plies it to be so. The presence of animal matter is by no means conclusive; since bones from the plaster quarries at Paris still contain it.

Unfortunately, our geological knowledge of Guadaloupe is yet too imperfect to assist in determining this question. The only positive information being, that the bed in which these skeletons are found is nearly an English mile in length, and that it is covered by the sea at high water.

A new Method of deducing a first Approximation to the Orbit of a Comet from three Geocentric Observations. *By* James Ivory, *A.M. Communicated by* Henry Brougham, *Esq. F.R.S.* Read February 17, 1814. [*Phil. Trans.* 1814, *p.* 121.]

Although it be true that three geocentric observations are really sufficient for determining the parabolic orbit of a comet, as well as the elliptic orbit of a planet; the latter problem is far the easier, because we can select those positions of a planet from which its heliocentric places are found without any intricate calculation: but with regard to comets it is far otherwise. Since their appearance is unexpected, we are under the necessity of drawing our inferences from those positions in which they may happen to present themselves; and it is generally extremely difficult to deduce, with accuracy, their heliocentric positions from observations necessarily confined to a small part of their orbit.

In order to obtain an approximate solution, Sir Isaac Newton considered a small portion of the orbit as a straight line, the projection of which on the plane of the ecliptic will be also straight, and the parts of each will bear the same proportion to each other as the intervals of observation. But three observations alone leave the problem indeterminate; and though when four observations are employed the problem is generally determinate and easily solved, it is also often indeterminate even when four are employed.

In general it may be said that no solution is free from this imperfection, in which the velocity in the orbit does not enter as a principal condition, as in the methods of Boscovich, Laplace, and Legendre. But in that of Laplace, the first and second differential coefficients of longitude and latitude can be obtained but imperfectly, and only by interpolation; and in that of Legendre his formulæ are complicated, and the number of equations that require to be solved render it ill adapted for general use.

The object of the present paper is to give a new solution of the problem, which, in the author's estimation, is at least as accurate as any former method; and in practice, he thinks, as commodious as the nature of such a calculation can well admit.

After detailing the particulars of this method, which from its nature cannot admit of abridgement, the author gives various instances of its successful application in discovering the orbits of the comets of 1769, 1781, and two comets of 1805, from observations selected by Legendre for the same purpose; and he shows, by comparison of his

results with those elements which M. Mechain obtained by Laplace's method, with those obtained by Legendre himself, and with those ultimately deduced as corrected elements from the latest observations, how near an approximation is obtained by the method here given; so that the apparent errors seem rather to be those of observation, which, in fact, are not susceptible of great accuracy even with the best instruments, and with the greatest care, on account of the haze or coma with which these bodies are generally surrounded.

On the Affections of Light transmitted through crystallized Bodies. By David Brewster, *LL.D. F.R.S. Edin. and F.S.A. Edin. In a Letter to Sir* Humphry Davy, *LL.D. F.R.S.* Read December 23, 1813. [*Phil. Trans.* 1814, *p.* 187.]

The present experiments, to which the author has been led by discovering the singular property of agate described in his former communication to the Society, have been attended with results which he considers so extraordinary, that they appear to lead to the very mysteries of physical optics, and exhibit, he says, a series of appearances, which far surpass in splendour and variety all other phenomena of light.

This paper treats, first, of the polarizing power of the agate; secondly, on that structure of the agate on which its properties depend; thirdly, on peculiar colours exhibited by it; fourthly, on the depolarization of light; and fifthly, on certain elliptic coloured rings produced by obliquely depolarizing crystals.

With respect to the polarizing power of the agate, Dr. Brewster has before shown that a ray of light transmitted through a slice of laminated agate, cut at right angles to its laminæ, may be transmitted through a prism of Iceland spar without being subdivided, being refracted ordinarily in one direction, and extraordinarily when the principal section of the spar is transverse to the laminæ of the agate. The author observed at that time a nebulous light that accompanied the bright image of a luminous object seen through the agate, consisting of rays that were not *similarly* affected. He now adds, that this nebulous light is *oppositely* affected, being refracted like the extraordinary rays transmitted through Iceland spar, and accordingly disappearing when the bright image is most discernible, and *vice versâ*. But though the polarization of these rays be different, the refraction of both is the same.

In order to convey, as accurately as may be, an idea of the structure of the agate having these properties, the author assists his description by delineations of the appearances which the substance itself presents in consequence of the variations in fineness of the laminæ, their curvatures, or opacity. Some of the laminæ are white, others transparent; some straight, others variously curved; and where finest and most transparent, exhibiting an appearance of small waves on a surface of water rippled by a gentle breeze, and depending on small variations of the inclination of the laminæ.