## LETTERS TO THE EDITOR.

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### Colour of Water and Ice.

I HAVE read with much interest Sir Ray Lankester's letter on the colour of water in NATURE of March 17. I remember discussing this same problem in the case of ice with Sir Joseph Thomson when we stood at the foot of the great glacier at Glacier, B.C., during the western excursion of the British Association last summer. The rich blue colour of the hard, clear ice was remarkable, even in quite small pieces. The same blue colour is noticed when surface-ice, which has been formed slowly by conduction, is taken out of the St. Lawrence River. The blocks lose their colour when they are exposed for long to the light, and especially rapidly when exposed to sunlight. Coloured sediment and air cavities in the ice detract from the colour. I am inclined to believe that the colour of ice is a real absorption effect, due to the large molecular aggregates forming the structure, which absorb the long rays, and not a "blue sky" effect, as I suggested after seeing the blue ice of the glacier.

In the case of water, all the physical properties indicate the presence of complex molecular aggregates in solution, which become gradually reduced in number as the temperature rises. Thus the variation of specific heat, of density, of viscosity, and compressibility, all disclose an effect due to a gradual diminution of the molecular aggregates. I believe these are the same as the ice molecules, and constitute the absorbing medium which gives water its blue colour. Sea-water is particularly blue, and here we probably have added the effect of the salt molecules, in addition to the fact that the water is very clear.

Mr. W. H. Sherzer has shown (Smithsonian Report, 1907) that the blue colour of the water and ice of the glaciers of the Canadian Rockies is a real absorption effect. The blue colour is increased by the presence of minute white sediment, but not by coloured sediment.

If it has not been already tried, it would be very interesting to see what effect temperature has on the greenish-blue light transmitted through very pure water. If the colour is due to the presence of ice molecules, it should grow less as the numbers are reduced. I cannot help thinking of the beautiful blue colour of liquid air as soon as most of the nitrogen has boiled away; if this were due to the presence of complex oxygen molecules, such as ozone, it would be somewhat similar to water.

H. T. BARNES.

McGill University, Montreal, March 29.

### Centre of Gravity of Annual Rainfall.

THE question whether Mr. Cook's suggestions in NATURE of March 31 have a practical value can be very simply settled. It is proposed to consider the month to month rainfalls at a place as a series of parallel forces, $p_1, p_2 \ldots p_{12}$, say, where the distance (X) from the beginning of the year of the corresponding "centre of gravity" is given by

$$X = \frac{p_1 + 2p_2 + \ldots + 12p_{12}}{p_1 + p_2 + \ldots + p_{12}}.$$

Now, if we assign arbitrary values to any ten, say, of the $p$'s (and these ten $p$'s could be selected in sixty-six ways), then, the position of the C.G. remaining the same, we have obviously a single linear equation in two variables to give us the values of the two remaining $p$'s, and this equation can be solved in an infinite number of ways. Thus the same C.G. can be given by an infinitely varied arrangement of sizes of the $p$'s, and therefore its position gives no indication whatever of the monthly distribution of the rainfall of the places referred to.

To illustrate by three simple examples. The absolute value of the elements is of no importance, and taking for convenience a rainfall of 36 inches, we might have the three following distributions:—

| | A in. | B in. | C in. |
|---|---|---|---|
| January | 3 | 0 | 12 |
| February | 3 | 0 | 4 |
| March | 3 | 0 | 2 |
| April | 3 | 6 | 0 |
| May | 3 | 6 | 0 |
| June | 3 | 6 | 0 |
| July | 3 | 6 | 0 |
| August | 3 | 6 | 0 |
| September | 3 | 6 | 0 |
| October | 3 | 0 | 2 |
| November | 3 | 0 | 4 |
| December | 3 | 0 | 12 |
| Total Rainfall | 36 | 36 | 36 |
| C.G. | 6·5 | 6·5 | 6·5 |
| Rainfall Moment | 234 | 234 | 234 |

Thus A, B, and C have the same annual rainfalls, the same C.G., and the same "rainfall moment." The question whether or not the seasonal distributions correspond to those of actual places on the earth's surface is not to the point, though, as a matter of fact, C approximates to the typical Levantine curve.

Thus places with very different rainfall distributions may have the same C.G. and the same rainfall moment, and the proposed method of comparing the rainfalls of various places appears to have neither a theoretical nor a practical value. The method may possibly have a certain critical value in comparing the yearly variations at a particular place, where there is but little change in type from year to year, and especially in such a country as India, where the seasonal rainfalls are exceptionally well marked; but this seems doubtful, and in any case the method could be used only in conjunction with the actual monthly values.

ANDREW WATT.

Scottish Meteorological Society, Edinburgh, April 6.

### Certain Reactions of Albino Hair.

UNDER this heading in NATURE of March 24 (p. 96) Miss Igerna Sollas referred to some experiments of mine upon the hair of albino rats, in which she failed to obtain one of the reactions described in my note (Proc. Physiological Soc., March 27, 1909). It is, of course, not improbable that different albino rats may carry different chromogens, and that some of them may lack the one which, when oxidised with $H_2O_2$, gives a brownish colour. On the other hand, the failure may be due to the presence of some of the formalin, which may not have been completely washed away from the previous reaction.

There is one new observation which I should like to record here, since it bears upon the $H_2O_2$ reaction. The action of $H_2O_2$ is an oxidising one, and the production of a brownish tint may be interpreted as due to the oxidation of a colourless chromogenous body present in albino hairs. If this interpretation is right, other oxidising agents should produce a similar tint. During November of last year I casually placed two dead albino rats upon the top of one of my cages, these latter being kept out of doors. The rats were forgotten, and left exposed to the air for about a fortnight. During this interval the weather had been wet and warm for the time of year. Upon discovering them at the end of this interval, I noticed that on both rats the upper side, and part of the belly and back, had assumed the same sort of brownish tinge that $H_2O_2$ produces. The under side of both rats, which had been protected from the wet and light by its contact with the cage, was quite white. It thus seems possible to oxidise the chromogenous substance ostensibly present in albino rats by the oxygen of the air in the presence of continuous moisture. I do not think that light played much part in the reaction, since throughout this period it was very dull weather.

The mention of light brings me to another point in Miss Sollas's note. She says that prolonged immersion in the