coloration. They existed in the rock before cleavage was induced. Many of them are broken up like broken egg-shells. Those which are complete lie with their longest axes in the plane of cleavage, and would well agree with the theory that they were deformed along with the enveloping rock by a shearing process, and that the plane of the greatest distortion was the plane of cleavage.

In my paper on cleavage and distortion in the *Geological Magazine* I pointed out that it is to Sir John Herschel that we are indebted for the theory of the "molecular movement," which, I remarked, was in fact a "shear"—a term which has now been universally accepted for this kind of action in rocks; and in my "Physics of the Earth's Crust" I have explained how the crumpling in the harder and cleavage in softer layers of a rock would simultaneously arise from such a shearing movement. O. FISHER.

Harlton, Cambridge, May 8.

A Relation between Spring and Summer.

A FAIR idea of the larger fluctuations of a given meteorological element may be had by means of a two-fold smoothing process, *e.g.* adding the series of values in groups of five (1 to 5, 2 to 6, 3 to 7, &c.), and then doing the same with those sums. In each case the sum is put opposite the middle member of the group.

When this is done with (*a*) the amounts of rainfall in spring (March to May) at Greenwich since 1841, and (*b*) the numbers of warm months in summer (same place and period), we have the two curves in the diagram. The

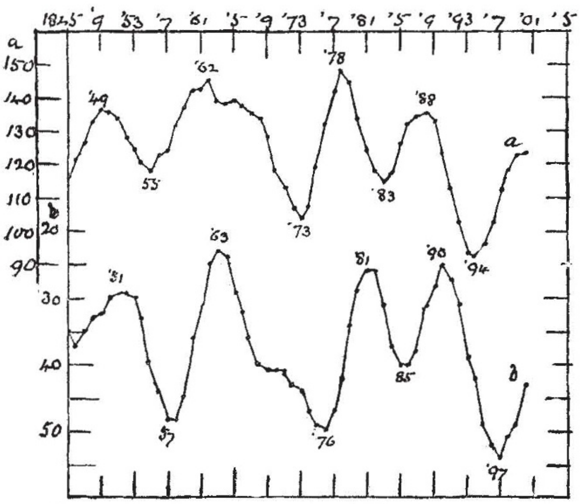

FIG. 1.—Smoothed curves of spring rainfall and summer warmth.

lower one (that for summer) is *inverted,* so that its crests represent *few* warm months, or coolness.

One must be struck, I think, with the similarity of the curves; four long waves (roughly) in each, those of the lower curve lagging in phase somewhat (one to three years) on those of the upper curve. The four *centres of wetness,* as we may call them, of the spring series are followed at a brief interval by four *centres of cold* in the summer series, and the four *centres of dryness* in the former, at much the same interval, by four *centres of warmth* in the latter.

Let us look briefly at the nature of those centres, and we may do so by indicating, first, the character of the group of five springs about each of the dates 1849, 1862, 1878, and 1888 (wave-crests of upper curve), and the corresponding summer groups (wave-crests of lower curve). We find in each group of five springs an excess in the total rainfall, and at least three of the five wet; further, in each summer group a small number of warm months.

5 Springs about	Rainfall	Relation to av.	Wet Springs	5 Summers about	Warm months
1849 ...	28·5 ...	+3·8 ...	3 ...	1851 ...	6 out of 15
1862 ...	28·5 ...	+3·8 ...	3 ...	1863 ...	5 ,,
1878 ...	31·2 ...	+6·5 ...	4 ...	1881 ...	3 ,,
1888 ...	27·9 ...	+3·2 ...	3 ...	1890 ...	3 ,,

Making a similar comparison of the centres of dryness in spring with the centres of warmth in summer, we have:

5 Springs about	Rainfall	Relation to av.	Wet Springs	5 Summers about	Warm months
1855 ...	23·9 ...	−0·8 ...	2 ...	1857 ...	12 out of 15
1873 ...	20·2 ...	−4·5 ...	1 ...	1876 ...	11 ,,
1883 ...	22·3 ...	−2·4 ...	1 ...	1885 ...	10 ,,
1894 ...	15·9 ...	−8·8 ...	0 ...	1897 ...	12 ,,

Here the relations are all of an opposite character.

To what are those long waves of variation to be attributed? And can any physical explanation be given of the sequence which has been indicated? Perhaps some of your readers may be able to throw light on these points. I will only remark that there is no obvious connection with the sun-spot cycle. Thus the first two crests in the upper curve come close after maxima (1848 and 1860), while the two latter are near minima (1878 and 1889).

With regard to the point now reached by this curve (*a*), the rainfall of the present spring (already in excess, May 10) should extend it upwards, but it must apparently be near another crest. Some help in forecasting our summers might perhaps be derived from a consideration of the facts above given. ALEX. B. MACDOWALL.

Fictitious Problems in Mathematics.

IN NATURE of April 27 (vol. lxxi. p. 603) your reviewer finds fault with Cambridge examiners for endowing bodies with the most inconsistent properties in the matter of perfect roughness and perfect smoothness—"A perfectly rough body placed on a perfectly smooth surface." Your reviewer adds, the average college don forgets that roughness or smoothness are matters which concern *two surfaces,* not *one* body.

Will your reviewer give a reference to some page of Whittaker's book (that under review), or to some page of any other text-book used in the last half-century at Cambridge, in support of his charge against Cambridge examiners? Fifty years ago, William Hopkins was still directing the mathematical teaching of Cambridge, and enforcing the conservation of energy where friction is taken into consideration. A perfectly rough sphere moving on a rough surface is intended to mean that, during the motion considered, the sphere rolls without any slip. "A perfectly rough sphere moving on a smooth surface" would no doubt be equivalent to "A sphere moving on a smooth surface"; but where does the phrase occur?

AN OLD AVERAGE COLLEGE DON.

THE alleged inaccuracies of language in stating the assumed conditions of smoothness or roughness prevailing between two bodies in contact are unfortunately so common that it is the exception rather than the rule to find any problem in which these conditions are correctly worded. In working through a chapter of Besant's "Dynamics" with a class the other day, I came across no less than two problems in which a "perfectly rough" body was supposed to be in contact with a second body which in turn rested against a third "perfectly smooth" body. In these cases the framer of the question carefully avoided giving any information as to the roughness or smoothness of the middle body, so that the inaccuracy of language might easily be overlooked. But this does not apply to the following example:—

"A person is placed at one end of a perfectly rough board which rests on a smooth table. Supposing he walks to the other end of the board, determine how much the board has moved. If he stepped off the board, show how to determine its subsequent motion" (Routh, "Elementary Rigid Dynamics," 1882 edition, p. 69, example 4).

At the time of writing the review I was quite unaware that such an example had found its way into a text-book written by so careful a teacher of applied mathematics as Dr. Routh, and it says much for the prevalence at Cambridge of these erroneous forms of statement that this wording failed to attract the author's attention. Since writing my review, it has been brought to my notice that similar inaccuracies widely prevail in the statement of problems involving so-called "perfectly elastic" or "inelastic bodies." THE REVIEWER.