and the observer, obscuring its light. During twenty minutes that Lord Darnley observed the phenomenon, it seemed to proceed through its whole extent from north to south, its edges, which, when first observed, extended equally on either side of Castor and Pollux, having in that time entirely left the most northern of those stars. It had wholly disappeared before ten o'clock.

Lord Darnley did not see the beginning of the phenomenon; but was informed that it appeared at first like the moon rising, and gradually extended from the eastern to the opposite horizon. The reflection thrown on the earth was faint: the degree and colour of the light may be compared to that of a comet; of greater brilliancy, however, than any that has appeared in this century.

In a postscript, His Lordship states, that precisely the same appearance was observed at Castlereah, distant sixty miles; and, according to a Carlisle paper, somewhere in the North of England; the time of appearance in both cases corresponding very nearly with that of his own observation.

A paper was also read, entitled, "On the Magnetic Power of Soft Iron." By Mr. Francis Watkins. Communicated by Michael Faraday, Esq. D.C.L. F.R.S.

When free magnetism is developed by induction, and is not retained in that state by what has been termed the coercive force of hard steel, it has generally been considered that all the phenomena due to the existence of free magnetism cease on the removal of the inducing cause. The object of the present communication is to show that such is not the fact. From a variety of experiments described by the author, it appears that soft iron continued to exhibit strongly the attraction due to the developement of magnetism long after the means by which the magnetism had been originally excited had ceased to act. In these experiments, bars of soft iron, in the form of a horse-shoe, had a single helix of copper wire wound round them, so that on the ends of the wire being brought into contact with the poles of a voltaic battery, the iron became an electro-magnet. With one of these horse-shoes, while the connexion between the ends of the helix and the poles of the battery existed, the soft iron, having a keeper applied to its poles, supported 125 pounds; it supported 56 pounds after that connexion had been broken, and continued to retain the power of supporting the same weight after an interval of several days, care having been taken not to disturb, during the time, the contact between the horse-shoe and its keeper. On this contact, however, being broken, nearly the whole attractive power appeared to be immediately lost. The author describes several instances of the same kind, particularly one in which the contact between the ends of the horse-shoe of soft iron and its keeper having been undisturbed during fifteen weeks, the attractive power continued undiminished. Although the interposition of a substance, such as mica or paper, between the ends of the horse-shoe and its keeper necessarily diminished the force of attraction, it did not appear to diminish the power of retaining that force. In a case where the electro-magnet of soft iron and its keeper were equal semi-circles, the author found, what may appear singular,

that the arrangement of the magnetism during the time that the electric current traversed the helix, appeared not to be the same as after the cessation of that current; in the one case similar, and in the other dissimilar, poles being opposed to each other at the opposite extremities of the two semi-circles.

Whether the magnetism was originally developed in the soft iron by means of an electric current passing round it, or by passing over its surface the poles of an electro-magnet, or those of a common magnet of hard steel, it appeared to possess the same power of retaining a large portion of the magnetism thus developed. The retention of the magnetism does not appear to depend upon the relative positions of the ends of the horse-shoe and the keeper remaining undisturbed, but on their contact remaining unbroken: for one keeper was substituted for another without diminution of this power; care being taken that the second should be in good contact with both ends of the horse-shoe before the complete removal of the first.

This power of soft iron to retain the magnetism developed in it was also shown by the action of the ends of the horse-shoe magnets upon a magnetized needle; by the attraction of iron filings; and by the evolution of the electric spark, by means of a suitable apparatus, on the sudden rupture of the contact between the keeper and the horse-shoe, when several days had intervened since the removal of the battery by which the magnetism had been originally developed.

The author's views on entering upon these experiments were, that the soft iron, with its keeper, resembled a closed voltaic circuit; but they have convinced him that the phenomenon of the permanency of the magnetism resolves itself into a case of complex induction, between the soft iron horse-shoe and the keeper.

May 2, 1833.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, K.G., President, in the Chair.

The Right Honourable the Earl of Darnley was elected a Fellow of the Society.

A paper was read, entitled, "Essay towards a first approximation to a Map of Cotidal Lines." By the Rev. William Whewell, M.A. F.R.S. Fellow of Trinity College Cambridge.

The general explanation of the phenomena of the tides originally given by Newton, although assented to by all subsequent philosophers, has never been pursued in all the details of which its results are susceptible, so as to show its bearing on the more special and local phenomena, to connect the actual tides of all the different parts of the world, and to account for their varieties and seeming anomalies. The first scientific attempt that was made to compare the developed theory with any extensive range of observations, was that of Daniel Bernouilli in 1740: the subject has since been pursued by Laplace and Bouvard, and still more recently by Mr. Lubbock. But