

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

New Army Regulations.

It appears, from the letter in the daily papers of yesterday, signed by the Headmaster of Eton, that the headmasters are beginning to cry out under the smart of the rod they have made for their own backs. When, five or six years ago, Latin was made a compulsory subject for the Army Entrance Examinations, I for one, as a schoolmaster, welcomed it in that capacity, from its value as a mental discipline, and as a remedy to some extent for a certain illiterateness and incapacity for accuracy of expression, which one met with too often in Army candidates. But it was soon found that the position assigned to it was taken advantage of by men of non-scientific education, as a pretext for driving science into the background, and making it contemptible in the eyes of boys and parents, by a considerable curtailment of the time previously given to it, and then, with Egyptian logic, wondering that the marks fell off.

I do not say that the headmasters were altogether to blame for this. The spirit of the cram-shop has invaded the public schools, and is utterly spoiling their intellectual life; and, when this spirit allies itself with other motives, the pressure may be too strong for the most noble-minded headmasters. But they, like other mortals, must reap as they sow, and accept the results of their policy. Their intellectual incapacity as a body to appreciate the value of scientific training *per se* is the fault, not so much of themselves, as of the traditions, which still hold the dominant place in this country, among those in whose hands their appointment rests. I sincerely hope that all will be done, that can be done, to minimise the mischief with regard to Latin, which is deprecated in the circular; but I do trust that, for the public weal, the military authorities, having "put their foot down," will remain firm in insisting upon *all candidates for the scientific branches of the Army being trained, not crammed, in Experimental Science*. This they will doubtless do with their hands strengthened by the strong Committee which has been dealing with the matter in its relation to Woolwich during the last two years.

When we recollect that back in the '70's and the earlier '80's, though Latin was a *voluntary subject*, classical scholarship continued to flourish in the public schools, it is difficult to read without a smile the alarmist predictions contained in Dr. Warre's letter, as to what is likely to ensue from what he calls "the degrading of Latin from Class I., and making it a voluntary subject." The headmasters have had their opportunity, and had they, in the spirit of their intellectual ancestors of the sixteenth century, shown more magnanimity towards the "New Learning" of the nineteenth century, this rude shock to their intellectual consciousness might have been unnecessary.

Looking at the matter now from the outside, one can perhaps see the true perspective of the whole better than one could while in the thick of the fray.

A. IRVING.

Hockerill Vicarage, Herts, July 6.

Erosion of the Muir Glacier, Alaska.

DR. WRIGHT, in his "Ice Age in North America," has calculated that the Muir Glacier erodes its bed annually to the depth of one-third of inch (p. 64), and Prof. Harry Fielding Reid, in his very interesting "Studies of the Muir Glacier" (*American National Geographical Magazine*, March 21, 1892, p. 51), arrives at the still more startling result of three-quarters of an inch per annum. As one who has paid some attention to rates of denudation by various eroding agencies, I felt some curiosity to know in what way these figures were arrived at. I find that these two calculations are substantially the same, the difference arising from Prof. Reid crediting the whole of the erosion to the glacier bed which occupies only half of the watershed of 700 square miles.

As this rate of erosion is nearly 244 times that of the glaciers of Norway descending from the Justedalsbræen, calculated from the observations of Prof. Amund Helland (*Q. J. G. S.*, 1877, vol. xxxiii. p. 158), and is altogether an abnormal and unprecedented rate of erosion of any agency we know of that acts over so large an area, I think most geologists will agree with me that

before it can be accepted we must be satisfied that the data are reliable and beyond question.

Dr. Wright unfortunately gives no particulars of the method adopted of sampling the sub-glacial waters, or the number of specimens taken, or the times and circumstances under which they were taken, all of which form material elements in the calculation. He contents himself with the bare statement that—"The amount of sediment contained in each United States gallon (231 cubic inches) of water collected from the sub-glacial streams is, as determined by the analysis of the late Prof. H. C. Foote, of Cleveland, 708.48 grains.

This proportion of sediment is nearly eighty-five times the mean of that from the sub-glacial rivers of the Norwegian glaciers descending from the snow and ice field of Justedalsbræen, and nearly twenty times the mean of the sediment from seven of the sub-glacial rivers of Greenland (*Q. J. G. S.*, 1887, p. 158), as observed and recorded by Amund Helland.

It will be seen from these bare figures that this prodigious calculation requires some explanation. It is certainly a wonderful amount of "work" to credit a glacier with that only moves 2555 feet per annum at the surface in its central position, and of course at a considerably less average rate on its bed.

The American geologists have supplied us with so much and such accurate information on many points which could not be investigated in this country, that I trust those who are able will help to correct this little sum.

T. MELLARD READE.

Park Corner, Blundellsands, June 7.

IN response to the questions contained in the communication by Mr. Reade, I would say that the estimations, both of Prof. Reid and myself, concerning the erosion of the Muir Glacier are based upon a specimen of water collected by me from a large sub-glacial stream issuing from near the south-east corner of the glacier at a height of about 150 feet above tide-level. This stream is only one of many which issue from the ice-front; but it is practically the only one from which any calculations could be safely made. At two or three places where the front of the glacier is pushed out into tide water, powerful sub-glacial streams issue, boiling up at low tide with great force just in front of the ice, and discolouring the water of the inlet for miles beyond. The head of the inlet is a mile and a half wide, enlarging very soon to nearly twice that distance. The water in the middle is more than 100 fathoms deep.

The appearance and everything else indicated that the stream chosen for examination was truly representative. It was a rushing torrent from ten to fifteen yards wide, which could be waded with difficulty. The specimen was collected about the middle of August 1886, when the melting upon the surface of the glacier was proceeding at its maximum rapidity, so that the volume of water was probably much larger than the average through the year. Prof. Foote had a high reputation for accuracy, and kindly analysed the water for me, evaporating the entire amount and distilling it, so that after he had weighed the sediment the identical elements were reunited, and, as I write, it stands before me as characteristic a specimen of glacial milk as one can anywhere find.

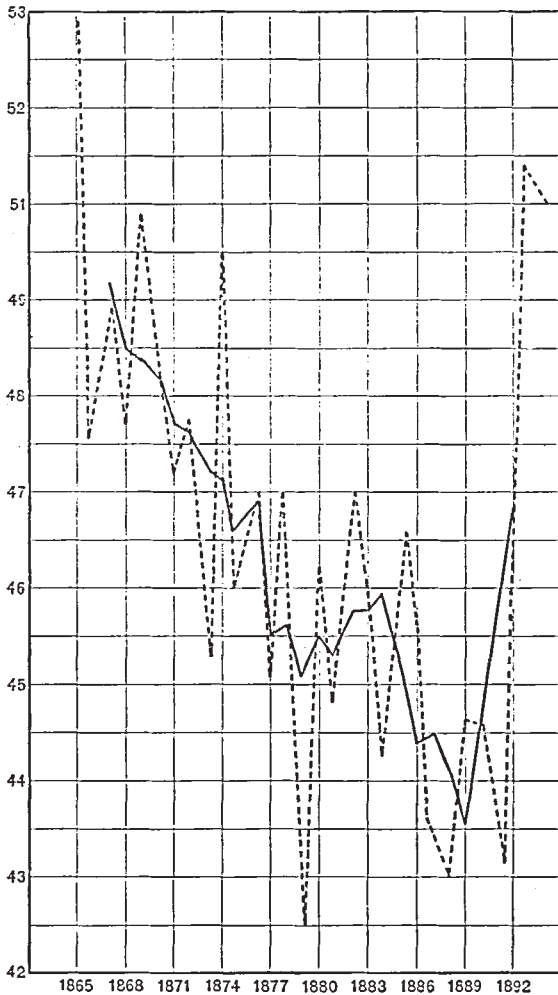
As stated in my "Ice Age in North America" (p. 64), the estimates of erosion are based upon the supposition that the total rainfall in the drainage basin of the Muir Glacier is the same as at Sitka, namely, 100 inches, and that a certain proportion of this passes off as icebergs and in evaporation, and that the balance which is carried away by subglacial streams is properly represented by this specimen. Of course if there is any serious error in either of these data it will affect the result. But I can scarcely believe that the error can be so great as to account for all the difference between our calculations and those made concerning the erosion of glaciers in Norway and Greenland; for the conditions are very different in the Muir Glacier from those either in Norway or in Greenland, as observed by Helland. The glaciers of Norway have a very slow movement as compared even with Prof. Reid's estimate of the movement of Muir Glacier; while in Greenland the continental proportions of the ice and the unknown conditions of the country upon which it rests quite preclude comparison; for it is evident that the best of the Muir glacier has a rapid gradient, while it is not certain that the best of many of the Greenland glaciers has any gradient at all. Judging from Helland's description of the appearance of the sea-water in the fiords of Greenland, I should think it was much less milky than that of the Muir inlet in Alaska.

I am thankful to have had my attention called to the subject by Mr. Reade just upon the eve of departure for a few weeks among the glaciers of Umenak Bay, in Greenland. I will give special attention to the subject, and report upon my return in the autumn. G. FREDERICK WRIGHT.

Oberlin, Ohio, June 23.

On a Recent Change in the Character of April.

THE months are all, of course, continually changing in temperature, rainfall, &c. And, as a rule, those changes are not long in one direction; the curve of variation has many zig-zags. Yet, by methods of averaging, one may sometimes detect a gradual process of change extending through a good many



years; we might compare it to the slope of an ocean-swell underlying the surface-ripples. The mean temperature of April at Greenwich is a noteworthy example of this.

Here are the values since 1865, and averaged in fives in a second column:—

M.T. April.	Av.	M.T. April.	Av.	M.T. April.	Av.
1865	52.9	1875	47.0	1885	47.6
66	48.6	76	48.0	86	46.6
67	49.9	77	46.1	87	44.2
68	48.7	78	48.0	88	43.5
69	50.9	79	43.5	89	45.7
70	49.2	80	47.2	90	45.6
71	48.2	81	45.8	91	44.2
72	48.8	82	48.0	92	46.9
73	46.3	83	47.0	93	51.4
74	50.5	84	45.3	94	51.0

NO. 1289, VOL. 50]

Thus from a maximum of 50.2 in 1867, the average went down, with some slight interruption at one point, to 44.6 in 1889 (*i.e.* 5.6 degrees), the extreme actual values being 52.9 in 1865 and 43.5 in 1888 (difference 9.4 degrees). Last year and the present yield values in marked contrast to those just before, and a pronounced rise appears in the average curve.

The data for Paris and Geneva give results very similar, so that the process is not merely local. Thus the smoothed values for Geneva descend from 10.6 C. in 1864 to 7.9 in 1889.

A general, though less continuous, decline in the mean temperature of the entire spring (March to May), at Greenwich, may also be noticed.

I do not know whether any cause can be assigned for prolonged changes like these in April: some of your readers may be able to throw light on the matter.

The accompanying diagram illustrates the change referred to. A. B. M.

The Deposition of Ova by "Asterina Gibbosa."

I RECENTLY brought back from Jersey three specimens of *Asterina gibbosa*, all of which deposited ova in the small aquaria in which they were kept. As it appeared evident that the ova exuded from the oral surface, two specimens were selected for experiment.

The first was placed with the oral surface uppermost in a small glass well, with just sufficient water to cover it. When examined about half an hour later, ova had exuded from a genital pore on the oral surface, and had floated up to the top. Had the opening been on the aboral surface, they would have been retained beneath the starfish.

The second specimen was then placed in a glass dish with the aboral surface uppermost. Sufficient water was added to allow the animal to be moved easily with a pair of forceps, but not enough to enable the tube-feet to act. Consequently ova, if deposited, could not float away. In this position it was left for about an hour. When turned, so as to bring the oral surface uppermost, it was seen that ova had exuded. The starfish was killed with the eggs still adhering.

The sexes of starfish are generally said to be separate. But in this case only three specimens were brought: all deposited ova, and in one small aquarium there are now young *Asterinas*. HENRY SCHERREN.

BIFILAR PENDULUM FOR MEASURING EARTH-TILTS.

INSTRUMENTS designed for measuring movements of the earth's crust belong to two classes. The first consists of seismographs which register the amplitude and period of the rapid vibrations of earthquake-shocks, and by their records enable the velocity and acceleration of an earth-particle at any instant to be determined. The second class includes nadiranes and various forms of pendulums (such as the bifilar pendulum here described) which are, or should be, unaffected by vibrations of short period, and which indicate only slow tilts or bendings of the ground, showing the change of inclination at any spot, the rate at which it is taking place, and, if periodic, the length of its period. No part of the earth, so far as we know, is free from such movements. Every day, and every year, the surface of the ground at any spot tilts forward and backward through a small angle, perhaps not exceeding a small fraction of a second. Sometimes regular pulsations are observed, each a very few seconds or minutes in duration, and lasting, it may be, for hours; at other times the tilting is irregular and occasionally abrupt; but invariably it is so slight, and takes place so slowly, that without the aid of refined instruments it could never be perceived.

The report of the Earth Tremor Committee (British Assoc. Report, 1893, pp. 291-303), presented at the last meeting of the British Association, contains an account of a new bifilar pendulum designed by Mr. Horace Darwin, and of some of the first experiments made with it at Birmingham. This preliminary trial brought to light one or two slight defects which Mr. Darwin has