Letters to the Editor.

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The Fechner-Weber Law in Wool Sorting.

IN the course of research work regarding the determination of the fundamental basis upon which wool 'quality' is assessed, an interesting illustration of Fechner's law has been brought to light.

An examination of a range of worsted tops comprising all qualities usually accepted by the trade from 48's to 80's has yielded interesting results. The tops were selected and vouched for by several authorities in the trade as being typical of their particular quality, and investigation revealed the interesting fact that the mean finenesses of the fibres comprising the samples of successive qualities of wool form a geometric progression. This result is in direct agreement with the Fechner-Weber law which states that "in order that the intensity of a sensation may increase in arithmetic progression the stimulus must increase in geometric progression, or in Fechner's notation $I = c \log S$".

An examination of French, German, and Italian standards has revealed that the same law is followed with, of course, a different number of grades in each country. It is not surprising to find that this should be the case, since the wool sorter's estimate of quality is made through the visual and tactile senses. The fact that the results of wool sorting follow Fechner's law affords a convenient basis for international agreement for an agreed scale of fibre fineness. So far as we are aware, the confirmation of this psycho-physical law, in its application to the wool industries, has not previously been noted.

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Wool Industries Research Association,
Torridon, Leeds, Oct. 6.

Natural Transport of Stones and Marine Animals.

AN article on the "Transport of Stones by Attached Seaweed" in NATURE of Feb. 8 suggests some interesting lines of thought. During the last two years, I have explored some 600 miles of coast in Western Australia, but have seen nothing comparable to the cases cited below or in the paper quoted, the only feature of interest in this connexion being the *Cymodocea* drift; the long ribbon-like leaves are rolled together by the waves and masses of several tons commonly present a wall two feet high and a chain long to the waves, and so give the beach a temporary degree of permanence, with shallow temporary pools on the landward side.

The case is very different in New Zealand. The coasts of Canterbury include cliffs, reefs, shingle, and sand, and the algal vegetation is luxuriant, including numerous float-bearing fucoids, notably *Cystophora retroflexa*, and also the immense kelps *Durvillæa antarctica* and *Macrocystis pyrifera*. One would expect that under such conditions supporting evidence could be found for Mr. Symington Grieve's views, as quoted in the above article, but although I have several curious observations to offer, I have never seen anything to suggest that stones attached to the holdfasts of algæ contribute materially to the breaking down of cliff faces or to the building up of stone beaches.

The article referred to mentions an account by my former teacher Dr. Charles (not James as given) Chilton, on the transport of stones by ascidians. Sponges are much more frequently concerned; at Timaru, for example, drift sponges may be seen in great numbers on a shingle beach, attached to stones or to the sessile queenshells *Chlamys*. No doubt the increasing size of the sponge leads to the dislodgment of the object to which it is attached, as also happens with fucoids attached to stones or to crumbling limestone or papa rock, or *Macrocystis* on the pinna shell *Atrina zelandica*. But the sponges did not accomplish much in the building up of the Timaru stony beach, which was small until a large mole was built out into the sea a few years ago; the mole not only stops the shingle as it drifts northwards from the mouths of the Pareora and Waitaki Rivers, but also it holds the beach permanently there in a way that *Cymodocea* or sponges could never do. As for the battering of cliffs by suspended stones, the latter are by no means hurled at the cliff, but trail sluggishly along the bottom with the upper fronds of the weed swaying backwards and forwards nearer the surface, and the usual fate of the stones seems to be to get wedged in between other larger stones and held firmly. There is a narrow range in the size of stones transported by any such means, and a small stone and a weed would seem a poor combination in comparison with a good Pacific breaker.

I am, however, the more ready to think that the differences between Mr. Symington Grieve's views and my own impressions are due to genuine local differences, because I can mention a number of curious phenomena which, though possibly paralleled in the North Atlantic, are not mentioned in any accounts which have come under my notice. First, there are rocks in New Zealand which, so far as mechanical forces are concerned, must be more kelp-worn than water-worn. *Durvillæa* invariably grows between tide marks in channels or exposed points where there is a maximum disturbance of the water; at a rough estimate, the discoid holdfasts, which commonly overlap or fuse, are 10 in. across, the stipe is cylindrical and 1½ in. in diameter, the fronds are ½ in. thick, and the whole plant 10 ft. in length. The fronds, which are torn into ribbons by the continued impact on the rocks, are full of air-spaces, and very buoyant, but nevertheless extremely tough. As a wave recedes these fronds trail outwards after it, slithering over one another and over the rock in a dense mass, and the next wave hurls them back by the ton with terrific force against the rock. In some places more kelp strikes the rock than water, and the wearing effect must be much greater. But by a strange oversight, experimental work in New Zealand on the wearing effect of shingle grinding together has not yet been extended in the present direction. Similarly, rocks half buried in sand are devoid of life within a foot or so of the sand, and are no doubt worn down by the suspended sand.

Macrocystis grows below low water mark, at a sufficient depth for its fronds, though many yards in length, to be safe from laceration on the rocks; it thus forms a continuous fringe outside the *Durvillæa* belt. It is chiefly of interest in that its large branched holdfasts, like the discoid holdfasts of *Durvillæa*, harbour a varied community of animals, and differences of opinion have been expressed as to the efficacy of drifting kelps in transporting these animals. The late Dr. Chilton used to emphasise the view, as finally stated in the "Subantarctic Islands of New Zealand", that faunistic similarities between New Zealand and South America are, at least predominantly, indications