of students. But this may well be in a country largely constituted of altered and igneous rocks, and among students who have reason to look for evidence of geological history as well in the original conditions and successive changes of rock-material as in the character and position of organic remains. The valuable abstract notices of contemporaneous books and memoirs treating of geology and mineralogy are abundantly and carefully given as heretofore.

CORRESPONDENCE.

THE POSSIBILITY OF CHANGES OF LATITUDE.

SIR,—The question discussed in the article on Changes of Axis in the June Number of this MAGAZINE was,—"The earth being rigid, could a deformation tilt the axis in space, or shift the position of the Poles?" The answer was that a tilt was impossible and a shift improbable. Mr. Fisher, in the July Number, asks for a discussion of the question—"Assuming that a thin crust surrounds a fluid substratum, could then a deformation shift the crust over the nucleus?

An obvious reply is, that if the Earth's rigidity has been proved, the discussion would be fruitless. Mr. G. H. Darwin, who has been investigating this point, concludes that the Earth is "enormously stiff" (Proc. Royal Soc., No. 188, 1878).

However, the nature and consequences of the objection to Dr. Hopkins's demonstration may be noticed. His argument was in effect that if there existed a very large fluid nucleus, since the shell would slide freely over it, the Earth's crust could not oppose to the tilting forces so great a resistance as we find from the amount of Precession that it does oppose. To this it is now answered that if the fluid nucleus be spheroidal and rotating, it would resist the tilting force which produces Precession, and the shell would not slide freely. But then would it not also resist the tilting tendency resulting from a deformation? If Dr. Hopkins's proof from Precession collapses, does not also the supposition become untenable that a fluid nucleus would render easy a shift of the crust? The suggestion of a fluid substratum seems to lead to the same dilemma; either the fluid could resist any shift of the crust, or it could not, and so Dr. Hopkins's disproof remains valid.

A question prior to all this is, Will a change in Latitudes give the best explanation of the phenomena? E. HILL.

ST. JOHN'S COLLEGE, CAMBRIDGE, *August 22nd.*

GEOLOGICAL TIME.

SIR,—The great difficulty encountered by the geologist, in reducing a section of Geological Time to years, from the want of data, is so well known, that bringing the following before your readers may be pardoned, as an attempt to measure a small section of time.

In the parish of Beith, North Ayrshire, the Lower Carboniferous Limestone is extensively wrought as a surface stratum. In some quarries the limestone is preserved by a thick covering of Boulder-clay, and here the surface is ice-polished and finely striated, retaining

https://doi.org/10.1017/S0016756800151076 Published online by Cambridge University Press

the same features as when the ice-grinding stopped. In other quarries, where the covering is loose, the limestone is eroded into pits, swallow-holes, and crevices, many feet in thickness being often dissolved away altogether. For a long time I have been on the outlook to find a section that would give the number of feet destroyed by sub-aërial erosion since glacial action ceased, but failed until lately. It was always easy enough to know how many feet had been removed as a whole, but there was no data to show where glacial action had stopped, and sub-aërial erosion had commenced. However, a section has been laid open that gives a close approximation.

In the upper half of this limestone various bands of nodular flint occur, three of which bands are prominent; and are divided from each other by five feet of intervening limestone, and lesser flint bands. In one section, where about 20 feet of limestone had been removed by erosion, the three flint bands were found nearly entire, while the limestone was gone. It was therefore clear that all of it, from, at least, the upper flint band, had been destroyed by such sub-aërial erosion since glacial action stopped—the minimum quantity eroded cannot be less than twelve feet, probably as much as fifteen feet.

Having measured the rate of erosion for thirty years, by taking the limestone surface with a plastic substance, and replacing the loss through erosion with water, and thus calculating the loss, I find from this, that it is being denuded at the rate of $\frac{1}{16}$ of an inch in fifty years, or one foot in 9600 years. If this be anything approaching an average, it would take 115,000 years to denude twelve feet, or 144,000 to reduce fifteen feet, the probable quantity destroyed.

This gives an approximation of the time that has passed away since glacial action stopped, and sub-aërial erosion commenced. Still a considerable period may have been taken up in denuding clay left by the ice; but on this I do not enter, farther than to say that the section being on a very small plateau, on a water-shed, and I believe that very little Boulder-clay would be left upon it, and that sub-aërial erosion would commence shortly after glaciation had stopped.

ROBERT CRAIG.

LANGSIDE, BEITH, *Sept. 4th*, 1878.

THE DIVINING ROD.

SIR,—The following extract from the *Marlborough Times* of Aug. 24th should possess great interest for readers of the GEOL. MAG.

LONDON, *6th Sept.*, 1878. W. H. PENNING.

SEARCH FOR WATER.—A person from Colerne, near Bath, who professes to have the gift of divining where a spring of water is to be found by means of a small piece of white thorn of this year's growth in the shape of a V, was at Wootton Bassett the other day and operated on Mr. Hart's premises, pointing out a site for another well for his brewery—even the depth at which water would be likely to be found being designated by him. It is said that those who possess this quality are extremely few. Two or three years since a person named Weare resided in the town who used the divining rod, and who had a most implicit and sincere belief in his powers, for which he could not account, and really to a looker on the rod appeared to move quite independently of him and in fact to be beyond his control. The operator on this recent occasion stated, we believe, that he had been successful in discovering springs by this means on more than two hundred occasions without a single failure. (!)

https://doi.org/10.1017/S0016756800151076 Published online by Cambridge University Press