In Sir A. Geikie's calculation and all other similar ones with which I am acquainted, the thickness of the sedimentary rocks is tacitly assumed to be their thickness all over the land area of the globe.

Dr. Wallace's calculation leads to the absurd result that continents are growing nineteen times as fast as materials are produced to supply their growth.

Leaving the question of the conclusions to which Dr. Wallace's data logically lead, I may say that I am not responsible, and do not hold him to be responsible, for the absurd theory as to the thickness of sedimentary rocks on which they are based.

In order to arrive at a scientifically accurate result, what we require to know is the present actual thickness in every part of the world, plus all the thickness which has previously existed in, but since been denuded away from, every area. The existing thickness in geologically explored areas can perhaps be ascertained within certain limits of error from geological maps and memoirs. For instance where the surface consists of Torridon Sandstone overlying Archæan gneiss of igneous origin, the thickness of sedimentary rock is that of the Torridon Sandstone only, if we assume that the gneiss there is part of the metamorphosed original crust of the earth, for the existence of which Rosenbusch has recently argued.

It is easily demonstrable, first, that in many places the existing thickness of each formation, where undenuded, is far from being the maximum thickness, and, secondly, from the thinning out in some directions, or merging, near the old shore-line, into conglomerates, that some formations were never deposited over certain areas; indeed, the very existence of a sedimentary deposit necessarily implies that of land undergoing denudation and not receiving deposit, although it may well be doubted whether the land area was always nineteen times the area receiving deposit.

Reasoning from the deposits preserved as to those removed by denudation, it is highly improbable that any considerable area ever received either the complete series of deposits, or on the average anything like the maximum thickness of the deposits it actually received. In addition to this, some formations usually considered to be successive may be really contemporaneous, so that the figures representing maximum thicknesses usually taken in calculating the earth's age are probably far above the truth for the purpose in question.

The immense labour involved in calculating the existing thickness of sedimentary rocks in each area, and the thickness which there is any reasonable ground for supposing to have been at any time denuded from that area, as well as the uncertainty of the results, has probably deterred geologists from attempting the task, especially as large areas are very imperfectly known. BERNARD HOBSON.

Tapton Elms, Sheffield, December 24.

THE first part of Mr. Hobson's letter alone requires notice from me, as the latter part characterizes as absurd the views of those eminent geologists who have estimated the total thickness of the sedimentary rocks, and seems to assume that such writers as the late Dr. Croll and Sir Andrew Ramsay overlooked the very obvious considerations he sets forth.

As regards myself, he reiterates the statement that when geologists have estimated the total thickness of the sedimentary rocks at 177,200 feet, they mean that this amount of sediment has covered the whole land surface of the globe; that, for example, the coal measures, the lias, the chalk, the greensand, the London clay, &c., &c., were each deposited over the whole of the continents, since it is by adding together the thicknesses of these and all other strata that the figure 177,200 feet (equal to 33 miles) has been obtained.

Mr. Hobson concludes with what he seems to think is a *reductio ad absurdum*:—"Dr. Wallace's calculation leads to the absurd result that continents are growing nineteen times as fast as materials are produced to supply their growth."

But the apparent absurdity arises from the absence of any definition of the "growth of continents," and also from supposing that the growth of continents is the problem under discussion. The question is, as to the growth in thickness, of sedimentary deposits such as those which form the geological series. These deposits are each laid down on an area very much smaller than the whole surface of the continent from the denudation of which they are formed. They are therefore necessarily very much thicker than the average thickness of the denuded layer, and the ratio of the area of denudation to the area of deposition, which I have estimated at 19 to 1, gives their proportionate thickness. If Mr. Hobson still maintains that he is right, he can only prove it by adducing *evidence* that every component of the series of sedimentary rocks has once covered the whole land-surface of the globe; not by assuming that it has done so, and characterizing the teaching of all geologists to the contrary as absurd. ALFRED R. WALLACE.

Ancient Ice Ages.

MR. READE in his letter (NATURE, p. 174) refers to the striations on the pebbles forming the conglomerates at Abberley and the Clent Hills.

Following the late Sir Andrew Ramsay, he considers the deposits to be of glacial origin, but goes further than that distinguished geologist in citing them as proof of a former ice age.

It is but reasonable to suppose that *glaciers* existed in past ages in places where the conditions—such as high altitude and abundant precipitation—were favourable.

Before, however, the existence of a former *glacial period* can be established, we must have evidence of contemporaneous deposits of undoubtedly glacial origin, and extending over wide-spread areas—say half a hemisphere. J. LOMAS.

University College, Liverpool, December 31.

Printing Mathematics.

THE use of the solidus in printing fractions has been advocated by authorities of such weight that it seems almost a heresy to call it into question. Yet I venture to think that there is a good deal to be said against it. In such matters the course preferred by mathematical writers and their printers is apt to take precedence over that which is most convenient for the great body of those who will read their work. It is tacitly assumed by those who prefer this notation that the getting of mathematical formulæ into line with ordinary printing is an unmixed advantage. No doubt it is easier to set up the work in type thus, but with the consequent rapidity and cheapness of printing the advantage ends. Most people will agree that it is much pleasanter to read a mathematical book in which the letterpress is well spaced, so that the formulæ stand out clearly from the explanatory language, than one in which the two run together in an unbroken stream: just as a book divided into paragraphs is more readable than one which is not. The old style is more restful to the mind and eye, and one can more readily pick out the salient features of the demonstration.

Another aspect of the question seems to me more important. In making any calculation mentally it is much easier to visualize fractions, more especially if complicated, as written in the ordinary way than as written with the new-fashioned notation. The component parts of the mental picture are imagined as spread over a plane instead of being arranged along a line, and can be thought of separately with less confusion. From a similar point of view it will be admitted that it is inconvenient to write mathematical expressions in one form and to print them in another.

Then, again, I doubt whether the assumption that the solidus notation conduces to accuracy is justified. No doubt the printer makes fewer original errors; but whereas with the old notation his frequent glaring errors are more readily detected by the proof-reader (or, if missed by him, by the ordinary reader), with the new notation the misplacement or omission of a solidus is, from the simplicity of the error, likely to be overlooked. In general, no one will be the poorer if a little more trouble is taken with the printing, and a little more paper is used for the book.

The symbol $/$ has advantages over its equivalent $\div$, and to its restricted use, such as is made by Sir G. Stokes, one can hardly object; it matters little how such expressions as a/b or dy/dx are printed. But it is the thin end of the wedge; and one is under a debt of gratitude to Mr. Cassie for showing, in your issue of November 3, to what it may lead. May it be a long time before we have to learn to substitute for the harmless expression, $\frac{b^{\frac{1}{2}}}{c(d+e)^3}$ its newest equivalent, $| b \setminus 1 / 2 | \; / c \,| d + e \setminus 3 |$!

I trust that no one will interpret the final note of exclamation as a factorial symbol. M. J. JACKSON.

D. I. Sind College, Karachi, November 23.