	+ 19.2	+ 17.1	1 1 1	Indirect comparison. Indirect comparison. Indirect comparison. Definition poor.
+ 13.8	- 52.1	- 89.8	1 1	Indirect comparison. Indirect comparison. Definition poor.
+ 14.0	+ 30.7	+ 19.6	2 3	Indirect comparison. Star spectrum bright, and image steady, but the star-line very diffused. Indirect comparison.
+ 5.6	+ 25.7	+ 23.7	3	Indirect comparison. Line darker and better defined than that in Procyon.
- 9.6	- 16.2	- 50.9	3 4	Indirect comparison. Lines fairly well defined. Stars often lost in cloud, but shining brightly in the intervals. Indirect comparison.
+ 15.8	+ 7.2	+ 9.4	1 2	Indirect comparison. Indirect comparison. The star was more distinctly seen at the second observation than at the first.
+ 16.9	(- 46.1)		0 0	The star-line was exceedingly difficult to see with this high dispersion, and on placing the pointer near it, it became quite invisible. A displacement to the blue seemed to be shown by flashing in occasionally the light from the comparison tube.
+ 16.9	- 48.7	- 61.4	3 3	Indirect comparison. Indirect comparison.
+ 17.8	+ 22.1	+ 11.0	4 4	Indirect comparison. Line well seen in both instances. Indirect comparison.

+ denotes recession; - denotes approach.

Date, 1877, Greenwich Sidereal Time.	Observer.	Number of Prisms.	Position Circle.	Objects compared.	Micrometer Readings.	Displacement.		Width of Slit.
						Measured.	Estimated in Terms of the Breadth of the Comparison Line.	
d h m Mar. 10. 10. 25 10. 10. 50	M ,,	4 ,,	2 $\frac{1}{2}$,,	Pollux b_1 Mg $_1$ Pollux b_1 Mg $_1$	r 0'293 0'201 0'289 0'229	r - 0'092 - 0'061	$\frac{1}{3}$ to blue $\frac{1}{4}$ to blue	d 2'6 2'6
Mar. 10. 11. 15	M	4	2 $\frac{1}{2}$	Castor F H β	0'735 0'810	+ 0'075	$\frac{1}{4}$ to red	3'4
April 14. 12. 40 14. 13. 20	M ,,	2 ,,	5 ,,	β Ursæ Majoris F ... H β β Ursæ Majoris F ... H β	0'073 0'135 0'277 0'422	+ 0'062 + 0'145	$\frac{1}{5}$ to red $\frac{2}{5}$ to red	3'9 3'6
May 2. 12. 34 2. 12. 59	M ,,	2 ,,	3 ,,	β Ursæ Majoris F H β β Ursæ Majoris F H β	0'858 1'043 0'863 1'005	+ 0'185 + 0'142	$\frac{1}{2}$ to red $\frac{1}{2}$ to red	3'0 3'0
May 2. 13. 44 2. 14. 4	M ,,	2 ,,	3 ,,	γ Ursæ Majoris F ... H β γ Ursæ Majoris F ... H β	0'792 0'953 0'993 1'055	+ 0'161 + 0'062	$\frac{1}{3}$ to red $\frac{1}{6}$ to red	3'2 3'2
May 2. 14. 24 2. 14. 39	M ,,	2 ,,	3 ,,	ϵ Ursæ Majoris F H β ϵ Ursæ Majoris F H β	0'084 0'132 0'062 0'108	+ 0'048 + 0'046	$\frac{1}{6}$ to red $\frac{1}{6}$ to red	3'3 3'3
May 2. 2. 15. 19 2. 15. 27	M ,, ,,	2 ,, ,,	3 ,, ,,	δ Ursæ Majoris F H β δ Ursæ Majoris F H β δ Ursæ Majoris F H β	1'067 1'120 0'923 1'105 1'235 1'093	+ 0'053 + 0'182 - 0'142	$\frac{1}{2}$ to red $\frac{1}{3}$ to blue	3'3 3'3
May 2. 15. 44 2. 16. 9	M ,,	2 ,,	3 ,,	ζ Ursæ Majoris F H β ζ Ursæ Majoris F H β	0'001 0'043 0'005 0'049	+ 0'042 + 0'044	$\frac{1}{5}$ to red $\frac{1}{5}$ to red	3'0 3'0
Aug. 23. 20. 10 23. 20. 20 23. 20. 30	M ,, ,,	I. ,, ,,	 ,, ,,	ζ Aquilæ F H β ζ Aquilæ F H β ζ Aquilæ F H β	0'868 0'999 0'662 1'053 0'992 1'122	- 0'131 - 0'391 - 0'130	$\frac{1}{3}$ to blue $\frac{2}{3}$ to blue $\frac{1}{3}$ to blue	
Aug. 31. 20. 20 31. 20. 30 31. 20.	M ,, ,,	I. ,, ,,	 ,, ,,	α Coronæ F H β α Coronæ F H β α Coronæ F H β	0'138 0'022 1'312 0'959 1'120 0'993	+ 0'116 + 0'353 + 0'127	$\frac{1}{3}$ to red $\frac{2}{3}$ to red $\frac{1}{3}$ to red	
Aug. 31. 21. 0 31. 21. 10	M ,,	I. ,,	 ,,	α Ophiuchi F H β α Ophiuchi F H β	0'727 0'422 0'612 0'438	+ 0'305 + 0'174	$\frac{3}{5}$ to red $\frac{1}{2}$ to red	

The velocity of light has been taken as 186,660 miles a second, and the distance of the Sun as 92,250,000 miles.

1879GOAMW. 39D...77A

Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		Weight.	REMARKS.
	Measured.	Estimated.		
+15.7	- 30.2	- 45.7	3 3	Indirect comparison. Indirect comparison.
+16.2	- 3.9	+ 5.7	2	Indirect comparison.
+11.9	+ 22.2	+ 30.8	3 3	Indirect comparison. Star-line broad, dark and diffused at the edges. Spectrum fairly defined. Indirect comparison.
+12.7	+ 41.1	+ 48.9	3 3	Indirect comparison. Star-line and spectrum seen very well, considering the comparative faintness of the star. The line is very broad, and shaded off at the edges. Indirect comparison.
+11.8	+ 24.9	+ 20.4	3 3	Indirect comparison. Spectrum seen as well as that of β Ursæ Majoris, or perhaps better. Indirect comparison.
+ 9.6	+ 5.9	+ 12.3	3 3	Indirect comparison. Indirect comparison.
+10.8	+ 3.9	+ 0.1	3 $\frac{1}{2}$ $\frac{1}{2}$	Mean of six measures. No estimation. Indirect comparison. Indirect comparison.
+ 8.6	+ 5.5	+ 16.1	3 3	Indirect comparison. Images very steady. Clouds frequently passing, but definition good in the intervals. Indirect comparison.
+ 9.9	- 60.3	- 70.3	4 1 4	Indirect comparison. The position of the pointer after bisecting the star-line was compared with the $H\beta$ line, and after bisecting the $H\beta$ line it was compared with the star-line; each comparison giving the displacement in the same direction. Indirect comparison. NOTE.—The Half-prism Spectroscope was used regularly from this date.
+11.4	+ 54.4	+ 67.9	2 3 3	Indirect comparison. Star-line broad and dark, but the edges being ill-defined exact bisection is difficult. Indirect comparison. Direct comparison showed a marked displacement to the red. Indirect comparison.
+14.3	+ 61.3	+ 89.6	4 4	Both direct and indirect comparisons. The direct gave slightly the larger displacement. Both direct and indirect comparisons. Estimations alike in both cases, but the exact amount of displacement was difficult to estimate.

+ denotes recession ; - denotes approach.

Date, 1877, Greenwich Sidereal Time.	Observer.	Number of Prisms.	Position Circle.	Objects compared.	Micrometer Readings.	Displacement.		Width of Slit.
						Measured.	Estimated in Terms of the Breadth of the Bright Line of the Micrometer.	
d h m Nov. 14. 22. 30	M	I.	95	γ Aquilæ b_1	0.308	r		d
14. 22. 40	,,	,,	,,	Mg ₁	0.272	+ 0.036	$\frac{1}{2}$ to red	
				γ Aquilæ b_1	0.375	+ 0.021	$\frac{1}{4}$ to red	
				Mg ₁	0.354			
Nov. 14. 23. 20	M	I.	95	ϵ Cygni b_1	1.085			
14. 23. 40	,,	,,	,,	Mg ₁	0.974	+ 0.111	2 to red	
				ϵ Cygni b_1	0.957	+ 0.094	1 to red	
				Mg ₁	0.863			
Nov. 14. 0. 5	M	I.	95	γ Cygni b_1	0.758			
14. 0. 50	,,	,,	,,	Mg ₁	0.803	- 0.045	1 to blue	
				γ Cygni b_1	0.532	- 0.058	1 to blue	
				Mg ₁	0.590			
Nov. 14. 1. 5	M	I.	95	α Cygni b_2	0.367			
14. 1. 15	,,	,,	,,	Mg ₂	0.552	- 0.185	2 to blue	
				α Cygni b_1	0.502	- 0.146	$1\frac{1}{2}$ to blue	
				Mg ₁	0.648			
Nov. 14. 2. 10	M	I.	95	Aldebaran b_4	0.438			
14. 2. 50	,,	,,	,,	Mg ₃	0.334	+ 0.104	1 to red	
				Aldebaran b_1	0.008	- 0.140	$1\frac{1}{2}$ to blue	
				Mg ₁	0.148			
Dec. 31. 4. 0	WC	I.	95	Aldebaran b_1	0.964			
31. 4. 25	,,	,,	,,	Mg ₁	0.861	+ 0.103	$\frac{1}{2}$ to red	
				Aldebaran b_1	0.951	+ 0.073	$\frac{1}{4}$ to red	
				Mg ₁	0.878			
Dec. 31. 4. 10	M	I.	95	Aldebaran b_1	0.866			
31. 4. 40	,,	,,	,,	Mg ₁	0.775	+ 0.091	1 to red	
				Aldebaran b_1	0.949	+ 0.078	1 to red	
				Mg ₁	0.871			
Dec. 31. 5. 10	M	I.	95	α Orionis b_4	1.045			
31. 5. 25	,,	,,	,,	Mg ₃	0.998	+ 0.047	$\frac{2}{3}$ to red	
				α Orionis b_4	0.859	+ 0.067	$\frac{2}{3}$ to red	
				Mg ₃	0.792			
Dec. 31. 6. 10	M	I.	95	ϵ Orionis F	0.479			
31. 6. 20	,,	,,	,,	H β	0.402	+ 0.077	$\frac{1}{2}$ to red	
				ϵ Orionis F	0.546	+ 0.131	$\frac{1}{4}$ to red	
				H β	0.415			
Dec. 31. 6. 35	M	I.	95	δ Orionis F			$\frac{1}{2}$ to blue	
				H β				
Dec. 31. 7. 0	M	I.	95	β Orionis F	0.858			
31. 7. 20	,,	,,	,,	H β	0.758	+ 0.100	1 to red	
				β Orionis F	0.823	+ 0.087	1 to red	
				H β	0.736			
31. 7. 35	,,	,,	,,	β Orionis F	0.743	+ 0.071	$\frac{2}{3}$ to red	
				H β	0.672			

The velocity of light has been taken as 186,660 miles a second, and the distance of the Sun as 92,250,000 miles.

1879G0AMW...39D...77A

Earth's Motion in Miles per Second.	Concluded Motion of Star in Miles per Second.		Weight.	REMARKS.
	Measured.	Estimated.		
+14.8	- 3.7	- 2.6	3 2	Indirect comparison. An immense number of lines seen in the star spectrum, the magnesium lines being neither the darkest nor the best defined. Indirect comparison.
+12.2	+ 24.2	+ 25.7	1 3	Indirect comparison. Definition of the star-lines inferior to those of γ Aquilæ. Image tremulous. Indirect comparison.
+10.2	- 27.9	- 40.5	2 $\frac{1}{2}$	Indirect comparison. Definition much worse. Observations interrupted by cloud. Indirect comparison.
+ 9.3	- 69.5	- 61.3	3 4	Indirect comparison. Definition improved. Indirect comparison.
- 4.9	(- 1.8)	(- 2.7)	0 0	Indirect comparison. Images very watery and tremulous. Observations discordant. Indirect comparison.
+10.1	+ 22.5	+ 1.8	2 2	Indirect comparison. Indirect comparison.
+10.1	+ 21.2	+ 18.5	2 2	Indirect comparison. Indirect comparison.
+ 4.2	+ 16.9	+ 14.9	2 2	Indirect comparison. b_4 in the star spectrum was distinct, b_2 suspected, but b_1 was not visible. Indirect comparison. The spectrum was very tremulous, and the definition never good for long together.
+ 5.5	+ 29.9	+ 18.7	1 2	Indirect comparison. Star-line faint, but not very broad. Indirect comparison. Image of star tremulous. The pointer overlapped the spectrum a long way, and made bisection difficult.
+ 5.9		- 18.0	1	Direct comparison obtained by flashing in the light from the comparison-tube. The two spectra could not be seen together.
+ 7.0	+ 20.0	+ 14.5	2 2 2	Indirect comparison. The rough comparisons are more trustworthy than the measures, the overlapping of the pointer rendering these uncertain. Indirect comparison. Image steadier than in the cases of the preceding stars. Definition fair. Indirect comparison.

+ denotes recession ; - denotes approach.

94 COLLECTED RESULTS FOR MOTIONS OF STARS IN THE LINE OF SIGHT, FROM SPECTROSCOPIC OBSERVATIONS

COLLECTED RESULTS for MOTIONS of STARS in the line of Sight, from SPECTROSCOPIC OBSERVATIONS made at the
ROYAL OBSERVATORY, GREENWICH, in the Year 1877.

(F for the Star is compared with H_β of Hydrogen, and b_1, b_2, b_4 with Mg₁, Mg₂, Mg₃ of Magnesium.)

(+ denotes Recession ; — Approach.)

Date.	Observer.	Number of Measures.	Weight.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star.	
									Measured.	Estimated.
α TAURI (<i>Aldebaran</i>).										
1877, November 14	M	2	0	I.	95	..	b_4 & b_1	— 4.9	(— 1.8)	(— 2.7)
December 31	WC	2	4	I.	95	..	b_1	+ 10.1	+ 22.5	+ 1.8
31	M	2	4	I.	95	..	b_1	+ 10.1	+ 21.2	+ 18.5
β ORIONIS (<i>Rigel</i>).										
1877, March 10	M	2	3	4	$2\frac{1}{2}$	2.5	F	+ 15.8	+ 7.2	+ 9.4
December 31	M	3	6	I.	95	..	F	+ 7.0	+ 20.0	+ 14.5
δ ORIONIS.										
1877, December 31	M	1 est.	1	I.	95	..	F	+ 5.9	..	— 18.0
ϵ ORIONIS.										
1877, March 10	M	2	0	4	$2\frac{1}{2}$	..	F	+ 16.9	(— 46.1)	..
10	M	2	6	2	$2\frac{1}{2}$	4.6	F	+ 16.9	— 48.7	— 61.4
December 31	M	2	3	I.	95	..	F	+ 5.5	+ 29.9	+ 18.7
α ORIONIS.										
1877, February 28	M	3	3	2	6	1.4 & 2.0	b_4	+ 17.2	+ 19.2	+ 17.1
March 10	M	2	8	4	$2\frac{1}{2}$	2.6	b_4	+ 17.8	+ 22.1	+ 11.0
December 31	M	2	4	I.	95	..	b_4	+ 4.2	+ 16.9	+ 14.9
α CANIS MAJORIS (<i>Sirius</i>).										
1877, February 28	M	2	5	4	6	5.1 & 2.7	F	+ 12.2	+ 9.3	+ 14.5

Date.	Observer.	Number of Measures.	Weight.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star.		
									Measured.	Estimated.	
α^2 GEMINORUM (<i>Castor</i>).											
1877, March	10	M	1	2	4	$2\frac{1}{2}$	$3^d 4$	F	+ 16.2	— 3.9	+ 5.7
α CANIS MINORIS (<i>Procyon</i>).											
1877, March	5	M	2	5	2	10	2.0	F	+ 14.0	+ 30.7	+ 19.6
β GEMINORUM (<i>Pollux</i>).											
1877, February	28	M	2	2	2	6	1.0 & 1.8	b_1	+ 13.8	— 52.1	— 89.8
March	10	M	2	6	4	$2\frac{1}{2}$	2.6	b_1	+ 15.7	— 30.2	— 45.7
α LEONIS (<i>Regulus</i>).											
1877, March	5	M	1	3	2	10	1.7	F	+ 5.6	+ 25.7	+ 23.7
β URSÆ MAJORIS.											
1877, April	14	M	2	6	2	5	3.9 & 3.6	F	+ 11.9	+ 22.2	+ 30.8
May	2	M	2	6	2	3	3.0	F	+ 12.7	+ 41.1	+ 48.9
γ URSÆ MAJORIS.											
1877, May	2	M	2	6	2	3	3.2	F	+ 11.8	+ 24.9	+ 20.4
δ URSÆ MAJORIS.											
1877, May	2	M	8	4	2	3	3.3	F	+ 10.8	+ 3.9	+ 0.1
ϵ URSÆ MAJORIS.											
1877, May	2	M	2	6	2	3	3.3	F	+ 9.6	+ 5.9	+ 12.3
ζ URSÆ MAJORIS.											
1877, May	2	M	2	6	2	3	3.0	F	+ 8.6	+ 5.5	+ 16.1

COLLECTED RESULTS FOR MOTIONS OF STARS IN THE LINE OF SIGHT, AND
MEASURES OF DARK BANDS IN PLANETARY, COMETARY, AND STELLAR SPECTRA,

Date.	Observer.	Number of Measures.	Weight.	Number of Prisms.	Position Circle.	Width of Slit.	Line.	Earth's Motion in Miles per Second.	Concluded Motion of Star.		
									Measured.	Estimated.	
α BOÖTIS (<i>Arcturus</i>).											
1877, March	5	M	2	7	4	$5\frac{1}{2}$	d 2.5	b_1	— 9.6	— 16.2	— 50.9
α CORONÆ.											
1877, August	31	<u>M</u> measured	3	8	I.	..	..	F	+ 11.4	+ 54.4	+ 67.9
α OPHIUCHI.											
1877, August	31	M	2	8	I.	..	..	F	+ 14.3	+ 61.3	+ 89.6
ζ AQUILÆ.											
1877, August	23	M	3	9	I.	..	..	F	+ 9.9	— 60.3	— 70.3
γ AQUILÆ.											
1877, November	14	M	2	5	I.	95	..	b_1	+ 14.8	— 3.7	— 2.6
γ CYGNI.											
1877, November	14	M	2	$2\frac{1}{2}$	I.	95	..	b_1	+ 10.2	— 27.9	— 40.5
α CYGNI.											
1877, November	14	M	2	7	I.	95	..	b_2 & b_1	+ 9.3	— 69.5	— 61.3
ε CYGNI.											
1877, November	14	M	2	4	I.	95	..	b_1	+ 12.2	+ 24.2	+ 25.7

MEASURES of DARK BANDS in PLANETARY, COMETARY, and STELLAR SPECTRA.

Note.—The same Nos. are given throughout to the bands corresponding to those in the Spectrum of β Pegasi, observed on 1876, October 18.

MIRA CETI, NEAR MAXIMUM.

The maximum ($= \alpha$ Ceti) occurred on 1877, January 5, according to Dr. Schmidt's observations (Astronomische Nachrichten, No. 2121).

1877, January 30.

Single-prism Spectroscope. Position-circle 90° . Micrometer B. Eye-piece No. 1.

Observer, W C.

The spectrum of Mira Ceti showed strong absorption lines, with a shading of fine lines towards the red of Bands VI., VII., and II.; this feature was not so marked in the case of the other lines or bands. I. was perhaps 70 tenth-metres, and IV. about 25 tenth-metres in breadth. The strong lines (on the blue side) in Bands II., V., VI., and VII., were also about 40 tenth-metres broad. Beyond VIII. a band (nearly continuous) commenced at a distance of about 30 tenth-metres, and extended as far as the spectrum could be traced into the violet.

No. of Band.	Wave-length.	Breadth of Shading.	REMARKS.
	Tenth-metres.	Tenth-metres.	
II.	5828	..	Sharp edge of dark band.
V.	5443	..	Faint band.
VI.	5215	..	Sharp edge of dark band.
VII.	5020	..	Broad dark band, shaded towards the red.

Slit $0^{\text{in}}.005$. Spectrum faint; measures very rough.

I.	6129	70	Dark band, forming end of spectrum.
II.	5870	120	Broad band, composed of fine lines.
IV.	5580	50	Narrower than any of the other bands.
V.	5477		Dark band with sharp edges, <i>not</i> shaded off to the red.
VI.	5177	100	Very dark band, composed of fine lines shading off towards the red.
VII.	4951	120	Very dark band, the shading darker than in Band VII.
VIII.	4870	}	Approximate edges of a band which shows little shading, being nearly uniform throughout.
VIII.	4778		
IX.	4500		Commencement of a band extending into the violet. Estimated, not measured.

Slit $0^{\text{in}}.009$. Spectrum much brighter; measures more accurate.

1877, February 16^d. 7 $\frac{1}{2}$ ^h. — 9 $\frac{1}{2}$ ^h.

Ten-prism Spectroscope. Half-prism and plane reflector. Position-circle $0^\circ.0$.

Observer, W C.

A determination was made of the wave-lengths of the sharp and shaded edges of Bands VI. and VII., their positions being compared with the b lines of Magnesium, and the strong double line of Air in the green. Owing to the faintness of the star it was necessary to employ a wide slit, rendering the measures less accurate than would otherwise have been the case, the Magnesium lines being seen as one mass.

The following results were obtained:—

	Tenth-metres.
Band VI. Shaded edge.....	5218
Sharp edge	5169
Band VII. Shaded edge.....	5017
Sharp edge.....	4995

1877, February 26^d. 7^h.

Single-prism Spectroscope.

Observer, M.

The star was very faint at first, owing to mist and moonlight, and the spectrum was only visible from the yellow to the blue. As the mist cleared off, the spectrum was seen much further in both directions, but no dark bands could be detected either in the red or in the violet.

Six bands were seen; three of them strong, viz., Nos. II., VI., and VII.; one of them faint, No. VIII.; two more reduced apparently to mere lines, and these exceedingly feeble, Nos. IV. and V. Bands I. in the red, and IX. and X. in the violet could not be traced.

Band VII. was very black, and was about 140 tenth-metres in breadth. Band VI. was not so dark, and scarcely 100 tenth-metres in breadth.

A bright line was suspected just beyond the sharp edge of Band VI. on the blue side.

The colour of the star was a very ruddy orange.

1877, February 28^d. 7^h.

Small eye-piece Spectroscope.

Observer, M.

The star was very faint and in much haze, but Bands I. (in the red), II., VI., and VII., were very clearly seen; the bright spaces between looking very brilliant by contrast; but no bright lines could be detected. Bands IV. and V. could not be distinguished, nor could the spectrum be traced in the violet. Band I. was very distinct, instead of being invisible, as on February 26.

 α HERCULIS.

Maxima occurred on 1877, March 27 and July 5, and a minimum on May 29, according to Dr. Schmidt's observations (Astronomische Nachrichten, No 2122).

1877, April 23.

Single-prism Spectroscope.

Observer, M.

The star shows a continuous spectrum crossed by shaded bands. The bands usually terminate towards the blue, in an intensely dark line, and grow gradually fainter towards the red.

No. of Band.	REMARKS.
I.	A band in the red. Not very dark, the blue edge not the darkest part.
II.	A band on both sides of D, not very dark, the darkest part of the band being in the centre.
IV.	A very faint band midway between II. and V. Band III. of the spectrum of β Pegasi could not be detected, probably because α Herculis is the fainter star.
V.	A short band by no means so broad as the foregoing; gradually deepens to a black sharp edge towards the blue.
VI.	Darker than the preceding bands; gradually deepens to a black sharp edge towards the blue. Blue edge nearly coincident with b_4 . The breadth of the band was about twice the distance between b_1 and b_4 .
VII.	Very dark band, double the breadth of VI. The bright space between the end of VI. and the beginning of VII. is about double the breadth of Band VI., and is very brilliant. This Band VII. commences less gradually than V. and VI. do; the fine lines composing it being from the commencement darker than those in the two preceding bands.
VIII.	Is separated by a very short bright space from Band VII. It is by no means so dark a band, and is somewhat more uniform in intensity.
IX.	Follows after another short space, and is fainter than Band VIII.

No other band could be clearly made out.

No *bright* lines could be seen. The observer suspected that the three Bands V., VI., and VII., were composed of a great number of distinct fine lines, but the power of the spectroscope was not sufficiently high to certainly isolate them.

1877, May 7^d. 9^h. 30^m.

Single-prism Spectroscope. Position-circle 5°. Micrometer B.

Observer, M.

No. of Band.	Wave-length.	Intensity of Dark Band.	Brightness of Bright Space.	REMARKS.
	Tenth-metres.			
	6700 ±	..	..	Beginning of the spectrum at the red end.
	6580 } ±	..	..	A narrow band.
	6560 }			
I.	{ 6450	..	1	Shaded edge.
	{ 6161	9	..	Very sharp edge.
			3	
II.	{ 5936	..	..	As distinct as the edge towards the blue.
	{ 5825	7	..	Not by any means so sharp an edge as usual.
			7	
IV.	{ 5661	..	..	Very faint band, only seen occasionally. As far as can be
	{ 5608	..	..	judged the blue edge is sharp and the red shaded.
			8	
V.	{ 5488	..	..	Approximate limit of red edge.
	{ 5460	..	..	Limit of blackest part of band.
	{ 5445	5	..	Sharp edge towards blue.
			10	This space very bright.
VI.	{ 5222	..	..	Approximate limit towards red.
	{ 5188	..	..	Limit of blackest part of band.
	{ 5169	10	..	Very black.
			10	
VII.	{ 5042	..	..	Approximate limit towards red.
	{ 4963	10	..	Very black.
			9	
VIII.	{ 4857	..	..	The spectrum becomes much fainter from about this point.
	{ 4783	..	..	Approximate limit on the red side.
	{ 4759	6	..	Sharp edge towards blue.
			..	Bands IX. and X. could not be measured.
	3940 ±		..	Spectrum ends about here.

The brightest part of the spectrum was that between the blue edge of Band V. and the red edge of Band VIII. The two dark bands in this space, VI. and VII., are the darkest in the spectrum. They differ in character, VI. being very dark for a short space and then shading off very rapidly, VII. shading off very gradually and regularly. The breadth of the blackest portion of VI. is about equal to the distance from b_1 to b_4 . VII. is several times as broad, and is easily seen half-way between the blue edges of VI. and VII.

VIII. resembles VII. in character, but is much fainter; and V. resembles VI., but is slightly narrower and very much fainter.

II. is the only exception to the rule that the bands end towards the blue in a very sharp black edge, and gradually shade away from that edge towards the red.

II. is of nearly the same intensity throughout; its maximum of darkness being near the centre of the band. The red edge of II. is almost as sharp as the blue, which last is by no means so sharp in this band as in all the other bands. IX. and X. are all but invisible, and Band I. can only be seen with difficulty. Band I. is very sharp and black at the blue edge, continues equally black for some little distance, and then shades off slowly. Band III. of β Pegasi, the faintest band in that star, could not be detected.

Beyond Band VIII. to the violet, the whole spectrum begins to change, becoming slowly, gradually, and regularly fainter. Beyond Band II. in the other direction, the spectrum becomes very faint much more quickly.

Position-circle 95° for the measures of the breadths of the bands.

α HERCULIS, NEAR MAXIMUM.1877, July 2^d. 10^h₂—14^h.

Single-prism Spectroscope. Position-circle 96°. Micrometer B.

Observer, M.

No. of Band.	Wave-length, 1st Measure.	Wave-length, 2nd Measure.	Wave-length, 3rd Measure.	Intensity.	REMARKS.
	Tenth-Metres.	Tenth-Metres.	Tenth-Metres.		
I.	6750	..	..	..	Beginning of the spectrum at the red end. A band suspected.
	6600±	..	..	..	
	6312	..	..	..	
	6152	..	6152	10	
II.	6032	..	..	..	In this band neither edge is very sharp. The intensity seems affected by atmospheric influence, at times seeming darker than at others. On the whole it seems fainter than usual, while Band I. is certainly darker than usual, and the others also appear to be darker than usual.
	5870	5870	5844	..	
	..	..	5824	5	
IV.	5706	..	..	..	This band is very faint. Its breadth, however, is considerable.
	5620	5620	..	2	
V.	5480	..	..	..	
	5456	5456	..	6	
VI.	5223	..	..	..	
	5169	5169	..	10	
VII.	5054	..	..	..	
	4956	4954	4958	10	
VIII.	4803	..	..	..	Seems to be broader than usual.
	4771	..	4771	4	
IX.	4567	..	4567	..	Spectrum ends here. Band X. was not visible.
	4000±	..	..	..	

 α HERCULIS, NEAR MINIMUM.

Examination of the component stars of the pair.

1877, June 4^d.

Single-prism Spectroscope. Position-circle 26°.

Observer, M.

A very narrow slit was used, and the light of only one star admitted at a time, the spectroscope being placed first on one star and then on the other, by turning the slow-motion-rod in R.A. In consequence of the narrowness of the slit, and of the light cloud which was constantly passing, the spectra, especially that of the small star, were but faint; so that only the brightest portion, the yellow and green, from D to F, could be examined. The four principal bands in this space, II., V., VI., and VII., were seen to be common to both stars, and to occupy exactly the same position in each. The only difference perceptible between the two spectra was that the dark bands in the smaller star seemed somewhat fainter than in the larger.

Position-circle 95°.

The spectrum of the larger star showed a decided change since May 7. Bands IV. and V. and also VIII., and the spectrum beyond it to the violet, were much fainter than on that occasion.

A careful determination was made of the wave-lengths of the sharp edges of Bands V. and VI., with the following result:—

Tenth-metres.

Band V. 5448

Band VI. 5169

1877, June 5^d. 9^h₂ to 13^h₄.

Half-prism Spectroscope, one prism train. Position-circle 26°.

Observer, M.

The sky being constantly covered with haze or light cloud, the only point ascertained was that the spectra of the two stars were evidently the same, certainly as far as Bands V., VI., and VII., are concerned. On a thoroughly good night some differential measures of the position of the bands in the two stars might be made. A slight displacement towards the blue was suspected of the bands in the larger star as compared with those in the other; but the character of the evening was not nearly good enough for so delicate an observation.

COMET *b*, 1877. (WINNECKE'S.)1877, May 15^d. 8 $\frac{1}{2}$ ^h. — 13^h.

Single-prism Spectroscope and Experimental "Half-prism" Spectroscope.

Observers, W C and M.

With the single-prism spectroscope the spectrum of the coma was found to consist of three bands, in the neighbourhood of the three principal bands in the spectrum of an alcohol vacuum tube (second spectrum of carbon), wave-lengths 4834, 5198, and 5610, whilst that from the nucleus appeared to be continuous. Under the much higher dispersion of the "half-prism" spectroscope (20° from A to H), the spectrum of the nucleus no longer appeared to be continuous. The wave-length of the brightest comet band was determined by six indirect comparisons with the carbon band 5198, as follows:— The comet band was brought up to coincidence with the fixed bright line of reference (formed by the direct image of the slit) by turning the half-prism by means of its micrometer-screw. The displacement of the carbon band with reference to the reference-line, was then estimated in terms of the distance between the two carbon-bands at 5198 and 4834.

Comet-band.

Displacement.	Wave-length inferred.	Observer.
—————	—————	—————
$\frac{1}{10}$ of (5198 — 4834) towards blue	Tenth-metres. 5162	W C.
$\frac{1}{10}$ — " towards blue	5155	W C.
$\frac{1}{10}$ + " towards blue	5169	W C.
Coincident	5198	M.
$\frac{1}{10}$ " towards blue	5162	M.
$\frac{1}{100}$ " towards blue	5194	M.
Mean	5173 ± 5 tenth-metres	

 β LYRÆ.1877, July 20^d. 9 $\frac{1}{4}$ ^h. — 11 $\frac{3}{4}$ ^h.The second minimum (3.9 magnitude) occurred July 20^d. 2^h.

Single-prism Spectroscope. Micrometer B.

Observer, M.

The star showed no trace of bright lines, and the dark lines were very faint and difficult to measure. The spectrum showed very little red or violet. It increased very rapidly in brightness from its commencement up to half-way between D and *b*. From this point to *b* it was very bright, but after *b* it grew gradually fainter towards F, and shortly after F died rapidly away.

Wave-length.	REMARKS.
Tenth-metres.	
6250 ±	Spectrum begins.
5950 ±	Dark line ?
5892	D lines. Rather broader than in Sun, and shaded at the edges.
5783	Dark line.
5470 ±	Dark line ?
4855	Dark line.
4700 ±	Dark line ?
4580 ±	Dark line.
4200 ±	Spectrum ends.

1877, August 23^d. 11^h $\frac{1}{2}$ to 12^h $\frac{3}{4}$.

ECLIPSE OF MOON.

Single-prism Spectroscope.

Observers, W C and M.

The spectrum was observed during totality and also during the partial phase, when the portion of the Moon's disk still in the umbra was repeatedly compared with the part which had emerged. During totality a strong absorption band was seen in the yellow, and the red and blue ends of the spectrum were completely cut off, whilst the orange was greatly reduced in intensity. The yellow and green were comparatively bright, and in fact appeared at a first glance to constitute the whole visible spectrum. The wave-length of the more refrangible edge of the strong absorption band was found, from a mean of 9 measures, to be 5624 ± 5 , and at about 11^h it extended to wave-length 5900, *i.e.*, as far as D. As the end of the total phase approached (12^h. 4^m.) the band became narrower, its breadth being only twice the interval of the D lines at 11^h. 45^m., and at 12^h. 20^m., during the partial phase, it was reduced to a mere line on the eclipsed portion. This band is coincident with the strong band δ of the atmospheric spectrum (as given by Brewster and Gladstone), which is peculiarly characteristic of the spectrum of light which has passed through a thick stratum of air. The red end of the spectrum was cut off by a dark band commencing about half-way from D to C, in which a black line was suspected. About the middle of totality a dark band, commencing at $5080 \pm$ (near band ι of the Brewster-Gladstone spectrum) cut off all the rest of the spectrum, but later on, at 11^h. 30^m., the spectrum was visible as far as about 4930 (the position of band κ in the atmospheric spectrum). After the end of totality the red and blue ends of the spectrum from the eclipsed portion became visible beyond these limits. The appearance of the spectrum of the part clear of the umbra, though still in the penumbra, was totally different, even when reduced to the same degree of faintness by closing the slit. In this case the spectrum faded out as a whole from beyond D to near G in the violet.

The part of the Moon examined when the band δ was darkest was the region of Mare Nectaris and Mare Fœcunditatis, and the band could be seen only on the darkest part of the Moon when Kepler was just emerging from the umbra, growing rapidly fainter as the spectroscope was moved away towards the bright part.

The light by which the eclipsed Moon is visible would thus appear to have passed through a great thickness of the earth's atmosphere, giving rise to the peculiar copper colour.

1877, August 23^d. 13^h.—14^h.

MARS.

Compared with the spectrum of the Moon.

Single-prism Spectroscope.

Altitude of Mars 26°. Altitude of Moon 24°.

Observer, M.

Three bands were seen in the spectrum of Mars between D and C, *i.e.*, in the red part of the spectrum, all of them being very faint and ill-defined at the edges.

Line or Band.	Wave-length.	Breadth.	Character in spectrum of Mars.	Character in spectrum of Moon.
	Tenth-metres.	Tenth-metres.		
D	5892	..		
Unrecognised	6019	16	Very faint band.	Only suspected.
α of the telluric	6287	16	Very faint band.	Not seen.
spectrum.				
C	6558	24	Varied in character slightly from time to time in both spectra, being sometimes sharper than at others. It evidently owed its apparent breadth to the presence of atmospheric lines near it, which could not be isolated by so small a dispersion.	About two thirds as broad as in spectrum of Mars, shaded at the edges but black in the centre, by no means so sharp as it usually is in the solar spectrum, but sharper than in that of Mars, and decidedly fainter.
B	6852	44		Not seen.

The four lines B, C, α , and D, are with δ the most distinctive of the bands in the spectrum of a low sun, due to the influence of our own atmosphere.

1877, September 12^d. 11^h $\frac{1}{2}$ h. — 13^h.

Position-circle 90°. Slit parallel to equator.

Observer, M.

Different portions of the disk of the planet gave spectra differing in brightness and apparent length, but the lines and bands showed no change except in the case of the group round C, which seemed darker in the centre of the disk (the south edge of Dawes' Continent), and less so on the north limb. The breadth of this band was from 40 to 50 tenth-metres. Bands B and α were also seen, but no difference was detected in their appearance from whatever part of the disk obtained. But being fainter than C, a slight difference was less likely to be detected. The spectrum of Dawes' Ocean was much fainter than that of the general disk, especially in the red and yellow. The bright polar spot showed a very bright spectrum from D to F, whilst that from the north limb seemed to be rather less bright, but to be visible further into the red.

No further differences were noted with the position-circle at 0°, nor with the slit parallel to the equator of the planet.

The part of the disk where the C line seemed darkest (Dawes' Continent, where it borders on Dawes' Ocean) when examined at 13^h. 25^m, with a power of 310 on the Great Equatorial, presented a remarkable appearance. Though ordinarily one of the sharpest markings on the planet, (and presenting on September 7, when it was viewed in nearly the same aspect, a specially distinct appearance), it was now fringed by a thick cluster of minute points, darker than the body of the "Continent" itself, but much brighter than the adjoining "Ocean."

1877, September 21^d. 7^h $\frac{3}{4}$ h. — 13^h.

Position-circle 0°. Slit perpendicular to equator.

Observer, M.

Band or Line.	Wave-length.	REMARKS.
	Tenth-metres.	
δ Blue edge	5640	The δ band of the Brewster-Gladstone spectrum. Broad but not very dark.
δ Red edge	5661	
D Blue edge	5889	D lines, and atmospheric lines near them. Broader than sodium lines as given by a flame, and shaded at the edges.
D Red edge	5907	
Unrecognised	6022	A very faint band.
α Centre	6287	A broad band, fairly dark.
C Blue edge	6537	Fully twice as broad as the D group. Very dark.
C Red edge	6587	

These five bands seemed darkest some 5" or 6" within the limb of the planet.

No other bands or lines, except the Fraunhofer lines, could be seen.

There was a slight amount of mist low down, and the planet seemed unsteady and watery.

No other local differences could be detected in the spectrum, either with the slit in the primary focus of the telescope, or with the image of the planet enlarged two and a half diameters by an eye-piece.

1877, September 26^d. 8^h. 0^m. to 9^h. 38^m.

Position-circle 0° 0'. Slit perpendicular to equator.

Altitude of Mars 24°. Altitude of Moon 23°.

Observer, M.

Band or Line.	Wave-length.	Breadth.	Character in spectrum of Mars.	Character in spectrum of Moon.
	Tenth-metres.	Tenth-metres.		
δ Blue edge	5639	78	Very faint band.	Not seen.
δ Red edge	5717			Not seen.
D	5892			Measured as 5892 tenth-metres. Hardly so broad as in Mars.
α	6298	..	Rather dark.	Faint. Measured as 6299 tenth-metres.
	6511	..	Very faint.	Not seen.
C	6560	29	Very dark.	Much narrower than in Mars. Measured as 6553 tenth-metres.
	6695	..	Dark.	Not seen.
B	6895	..		Not seen.

The only local difference observed in the bands in the spectrum of Mars, was that they all appeared to be darkest at about 3" or 4" within the limb. The δ lines and other Fraunhofer lines were about equally distinct from all parts of the disk. The red end of the spectrum in Mars was not visible so far as in the Moon, and seemed faintest at the limb. The violet end extended as far or nearly as far as in the Moon, and was of about equal intensity from all parts of the planet's disk.