

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.<sup>1</sup>

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

<sup>1</sup> See Chap. viii. of "Rudimentary Magnetism," by Sir Wm. Snow Harris.

none. The testimony which that gentleman volunteers is, however, of value as confirming the only inference possible from the statements and figures, that the specimens of *Heterophyllia* are variously preserved, and that Mr. De Wilde has not seen all the varieties.

I am unaware, of course, of your reasons for adopting a somewhat unusual style of comment on Mr. Young's paper. He does not, however, as you say, "object to a discovery because it is an anomaly." He thinks the appearances may be otherwise interpreted, and that so unexpected a phenomenon as articulated spines on a coral requires more evidence in its support than has been adduced. Anomalies in other groups of animals furnish no argument in support of this particular one. Mr. Young thinks his specimens justify him in taking exception to Dr. Duncan's paper on two grounds, 1st, that *H. Lyelli* and *H. mirabilis* are not distinct species, 2nd, that neither possessed articulated spines. The criticism of published species is neither an unusual nor a hurtful proceeding, and I should have been unwilling to interfere in the matter which rests entirely between Dr. Duncan and Mr. Young, but that, having seen the specimens, I am satisfied that the difference of opinion, at least on the second of Mr. Young's criticisms, is due to difference in the state of preservation of the fossils.

JOHN YOUNG, M.D.

HUNTERIAN MUSEUM, GLASGOW, 18th November, 1868.

[ERRATUM.—In the heading to Mr. J. Young's paper on *Heterophyllia* (p. 448) in our October Number, we styled him "Curator of the Hunterian Museum, Glasgow." We find we were in error. Professor John Young, M.D., is Keeper of the Museum, and Mr. J. Young is Assistant-Keeper.—EDIT.]

#### HETEROPHYLLIA MIRABILIS, DUNCAN.

SIR,—Having read, in the November number of the GEOLOGICAL MAGAZINE, the observations of Messrs. De Wilde, Fielding, and yourself, upon the so-called articulation of the hooklets on *Heterophyllia mirabilis*, I now beg to state that the specimens of this coral which I sent to you, and which are referred to in Mr. Fielding's remarks, are of a mixed character, and were intended to illustrate the various conditions in which it is found, such as the various diameters the coral assumes, and the variation in form of the horizontal section. Others show the rounding of the bases of the spines when worn, presenting then the appearance of rounded tubercles; while others show the spines lying in position in the shale, or with their fractured bases projecting irregularly from the stem of the corallum.

The remarks which I formerly made were based partly upon these and other longer specimens in my possession, and I am satisfied, after a further examination of all the best preserved specimens I can find, that what I have stated in my paper is correct, viz., that the hooklets were not articulated upon tubercles, and the mere rounding of the base of the spines, so as to resemble tubercles, seen upon some specimens, stands for nothing in the face of the important fact which numerous others go to prove, viz., that these tubercles are not rounded in the better preserved specimens, and that they are in fact only the fractured bases of the spines or hooklets.