

probable, by the fact that Professor Kner has found *Diplodi* placed in rows in the jaws of a Fish which he designates *Xenacanthus*. The Professor asserts that "in the lateral parts of the jaws they are arranged in 28–29 rows, of 6–8 in each transversely, and on the outer maxillary they form 4 rows of 6–8 in each." If the observations of Professor Kner are perfectly reliable, the question is settled, and the *Diplodi* are teeth, but the evidence, so far as regards our Coal-measure specimens, points rather in the direction of their being tubercles, inasmuch as they are often found in large diffused patches, without any appearance of arrangement, and without the slightest indication of corresponding jaws in these localities. This evidence, however, is negative, and no merely negative evidence is of value in the presence of that which is positive. The only questions therefore to be determined are: Are the specimens described by Professor Kner generically the same as those found in our Coal-measures, and is the arrangement he describes so satisfactory as to be conclusive? It is acknowledged that many of the Professor's specimens are indistinct and dubious, and the question may without offence be asked, "Was the specimen jaw and teeth, or supposed teeth dubious or clear?" The writer of the review of the work on *Xenacanthus* in the *GEOL. MAG.* for August, observes: "Our author thinks that the strata in England and North America, containing the teeth of *Diplodus* and spines of *Pleuracanthus*, ought perhaps, on closer examination, also to be referred to the Permian system, and not to the Carboniferous. In this supposition Professor Kner is manifestly wrong, as *Diplodi* are among the commonest fossils of our Northumberland Coal-measures. On the table before us there are specimens of *Diplodi*, and some large slabs in which large bones are present and numerous *Diplodi* scattered about. There is also a mass of comminuted bones, in the midst of which *Diplodi* lie buried in considerable number.

CORRESPONDENCE.

INTERNAL FLUIDITY OF THE EARTH.

SIR,—In this month's *GEOLOGICAL MAGAZINE* no less than three articles occur treating of the internal constitution of the earth, and the manner of "Formation of Mountain Chains."

Mr. Fisher explains the "Elevation of Mountain Chains" by an outer crust becoming unsupported through the contraction by cooling of the inner parts of the earth, the intermediate layer then (by diminution of pressure) becoming the most fluid portion.

M. Delaunay says that, if the motion be slow, the rotation of a solid crust would be accompanied by that of the fluid interior, and therefore that no idea of the thickness of this outer crust can be formed from the phenomena of precession and nutation.

Mr. Shaler argues that, "if the effect of pressure in promoting solidification at the earth's centre were greater than the effect of heat in resisting solidification, then the mass would congeal first at the centre, and solidification extend thence towards the circumference;"

and in summing up says, "that the most probable hypothesis in the present state of our knowledge of the earth, is that it consists of an immense solid nucleus, a hardened outer crust, and an intermediate region, of comparatively slight depth, in an imperfect state of igneous fusion."

This last is precisely the state of the earth as imagined by Halley when endeavouring to account for the phenomena of the magnetic needle. To account for these phenomena he assumes the existence of four magnetic poles, two in each hemisphere. the relative positions of which undergo a constant change; to effect this he makes one pole in each hemisphere to be situated on an external crust, and the two other poles on an interior mass, separated from the crust by a fluid medium; this interior mass he supposes to revolve more slowly by an extremely small quantity than the outer crust. Subsequently Hanstein examined the subject, and came to the same conclusion with Halley as to the existence of four poles; these he made to be all of unequal magnetic force, and to revolve round the terrestrial poles at unequal periods; the periods being as near as possible, allowing for errors of observation, all multiples of that mystic number 432, the weakest north pole revolving in $432 \times 2 = 864$ years, and the strongest in $432 \times 4 = 1728$ years, the weakest south pole in $432 \times 3 = 1296$ years, and the strongest in $432 \times 10 = 4320$ years. While, curious enough, the least common denominator of these four periods is $432 \times 60 = 25,920$, which is the period of the revolution of the precession of the equinoxes; therefore the shortest time for the four magnetic poles to complete a cycle is equal to the precessional period of revolution.¹

Whether such a thing gives any real clue to the present state of the interior of our globe is a question which I would leave others to determine for themselves; at the present time I would merely draw attention to the similarity that exists between the supposed internal condition to account for magnetic phenomena by Halley and Hanstein, and that condition as put forward, to account for the "Elevation of Mountain Chains," by Messrs. Fisher and Shaler in their recent articles in this Magazine.

M. Delaunay shows that a slowly-revolving crust would take with it a contained fluid. It would be an interesting thing to know whether, supposing a solid occupied the centre of the fluid, it also would revolve with the said fluid at the same or a slower rate.

J. CLIFTON WARD.

YORK, Oct. 19th, 1868.

HETEROPHYLLIA MIRABILIS AND *H. LYELLI*.

SIR,—Mr. De Wilde's letter is quite satisfactory. Had the appearances referred to by Mr. Young (GEOL. MAG. Oct. p. 448, etc.) been present in Dr. Duncan's specimens, neither he nor Mr. De Wilde would have failed to notice them. It is therefore to be regretted that you did not submit Mr. Young's specimens to that artist, who has an interest in the matter, rather than to Mr. Fielding, who has

¹ See Chap. viii. of "Rudimentary Magnetism," by Sir Wm. Snow Harris.