The necessity for the narrow 20 million years' margin, which clashes with geology, is seen then apparently not to have the slightest foundation. It rests on the gratuitous hypothesis that the sun's heat was derived *solely* from gravitation, entailing an approach of matter in a primitive state of repose. The quantity of heat generated under these premises was calculated originally by Helmholtz to suffice for 20 million years of solar radiation.

Moreover, the sun is not yet cooled down: so that a notable part of the 20 million years period, which is the inexorable limit of the above hypothesis, must be spread over *future* time. How much is left for *past* duration of the solar system and for geological history of our globe then? Neptune and Jupiter were certainly shed from the revolving-contracting solar nebula some millions of years before the Earth, *i.e.* before the Earth had a separate existence. Some millions of years must be then inevitably lopped off the other end of our already contracted time-margin. What is left over for the Earth's past existence then: so that on the (exclusive) gravitational hypothesis of the source of the sun's heat, no geological epoch worthy of that name would remain. S. Tolver Preston.

Hamburg, *Dec.* 14, 1892.

THE MOMMOTH AND THE GLACIAL DRIFT.

Sir,—I wish Mr. Jukes-Browne had devoted a little more of his last letter to Geology and a little less to offensive personalities. To these latter I do not propose to reply. What is alone interesting to your readers in this correspondence is to fix the exact age of the Mammoth, a matter of importance not only to the geologist but more especially to those devoted to the early history of man. To the settlement of this problem Mr. Jukes-Browne's last letter adds nothing. He reverts to two cases he had already quoted, one of them the well-known case at Hoxne, where, as I showed, there is not only no positive evidence forthcoming but which was riddled through and through by Mr. Flower. There can be no doubt whatever that judging by the published evidence the case of Hoxne breaks down. There is some evidence that at that place the drift beds overlie the Mammoth bed. There is none that will bear criticism that they underlie it.

The second case from Burgh, where it was not the Mammoth but the *Elephas antiquus* that was found, I have already criticized.

I must correct a curious delusion of Mr. Jukes-Browne, that on this question I have set myself against the best authorities. The best English authorities on the age of the Mammoth known to me are Professor Dawkins, Professor Geikie and Dr. Hicks,[1] all of whom virtually agree with me, or rather, I with them. The French geologists are almost without exception on the same side, while among the geological surveyors, to whom perhaps Mr. Jukes-Browne limits "authority," Mr. Lamplugh and Mr. Skertchly have been liberally quoted by myself, but as a mattor of fact authority has and ought to have very little place in geology any more than in any

[1] See Dr. Hicks's letter.—Edit. Geol. Mag.

other science. Well attested facts and sound logic, combined if possible with literary courtesy, these are what, I am sure, your readers wish, and whoever brings them to your mill and helps to establish truth or sweep away error will be welcomed.

I trust I have avoided saying anything of which Mr. Jukes-Browne can complain, for I have profited a good deal from what he has written elsewhere. I have no wish to exchange sharp words.

ARLEY HOUSE, LYTHAM, NEAR PRESTON. HENRY. H. HOWORTH.
December 10th, 1892.[1]

THE MAMMOTH AND THE GLACIAL DRIFT.

SIR.—The tone which Mr. Jukes-Browne has thought it advisable to adopt in his attacks on Sir Henry Howorth, in recent Numbers of the GEOLOGICAL MAGAZINE, does not, I hope, commend itself generally even to the official mind, still less will it to those who, like myself, believe that it always has been and will still be to the advantage of geological science that it should be cultivated by others than those who have been made geologists by Act of Parliament, or who have adopted it as a profession.

Pending the appearance of the "man who has acquired an insight into the subject by long experience and by approved practical work in the field," (he does not say by whom or by what authority the work is to be approved) who will some day settle the question "beyond dispute." I should like to ask Mr. Jukes-Browne by what rule of evidence could he expect Sir Henry Howorth to accept "as final" the imaginary case he cites, viz. "Gravels with Mammoth bones resting on Boulder-clay." Surely in the first place he should point out a typical case, so that an opportunity may be given for critically examining the evidence. But let it be granted that he could point out such a case, how is it to be proved that the remains, which are those of land animals, are to be considered as of contemporaneous age with the gravels, and not as having been derived either from an earlier deposit, or directly from an older land surface? The only evidence that could be conclusive would be the finding of Mammoth remains, *in an undisturbed state*, on an old land surface with undoubted glacial deposits below it: such a surface as that on which the Endsleigh Street remains were found, but not having, as there, only pre-glacial beds below but some typical glacial deposits instead.

I have already pointed out that Mammoth remains were found by me in caverns in the Vale of Clwyd, under undoubted glacial deposits. I have this year obtained a fragment of a tibia of a Mammoth from the Lower Glacial Gravel at Finchley in a section where a great thickness of Chalky Boulder-clay, containing the well-known derived fossils, reposed on the gravel. The Endsleigh Street evidence, in my opinion, is equally conclusive in showing that the Mammoth lived there early in the Glacial period. The foregoing and similar cases which have been recorded can only *prove* that the Mammoth lived in this country, or in the districts in which the remains were found, during a part of or before the Glacial period.

HENDON, *Dec.* 8, 1892.[1] HENRY HICKS.

[1] Publication delayed by special request of Correspondents.—EDIT. GEOL. MAG.