II. *Miscellaneous Observations.* *By* William Herschel, *LL.D. F.R.S.*

Read December 22, 1791.

Account of a Comet.

LAST Thursday evening, the 15th of December, about half after eight o'clock, while I was taken up with observing Saturn, my sister looked over the heavens, and discovered a pretty large, telescopic comet, in the breast of Lacerta. I viewed it in my seven-feet reflector, and with that instrument settled its place and rate of moving. At $9^h\ 42'\ 4'',8$ true mean time, it preceded a small telescopic star $11'',3$ in time, and was $2'\ 41''$ south of the same. The place of this star I have since determined with sufficient accuracy, that it may be found again by those who wish to settle it more exactly. It follows the 2d of FLAMSTEED's stars in the constellation of Lacerta, $1'\ 41'',5$ in time; and is $45'\ 40'',8$ more south than the same. The apparent motion of the comet on Thursday evening was direct, and at the rate of about three minutes of time in right ascension, and a little more than two degrees in polar distance *per* day; from which we may suppose that we shall keep it some time in view. Last night I examined it with a twenty-feet reflector, and found it to consist of a great light, pretty regularly scattered

about a condensed small part of five or six seconds in diameter; which resembled a kind of nucleus, but had not the least appearance of a solid body. Beside the scattered, and gradually diminishing light, which reached nearly to a distance of three minutes every way beyond the bright centre, there was also a faintly extended, ill defined, pretty broad ray, of about 15 minutes in length, directed towards the north following part of the heaven, which might be called the tail of the comet.

Its place for the same night (Dec. 16th) was determined by a five-feet Newtonian *Sweeper*, carrying an equilateral triangle in the focus of the eye-glass, not so large but that the three intersections, made by the wires at the three angles, may be distinctly perceived. At $5^h\ 49'\ 40'',6$ it preceded the 6th Lacerta $4'.58'',5$ in time, and was $52'\ 14'',5$ more north than that star.

On the periodical Appearance of o Ceti.

The changeable star in the neck of the Whale, *o* Ceti, continues its variations as usual, but with some considerable irregularities of brightness.

In the year 1779, as we have seen *, it excelled *α* Arietis so far as almost to rival Aldebaran; and continued in that state a full month.

In 1780, its greatest brightness was only like that of *δ* Ceti.

In the year 1781, it did not come up to the brightness of *δ*.

In 1782, this star increased to the size of *β* Ceti, and continued bright for more than twenty days.

In 1783, it did not only vanish to the naked eye, as usual, but disappeared so completely, that I could not find it with a

* Phil. Trans. Vol. LXX. page 338.

telescope, which permitted not a star of the 10th magnitude to escape me. When it increased again, it did not amount to the brightness of δ.

In 1784, I saw it only of the 8th magnitude in a twenty-feet reflector, but as I did not continue to observe it regularly, it might possibly change as usual.

In 1789, it arrived to the brightness of α Piscium, or rather excelled it.

In 1790, the greatest brightness was almost equal to that of α Ceti.

In the present year, I have seen it only of the magnitude of γ Ceti nearly; or between γ and δ; but, as bad weather has occasioned many interruptions, it may possibly have been larger.

The period of 333 days, assigned by BOUILLAUD, does not agree with present observations compared to those of FABRICIUS made on the 13th of August, 1596, when this star was in its greatest lustre. M. CASSINI also found, that his observations, in the beginning of August, 1703, when the star was brightest, did not agree with the interval of 333 days; and therefore, supposing the star to have changed 117 times since the epoch of FABRICIUS, he gave it a period of 334 days. This will, however, not agree with the present time of the changes; and it appears now that M. CASSINI ought to have assumed 118 instead of 117 variations; which would have pointed out a period of 331 days, and some hours.

That this is, probably, very near the real time of the star's variation, will be seen when we admit it to have undergone 214 changes between the 13th of August, 1596, and the 21st of October, 1790; by which long interval we obtain the period of 331 days, 10 hours, 19 minutes. It will, indeed, be necessary,

in order to reconcile all observations, to admit of some occasional deviations in the appearance of the star, amounting almost to a month; but that this is no more than we may allow, is pretty evident from the variations I have taken notice of within the last 14 years; besides, a period of 334 days could not be admitted without totally giving up all regularity in the returning appearance of the star.

I have taken the epoch of the 21st of October, 1790, as one of the best ascertained, moderate appearances I have been able to obtain; and believe it to be more proper for settling the period, than that which might be deduced from a brilliant blaze of the star, such as took place in 1779, owing to causes that are not regular, and therefore may be apprehended to disturb the general order of the change.

On the Disappearance of the 55th Herculis.

Among the changes that happen in the sidereal heavens we enumerate the loss of stars; but, notwithstanding the real destruction of an heavenly body may not be impossible, we have some reasons to think that the disappearance of a star is probably owing to causes which are of the same nature with those that act upon periodical stars, when they occasion their temporary occultations. This subject, however, being of great extent and consequence, we shall not enter into it at present, but only relate a recent instance of the kind.

Two stars of the 5th magnitude, whose places we find inserted in all our best catalogues, were to be seen in the neck of Hercules. They are the 54th and 55th of FLAMSTEED'S, in that constellation. In the year 1781, the 10th of October, I

examined them both, and marked down their colour, *red*. The 11th of April, 1782, I looked at them again, and noted my having seen them distinctly, with a power of 460; and that they were single stars.

The 24th of last May, I missed one of the two, and examining the spot again the 25th, and many times afterwards, found that one of them was not to be seen. The situation of the stars is such that, not having fixed instruments, I could not well determine which of the two was the lost one. I therefore requested the favour of my much esteemed friend, the astronomer royal, to ascertain the remaining star; and it appears from Dr. MASKELYNE'S answer to my letter, that the 55th Herculis is the one which we have lost.

Remarkable Phænomena in an Eclipse of the Moon.

The 22d of October, 1790, when the moon was totally eclipsed, I viewed the disk of it with a twenty-feet reflector, carrying a magnifying power of 360. In several parts of it I perceived many bright, red, luminous points. Most of them were small and round. The brightness of the moon, notwithstanding the great defalcation of light occasioned by the eclipse, would not permit me to view it long enough to take the places of these points. They were, indeed, very numerous; as I suppose that I saw, at least, one hundred and fifty of them. Their light did not much exceed that of Mons Porphyrites HEVELII.

We know too little of the surface of the moon to venture at a surmise of the cause from whence the great brightness, similarity, and remarkable colour of these points could arise.

Slough, Dec. 17, 1791.