

remarkably successful, and very useful, especially if reports have been published of their geological details. The class-lectures were soon discontinued; but it is doubtful if they would not be useful still. The intercommunication with Societies and Field-clubs in the Counties has often been recommended, and to a great degree effected; but the re-institution of Honorary Local Secretaries, and with them the formation of *local geological committees* in communication with the Association, was recommended. The high value always and rightly placed by the Associates on the presence of ladies at the meetings was duly mentioned; and, to insure their company in the field as well as in town, it was suggested that special excursions, free from mountainous and rough ground, should be periodically arranged. The high esteem in which the Association is held by home and foreign geologists was not forgotten; and the Members were congratulated on the success of their Society, and advised to keep to the lines and precepts of their founders.—*Mining Journal*.

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CORRESPONDENCE.

MORTERATSCH GLACIER, ENGADINE.

SIR,—In the month of August, 1875, a friend and I agreed to get an approximate measurement of the rate of movement of this glacier. With this object we walked from the glacier snout, along the mountain side, on the left, till we saw a large boulder on the medial moraine, and also a rock *in situ*, on the mountain side on the right, at about the same level. We then found a spot on the left side, on looking from which we got the boulder and the rock *in situ*, in line. As these were of considerable size (the boulder being about 80 cubic feet), we pointed a strong line on each of them, and set up a post at the stand-point. This was about 3 furlongs above the snout of the glacier. Here the glacier is about half a mile wide, the boulder to the large medial moraine being 500 yards from the left side, or stand-point.

To estimate the movement, one person went on the moraine, near the boulder, while another was posted at the stand-point, and the latter signalled to the former to move to the right, or left, till he got to a spot which lined with the rock *in situ*. This was marked, and the distance to the boulder was measured.

In 1875, three observations were taken, two at intervals of 10 days and one at 24 days.

My friend has not been in the Engadine since. I have been here every year since. In 1877, 1879, and this year, I have measured the progress of the boulder, in the manner described.

The result is as follows :—

The average daily movement, in 2 years, Aug. 1875 to Aug. 1877, was 1·48 in.  
 in 2 years, Aug. 1877 to Aug. 1879, was 1·22 in.  
 in 1 yr. and 9 days, Aug. 1879 to Aug. 1880, was 1·28 in.  
 in 5 yrs. and 9 days, Aug. 1875 to Aug. 1880, was 1·34 in.  
 in 44 days, 7th Aug. 1875 to 20th Sept. 1875, was 2·07 in.

During the 5 years the glacier has diminished very considerably, especially in its depth. This may account for the slower movement

in the last three years. During the past year the boulder has been at a part of the glacier which is steeper than where it was previously. This may explain the slightly accelerated movement during the last year. I do not rely implicitly on the 44 days' observation, but if it be assumed to be correct, it leads to the inference that the movement in summer is 2 in. per day, and in winter 1 in.

In the first four years there was no perceptible disturbance of the position of the boulder on the sustaining ice. During the last year it has twisted a little.

Last summer I took some observations to ascertain the superficial waste of the glacier on a part which was free from moraine (during fine sunny weather), and found it amount to about 3 in. per day. This summer I have again taken observations, in a different manner, extending over 21 days; these gave a result of over 2 in. per day.

Forbes states that the waste is as much as 3 in. a day in a hot summer. Now on comparing the scale of movement with that of the waste by melting, I get results which I cannot reconcile.

The boulder which I have had under observation cannot have come from any mountain which is less than three miles distant from its present position. The angle of the glacier above the part where it rests, is less, rather than greater. I therefore assume that the recorded rate of movement may be taken as an average, in which case the boulder must have been travelling 400 years.

The depth of the glacier is probably not more than 300 feet, but I will assume it to be 600 feet, and that the average waste is only two inches a day, during three summer months, or fifteen feet per annum. On this assumption the whole depth of 600 feet would be melted in forty years. I have taken observations of the relative movement of the glacier, where covered with moraine, and also where free from it. They do not encourage the supposition that there is any material difference.

F. LLOYD.

19th August, 1880.

#### THE PERMANENCE OF OCEANS AND CONTINENTS.

SIR,—Mr. T. M. Reade, in your September Number, quotes certain authors who believe that oceans and continents have, throughout all known geological time, occupied pretty much the same relative positions as now.

There is, however, one important omission in this list. In the famous chapter in the *Origin of Species*, "On the Imperfection of the Geological Record," Mr. Darwin endeavours to account for the sudden appearance of groups of allied species in the lowest known fossiliferous strata; he does this by assuming that the Pre-Silurian continents probably existed where the oceans now are. He says: "We may infer that where our oceans now extend, oceans have extended from the remotest period of which we have any record; and on the other hand, that where continents now exist, large tracts of land have existed, subjected no doubt to great oscillations of level, since the earliest Silurian period. . . . At a period immeasurably antecedent to the Silurian epoch, continents may have