

V. "Observations of the Spectra of some of the Southern Nebulæ."

By Lieut. JOHN HERSCHEL, R.E. Communicated by W. HUGGINS, Esq. Received May 20, 1868.

[Lieut. Herschel, to whom the observations of the solar eclipse of August next have been entrusted by the Royal Society, has already employed the instruments, placed in his hands by the Royal Society for the observations of the eclipse, to good account by commencing an examination of some of the brightest of the nebulæ of the southern heavens. The first results of this examination, which are contained in the present paper, were obtained at Bangalore, Madras Presidency, during the months of March and April 1868. The instruments consist of an equatorially mounted telescope of 5 inches aperture, driven by a clock furnished with a pendulum-governor by Cooke and Sons, and a spectroscope by Messrs. Simms furnished with one dense prism of flint glass, and with a micrometer-screw and photographic scale for measuring the lines. The nebulæ No. 4390 and No. 2102 have been described by me, Phil. Trans. 1864, p. 439, and Phil. Trans. 1866, p. 383. —W. H.]

No. 3531. [\mathcal{R} $13^{\text{h}} 19^{\text{m}}$: N.P.D. $136^{\circ} 37'$: !!; globular cluster of stars; ω Centauri.]

March 25. A large cluster visible to the naked eye, oval-shaped, brighter towards the central part. *Spectrum an indefinable haze; no lines.*

No. 2197. [\mathcal{R} $10^{\text{h}} 40^{\text{m}}$: N.P.D. $148^{\circ} 57'$: great nebula in Argus.]

Spectrum: *lines distinctly visible*, but not clear enough to be separated; approximate position $D + 1.8 \pm .3$ ($D = 2.30$, $E = 3.68$, $b = 3.97$, $F = 5.03$). An unsatisfactory observation: to be looked for again.

No. 2017. [\mathcal{R} $10^{\text{h}} 1^{\text{m}}$: N.P.D. $129^{\circ} 47'$: !!; planetary nebula, very bright, very large, little extended, *9M.]

March 31. Found with difficulty in the spectroscope. After a minute or two's examination the tube was accidentally disturbed, and before direction could be again obtained, clouds had gathered and work was stopped. Appearance in telescope: a nebulous-looking star; under a higher power a nebulous-looking object with a much brighter nucleus or centre. In spectroscope: *a continuous streak with a blotch of light nearly in the middle of its length*, two-fifths, by estimation, from the red end; slit quite wide.

No. 2581. [\mathcal{R} $11^{\text{h}} 44^{\text{m}}$: N.P.D. $146^{\circ} 27'$: a planetary nebula, small, round; blue = *7M.]

April 2. *A pretty well-defined and bright short line* was distinctly visible in the spectroscope, accompanied by a considerably fainter and more refrangible companion. Principal line measured with the wires and found to be $D + 2.1 = 4.4$ ($b = 3.97$, $F = 5.03$), i. e. $b + 0.4$.

No. 4083. [\mathcal{R} $15^{\text{h}} 12^{\text{m}}$: N.P.D. $87^{\circ} 25'$: !!; globular cluster, very bright, large, extremely compressed in the middle.]

April 5. Seen in telescope as a slightly oval nebulous ball, easily seen but not very bright (perhaps owing to moon, nearly full); found with some difficulty in spectroscope; *a faint continuous spectrum* of considerable width; *no trace or suspicion of lines.*

(No. 4173. Seen easily in telescope; but looked for in spectroscope for two hours in vain.)

No. 4390. [R $18^h 6^m$: N.P.D. $83^\circ 10'$: planetary nebula; very bright, very small, little hazy.]

April 6. Scarcely recognized as a nebula in the telescope. Seen in spectroscope: *a short bright line* with a fainter one on the more refrangible side, and a third strongly suspected. (Knowing so well the relative positions of the "usual" lines, it is impossible that an unprejudiced corroborative opinion can be offered on such slight foundation as I have.) A very slight extension laterally was given in this instance with the cylindrical lens.

No. 2102. [R $10^h 18^m$: N.P.D. $107^\circ 59'$: !!; planetary nebula, very bright, little extended.]

April 9. Seen at once in telescope with low power; and seen distinctly in the spectroscope *as a bright and a faint line* (the third line not seen); principal line measured with wires and found $= D + \left\{ \frac{2.14}{2.16} = 2.15 \right\}$, or $b + 0.48$, $F = b + 1.06$.

No. 1179. Nebula in Orion. Examined for comparison. The spectrum of this nebula *shows the three lines distinctly, and three only*; they were measured (with wires), and the results were:—

$$D + \left\{ \begin{array}{l} 2.17 \\ 2.20 = 2.19 \\ 2.21 \end{array} \right\} = b + 0.52,$$

$$D + \left\{ \begin{array}{l} 2.31 \\ 2.40 = 2.36 \end{array} \right\} = b + 0.69,$$

and

$$D + 2.78 = b + 1.11.$$

The places and descriptions of the objects enclosed within brackets are taken from Sir John Herschel's "General Catalogue of Nebulæ" in the Phil. Trans. for 1864.

P.S.—The other day a storm passed over us. As there was a good deal of lightning, I took the opportunity to examine its spectrum. I saw, as I expected, numerous bright lines; the blue nitrogen one, I suppose, much the brightest. A suspicion also of the red hydrogen-line C. I was much surprised at the brightness of the continuous spectrum, in which all the principal prismatic colours were brilliant.