

The Earth's Age.

As Dr. A. R. Wallace's "Island Life" may be regarded as one of the best authorities on its subject, it appears desirable that any errors in it should be pointed out, lest any of its numerous readers should be misled.

In Chapter X. (2nd edition, 1892) is an estimate of the earth's age based on the following data:—Land area of globe, 57,000,000 square miles, coast line, 100,000 miles, width of shore deposits, 30 miles, hence area of shore-deposits, 3,000,000 square miles, hence rate of deposition 19 times as fast as that of mean rate of denudation, which latter is taken to be 1 foot in 3000 years.

Thickness of stratified rocks 177,200 feet, hence time required for deposit 28,000,000 years. This last result is taken to be approximately the earth's age.

It appears to me that Dr. Wallace's data warrant no such conclusion, for, in the 28,000,000 years in question, all that would have been deposited would be a thickness of 177,200 feet of rock, over an area of only 3,000,000 square miles, whereas, what has to be accounted for is an area of 57,000,000 square miles (neglecting igneous rocks and sedimentary deposits beneath existing seas) of the same thickness. Therefore, so far from Dr. Wallace's data leading to 28,000,000 years as the earth's age, they actually lead to a result 19 times as great, viz. 532,000,000 years.

Sir A. Geikie's estimate is (NATURE, vol. xlvi., p. 322), 100 to 680 million years. Personally, I think, the method of taking maximum thicknesses of deposits unsatisfactory, for it assumes that every formation was deposited, with its maximum thickness, over the whole land area of the globe. The absurdity of this supposition is obvious. The only defence of it is that it is held to make an ample allowance (of unknown amount) for repeated denudation. It would, perhaps, be better to ascertain the actual thickness of a great series of successive formations, say in the Colorado Cañon and other regions, and from such data to estimate the total *average* thickness. This estimate, of course, would allow nothing for repeated denudation, but would enable one to form an idea of the earth's *minimum* age.

BERNARD HOBSON.

Owens College, Manchester, December 5.

I AM glad that Mr. Hobson has formulated his difficulty as to the measurement of geological time by the comparative rates of denudation and deposition, because it shows that I cannot have explained my views as clearly as I thought I had done; yet on again reading over pp. 217-223 of "Island Life," I can hardly understand how he has missed the essential point of the argument. Fortunately, there is no dispute as to the data, only as to the conclusions to be logically drawn from them.

Mr. Hobson says that I account for a deposit of 177,200 feet (the supposed thickness of all the stratified rocks) over an area of 3,000,000 square miles (the estimated area over which at any one epoch stratified rocks are being deposited) in 28,000,000 years (the deduced estimate of known geological time); and then adds: "Whereas, what has to be accounted for is an area of 57,000,000 square miles of the same thickness" (my italics). This seems to me a most amazing misconception; for it means that every single formation and every stratum or member of each formation, was deposited to the same average thickness over the whole land surface of the globe (area 57,000,000 square miles)! And this implies that at every successive period, from the Laurentian to the Pliocene, the conditions of denudation and deposition were totally different from what they are now, since at the present time it is demonstrable that the area of deposition of continental debris is only a fraction of the whole continental area. It implies further, that

during each geological period the whole of the existing land area must have been, either at once or in rapid succession, sunk beneath the sea in order to allow of its being all covered with each successive formation—an amount of repeated upheaval and depression which hardly the most extreme convulsionist of the old school would have postulated. I cannot make the matter clearer, and trust that on further consideration Mr. Hobson will admit that his objection is invalid. ALFRED R. WALLACE.