Lastly, at the end of the Catalogue add.

Omitted Stars.

No.			h m s	s	° ′ ″	″	
435 *bis*	Bootis	V. 98	14 7 24·0	+ 3·00	84 2 13	+ 17·1	Σ.P.M.
742 *bis*	79 Cygni	VI. 57	21 38 27·8	+ 2·47	52 15 56	− 16·3	B.A.C.
813	Cassiopeæ	V. 79	24±	..	unidentifiable	..	..

Collingwood, Feb. 22, 1868.

On the Planetary Nebula 45 H IV. *Geminorum.*

By H. C. Key, Esq.

During the last three years I have constantly observed this remarkable object whenever a favourable opportunity occurred, but until the last few months without any special result. My instrument during that period had been only sufficient to show the star as nebulous, an intervening darker space round the nucleus, and a faint luminous ring at some distance. Since that time my optical means have been considerably increased, and a careful scrutiny has brought to light an additional feature, which seems to have escaped the notice of former observers, and of sufficient interest to induce me to lay it before the Society.

Smyth tells us (*Cycle*, vol. ii. p. 176) that in 1787 Sir William Herschel observed this object, and described it as "a star of the 9th magnitude, with a pretty bright nebulosity, equally dispersed all around;" and he calls it "a very remarkable phenomenon." And that Sir John Herschel describes it as "a star of the 8th magnitude, exactly in the centre of an exactly round bright hemisphere 25″ in diameter."

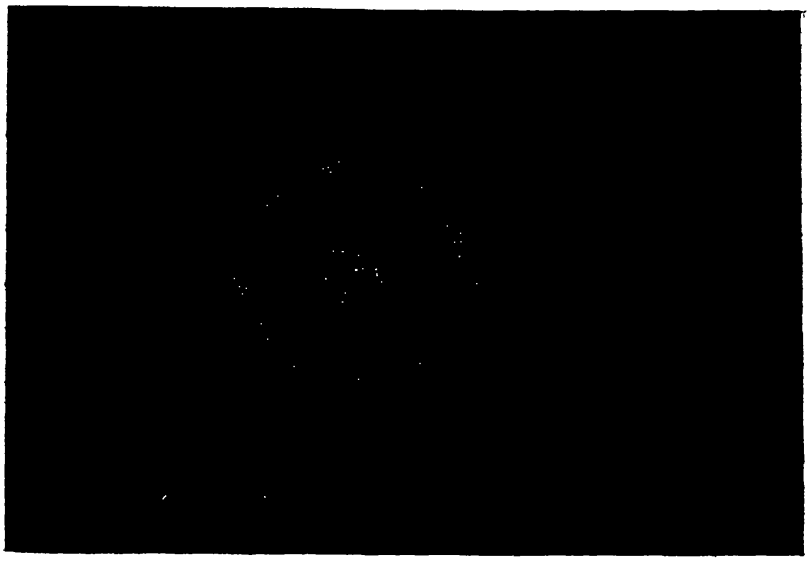
From the Earl of Rosse's account of this object in the *Philosophical Transactions*, 1850, of which Mr. Knott has kindly forwarded me an abstract and rough drawing, it appears that he saw it as a nebulous star with a black patch close to it on the preceding side, a less luminous space, somewhat unequal in breadth, surrounding the nucleus, and a luminous ring at some distance; this ring being of less breadth on the following side.

Mr. Lassell's drawing of this object in 1862 (*Mem. R. A. S.* vol. xxxvi.) represents a star in the centre of a planetary disk, surrounded by a non-luminous space; and, at some distance, by a luminous ring of considerable breadth. He also says, "I can see no trace of the dark patch in Lord Rosse's drawing near the bright centre."

The present appearance of this object, as seen in my instrument, is that of a bright, but somewhat nebulous star closely surrounded by a dark ring; this again by a luminous ring; then

an interval much less luminous, and, finally, at some distance, an exterior luminous ring.

The accompanying drawing (which has been repeatedly verified and corrected), although an inadequate one, if held at such a distance from the eye that the interior bright ring is just seen



45 H IV. Gem. 18-inch Reflector, power 510.

distinctly detached from the central star, gives a tolerably fair representation of this remarkable object as it appears in my instrument.

The whole is almost exactly symmetrical, although not quite so; the dark space between the two bright rings being darker on the north following side, and the preceding side of the whole object is rather fainter than the rest. Of the two luminous rings the interior is considerably the brightest. Like the annular nebula in *Lyra*, this object bears magnifying wonderfully well: with 150 little more is to be seen than a star in the centre of an extensive gauzelike, nebulous disk; with 300 I detected the interior ring; and 510 I found the most suitable power in every respect; with 666 I did not seem to gain any advantage, but rather the contrary. I may add that I have failed to see anything of the black patch in the Earl of Rosse's drawing, as well as the star shown by Mr. Lassell near the edge of the nebula.

On considering these several observations, which extend over a period of 81 years, from 1787 down to the present time, we can hardly fail to be struck by the progressive character of the results, which seems to be independent of the optical means employed. To both Sir William and Sir John Herschel there appeared merely a uniform nebulous planetary disk surrounding the central star, without any indication of a ring. To the Earl of Rosse, with his enormous optical power, there was visible only one exterior ring, and a small circular dark space near the central star, preceding it. To Mr. Lassell, with scarcely inferior power (comparatively), there was no appearance of an interior

luminous ring. While, in my own instrument, which, although somewhat more powerful than the 20-foot reflectors (front view) of the Herschels, is of incomparably inferior power to the instruments of the Earl of Rosse and Mr. Lassell, the interior bright ring was visible at once during the first night's observation, and with a power of 510 is quite obvious.

Not to draw any very definite conclusions from these results, one fact, at all events, seems abundantly evident,—viz., that whereas at the date of the Herschels' observations there was no appearance whatever of a ring surrounding the central star, at the present time there are two.

The instrument with which my observations were made consists of a silvered glass speculum of 18 inches aperture and 10 feet focal length, of my own making, mounted as a Newtonian equatorially.

I estimated the extreme diameter of the whole object at 35″; and the diameter of the inner ring, taken at its brightest part, at 9″; while its inner diameter I judged to be about 5″.

Stretton Rectory, Hereford,
February 26, 1868.

Postscript, March 23.—Since writing the above I have seen a dark patch situated in the inner dark ring close to the central star. It is a very faint object in my instrument, but I can speak with certainty of its existence; the estimated angle of position is about 5°. I am not aware of the position of the dark patch seen by the Earl of Rosse.

Note on the Occultation of α Tauri on May 22, 1868.

(*Communicated by R. S. Newall, Esq.*)

It may perhaps be desirable to call the attention of observers to the occultation of *α Tauri* on May 22, 1868, because it is not mentioned in the *Nautical Almanack* and other ephemerides on account of its occurring near the time of New Moon. As the star will be about 8° distant from the Sun, there seems little reason to doubt that, in a clear sky, and with a good Equatoreal, the occultation may be observed very well, provided the necessary precautions are not neglected. At any rate, the observation will be worth trying, be it merely as a matter of curiosity, since a similar favourable opportunity of observing an occultation of *α Tauri* so near the Sun will not offer itself again before the year 1885 or 1886.

The elements for computing the occultation beforehand, according to Bessel's formulæ (which may be found in the *Berliner Jahrbuch* and in the *Connaissance des Temps*), are these:—

For Greenwich, Paris, and neighbourhood.	For Washington and neighbourhood.
T = May 22 $6^h\ 50^m{\cdot}0$ Greenwich M.T.	T = $5^h\ 50^m{\cdot}0$ Greenwich M.T.
$h = 96°\ 5'{\cdot}2$	$h = 81°\ 2'{\cdot}7$
$p = +\ 0{\cdot}6394$	$p = +\ 0{\cdot}0464$
$q = +\ 0{\cdot}6320$	$q = +\ 0{\cdot}5316$