

ductor. Although we are not quite satisfied with this manner of comparing the effects, because we consider that time enters very differently as an element in the several cases, yet we are sensible of the value of the experiments, and think that they strongly confirm the author's conclusions as to the identity of electricities from different sources.

This series of experimental researches in electricity, we consider, makes a very valuable addition to Mr. Faraday's former ones; and we have no hesitation in recommending its publication in the *Transactions of the Royal Society*.

S. H. CHRISTIE.

14th March 1833.

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May 9, 1833.

WILLIAM GEORGE MATON, M.D., Vice-President, in the Chair.

A paper was read, entitled, "On the Anatomical and Optical Structure of the Crystalline Lenses of Animals, particularly that of the Cod." By Sir David Brewster, K.H., LL.D., F.R.S. V.P.R.S. Ed.

The author was led, by the observations he had made of some very singular phenomena in the crystalline lenses of fishes and quadrupeds when exposed to polarized light, to examine their minute anatomical structure, with the view of ascertaining if it had any relation to these optical appearances. He found that the crystalline lens of a cod has the form of a prolate spheroid, of which the axis coincides with that of vision. Its body is inclosed in an exceedingly thin and transparent capsule, within which it floats without having any apparent connexion with that capsule, and consists of a hard nucleus surrounded by softer matter. The nucleus is composed of regular transparent laminae of equal thickness, with perfectly smooth surfaces, presenting the iridescent appearance peculiar to grooved surfaces, and exhibited by mother-of-pearl. These apparent grooves have the direction of meridian lines converging from the equator, where their breadth is greatest, to the two poles, and indicating the boundaries of the component fibres of the laminae. The author was enabled to trace the course of these fibres to their termination very satisfactorily, when the fibres themselves could not be rendered visible by the best microscopes, by means of the reflected prismatic images of a luminous object, produced by interference. This method furnished also an accurate mode of determining the diameter of the fibres at any point of the spheroid. The uniform distribution of the light refracted through the lamina, as well as the distinctness of the reflected images, prove that these fibres are not cylindrical, but perfectly flat, and gradually tapering in breadth from the equator to the poles of the lens. The thickness of each fibre is at least five times less than its breadth, which, in the most external layer of the equator, is about the 5500th part of an inch.

The observation of another optical phenomenon apparent on looking at a bright light through a thin lamina of the lens of a cod, namely,

that of two faint and broad prismatic images, situated in a line perpendicular to that which joins the common coloured images, led the author to the further discovery of the mode in which the fibres are united laterally to each other, so as to resist separation, and form a continuous spherical surface. By viewing a well-prepared lamina with a microscope of high magnifying power, he observed that the fibres are united by a series of teeth, locking into one another, exactly like those of rack-work. The breadth and depth of each tooth are about the fifth part of the breadth of the fibre itself, and all the adjacent surfaces are in perfect optical contact. This denticulated structure exists in the lenses of every fish which the author examined. In that of the cod, the number of teeth in each fibre was found to be 12,500; and since the number of fibres in the whole lens is 5,000,000, the total number of teeth amount to 62,500,000,000.

The same structure obtains universally, as far as the author has examined it, in the lenses of birds; but he has never met with it in any of the Mammalia, not even in the Cetacea. It was found in two species of lizards, and in the *Ornithorhynchus*.

In the concluding part of the paper the author enters into some details as to the doubly-refracting structure of the crystalline lens of the cod and of other animals, in which several curious varieties are observable with regard to the relative positions of the strata giving positive or negative double refractions. In the prosecution of this subject he was led to the observation of a series of very curious phenomena, which he announces as the subject of a future communication to the Royal Society.

A paper was also read, entitled, "On the present Situation of the Magnetic Lines of Equal Variation, and their Changes on the Terrestrial Surface." By Peter Barlow, Esq., F.R.S.

The author has undertaken the task of collecting and arranging all the authentic information respecting magnetic variation which has been recorded in the accounts of several recent voyages and journeys of discovery. The inconvenience from the distortion and interruptions of the lines of equal variation laid down on maps or charts, induced him to trace them on a globe, where they can, of course, be exhibited in their natural situation, and in regular continuity: and he has been careful to mark only such as are deduced from actual observation. The examination of the lines thus laid down shows them to be dependent on definite and general laws, and not on local influences; their inflexions and curvatures presenting systems of great regularity, and being exempt from those abrupt and angular configurations which such local disturbances might be expected to produce: neither do they appear to be consistent with the hypothesis of the action of a certain definite plurality of magnetic poles.

The author next offers some observations on the progressive changes which these lines undergo in their places and configurations, and shows their agreement with the hypothesis of a revolution of the magnetic poles for each place round the poles of the earth; each respec-