In the course of these experiments Dr. Wells observes, that the sympathy between the eyes, which is in general considered as sympathy of the iris, is in fact sympathy of the retina; for when the pupil of one eye is dilated by belladonna, the pupil of the other becomes so much the more contracted, in consequence of the greater light which the enlarged pupil admits.

He remarks, also, that though he has lost, in great measure, the power of adaptation, he has in no degree lost any command of the external muscles, but can make the optic axes meet at any short distance from his face, to which he could formerly make them converge. So also, while Dr. Cutting's eyes were under the influence of belladonna, the powers of the external muscles remained unimpaired; whence it appears, that the power of adapting the eye to different distances is not dependent on the external muscles, but rather to be referred to the crystalline lens, although the muscularity of that organ does not appear to Dr. Wells to be by any means established.

On the Grounds of the Method which Laplace *has given in the second Chapter of the third Book of his* Mécanique Céleste *for computing the Attractions of Spheroids of every Description. By* James Ivory, *A.M. Communicated by* Henry Brougham, *Esq. F.R.S.* Read July 4, 1811. [*Phil. Trans.* 1812, *p.* 1.]

Sir Isaac Newton, who first considered the figure of the earth and planets, confined his view to the supposition of their having been originally in a fluid state; and he conceived them to retain the same figure which they assumed in their primitive condition; and those mathematicians who succeeded him in the same path of inquiry have seldom ventured beyond this limited hypothesis, and have shown, that when a body composed of one uniform fluid revolves about its axis, or even if it consists of several fluids of different densities, its parts will be in equilibrium, and it will preserve its figure when it has the form of an elliptic spheroid of revolution oblate at the poles.

But though the supposition of original fluidity of the mass simplifies the investigation, it does not seem to be warranted by what we see of the surface; for in that case, Mr. Ivory observes, the arrangement of all the heterogeneous matters would have been according to their densities; those least dense occupying the surface with gradual increase of density to the centre; whereas, on the contrary, nothing can be more irregular than the density of such solid parts of the earth as come under our observation, and the elevation of continents above the level of the sea, as well as the depths of the different channels which contain the waters of the ocean.

Moreover, according to the latest and best observations made for the express purpose of determining the figure of the earth, it does not appear to be of any regular elliptic form.

Since the hypothesis of Newton is, therefore, not consonant to observation, it became necessary to consider the subject in a more

enlarged point of view; and D'Alembert has extended his researches to other figures beside the elliptic spheroid, and has invented a method of investigating the attractive force of a body of any proposed figure, and composed of strata, varying in density according to any given law; but his method, though ingenious, is destitute of the requisite simplicity.

Laplace has also treated this extremely difficult question with his usual skill, and has deduced the relation between the radius of the spheroid and the series for the attractive force, upon a point without or within the surface, in a manner admirably simple when the complicated nature of the question is considered.

In the course of his investigation, Laplace lays down a theorem, which he affirms is true at the surfaces of all spheroids that differ but little from spheres. This proposition is enunciated in the *Mécanique Céleste* in the most general manner, comprehending every case in which the attractive force is proportional to any power of the distance between the attracting particles. But the demonstration which Laplace has given of this proposition appears to Mr. Ivory not to be conclusive. It is, says he, defective and erroneous, because a part of the analytical expression is omitted without examination, and is rejected as evanescent in all cases; whereas it is so only in particular spheroids, the radii of which are expressed by rational and integral functions of a point in the surface of a sphere; and though the quantities which Laplace has omitted are then really equal to nothing, yet, says Mr. Ivory, this does not happen for any reason assigned by Laplace, but for a reason that has no manner of connexion with anything touched upon in his demonstration.

In order to avoid all discussions which are not of real use to the inquiry into the figures of the planets, Mr. Ivory confines his attention chiefly to the case of nature, in which attraction follows the law of the inverse proportion of the squares of the distances. But he does also briefly examine the theorem of Laplace, in the general sense in which it is laid down in the *Mécanique Céleste*; and he admits, that when the exponent of the law of attraction is positive, and not less than unity, then the demonstration of Laplace is not liable to so much objection, and the theorem is in that case true to the full extent of his enunciation; but he observes, that when the exponent is negative, then certain quantities become infinitely great, instead of being equal to nothing, as the theorem of Laplace would require them to be.

The writings of no author on any subject, says Mr. Ivory, are entitled to more respect than those of Laplace on the subject of physical astronomy; and, consequently, it was not till after the most mature reflection that he has ventured to dissent from an authority for which he has the utmost deference. But in a work of so great extent as the *Mécanique Céleste*, which treats of so great variety of subjects, all very difficult and abstruse, it could hardly be expected that no slips or inadvertencies have been admitted, even by an author whose knowledge of the subject he treats is so profound, and the

correctness of whose views is established by so many important discoveries.

On the Attractions of an extensive Class of Spheroids. By James Ivory, *A.M. Communicated by* Henry Brougham, *Esq. F.R.S.* Read November 14, 1811. [*Phil. Trans.* 1812, *p.* 46.]

In his second paper, Mr. Ivory investigates the attractions of that particular class of spheroids mentioned in the former; for though it is to these that the theorems of Laplace may strictly be applied, it is liable to the important objection, that the terms of his series near the beginning cannot be found without previously computing all the rest. The analysis of Mr. Ivory, on the contrary, is direct; and every term of his series is deduced directly from the radius of the spheroid.

In an appendix to these papers, Mr. Ivory adds some remarks upon a memoir of Lagrange, upon the same subject, published at Paris in December 1809, but which had not till lately been received in this country.

An Account of some Peculiarities in the Structure of the Organ of Hearing in the Balæna Mysticetus of Linnæus. *By* Everard Home, *Esq. F.R.S.* Read December 12, 1811. [*Phil. Trans.* 1812, *p.* 83.]

From the time that Mr. Home discovered the muscular structure of the membrana tympani in the elephant, he has been seeking an opportunity of prosecuting the same inquiry on a similar scale, by examining the ear of a whale, and has at length succeeded in procuring the head of a young whale preserved in brine. As the skin had been taken off, a portion of the meatus externus had been removed along with it; but it did not appear that much was lost, as the outward extremity partook of the dark colour of the outer skin of the head. This passage was $5\frac{1}{2}$ inches in length, and only one fourth of an inch in diameter; but near the tympanum it widened to about $1\frac{1}{4}$ inch, and this is the breadth of the membrana tympani itself.

This membrane, instead of being concave externally as usual, is convex, so as to project nearly an inch into the meatus externus. The membrane consists of four parts: first, a cuticular covering, next a strong membrane, then a layer of muscular fibres; and lastly, another membranous lining towards the tympanum. It is remarkable that this membrane has no connexion whatever with the handle of the malleus, as in other animals.

The cavity of the tympanum is of an oval shape, capable of containing a pint of fluid, surrounded by the concave surface of a large bone peculiar to the whale, detached from the skull, and having only a loose connexion with the petrose portion of the temporal bone. This cavity terminates, as usual, in the eustachian tube, which is $2\frac{1}{2}$ inches long, terminating by a small aperture, having a valvular structure, and opening into the canal leading to the blow-hole.