

the Fucaceæ, but non-sexual sporanges containing zoospores similar to those of the *Laminariaceæ*. Mr. E. A. L. Batters describes an interesting new genus of perforating marine Algæ, *Conchocelis*, belonging to the order *Porphyraceæ*, which forms pink stains on empty shells, especially those of *Mya truncata* and *Solen vagina*. Miss Ethel S. Barton describes malformations produced in two seaweeds, *Ascophyllum nodosum* and *Desmarestia aculeata*, by the attacks respectively of a new species of Nematode, *Tylenchus fucicolus*, somewhat similar to that which produces the well-known "galls" of *Vaucheria*, and of an undetermined Copepod. The editor himself has two papers, one on a fossil Alga belonging to the genus *Caulerpa*, from the Oolite (Kimmeridge clay of Dorsetshire), a new species, which he names *C. Carruthersii*; and one on the genus of marine Algæ, *Dictyosphaeria*, the position of which he retains among the *Valoniaceæ*, near to *Valonia* and *Anadyomene*. The present number is illustrated by eight well-executed plates, most of them coloured.

A. W. B.

*Live Stock.* By Prof. Wrightson. (London: Cassell, 1892.)

THIS is the third of Cassell's series of agricultural textbooks, and though hardly equal to other writings of Prof. Wrightson, will be found useful as a reader in elementary classes.

The illustrations are well done, and the text is pretty clear, except perhaps on pp. 52-53, in a paragraph upon the "effect of food on milk." Here it is said that

"The quantity of milk is therefore in some degree dependent on liberal feeding. The quality of the milk is much less easily controlled, and it is doubtful if any special feeding will materially alter the percentage of butter-fats or cream in milk."

Then, at the end of the paragraph we have—

"Watery foods, such as silage, grass, grains, and distillery wash, increase the quantity of milk, but lower the quality, and in town dairies, where a large amount of milk is the principal object, they are much employed."

This paragraph is contradictory and confusing, for Prof. Wrightson himself admits that the quality of milk may be lowered by using watery foods, and we are decidedly of opinion that it may be increased by means of rich, oily foods.

#### LETTERS TO THE EDITOR.

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#### Lord Kelvin's Test Case on the Maxwell-Boltzmann Law.

IN his recent communication to the Royal Society, of a case disproving the Boltzmann law, Lord Kelvin seems to have overlooked an important consideration.

It is well known that in an atmosphere near the earth, under conductive (not convective) equilibrium of temperature, the mean kinetic energy (*i.e.*, the temperature) would be uniform notwithstanding the attraction of the earth, which causes each molecule to move more rapidly at the lower end of its path than at the upper end. This is due to the effect of gravity in sifting out the less rapidly moving particles, preventing them from reaching the upper layers, so that, of the particles in any one layer which reach a higher layer, the great proportion are those which move rapidly in the lower layer. Thus there will be fewer particles in the upper layer, but the mean kinetic energy of a particle will be the same in both.

Applying these considerations to Lord Kelvin's example, it appears that the C particle, when going rapidly, will penetrate a considerable distance into the region of the repulsive force, while, when going slowly, it will only penetrate a short distance. Thus the duration of a slow flight might be much shorter than

that of a quick one (with a force varying directly as the distance, the durations would be equal). It is quite different with the A particle, which moves uniformly to the end of the tube and back again. The duration of a slow flight will be long and of a quick flight short, being always inversely proportional to the velocity. Again, it appears evident that the chances for C having a great or small initial velocity at B are exactly the same as those for A. Hence, if we compare the velocities of A and C at an instant arbitrarily chosen, the probability of our happening on a time when A is moving slowly may be less than that of our happening on a time when C is moving slowly, and we cannot conclude that the mean kinetic energy of A is greater than that of C; indeed, a comparison of this case with that of the atmosphere, would lead us to expect that the mean kinetic energies of A and C would be equal.

There are cases in which the Boltzmann-Maxwell distribution does not hold. For instance, the case of a large particle confined at the end of a tube, with numerous small particles bombarding it. The mean kinetic energy of the large particle will depend on the range of its motion in the tube. This example would suggest the conclusion that in such cases as gases in contact with solids and liquids, where the molecules of the latter are so confined by molecular forces as to approximate to the condition of the large particle at the end of the tube, the conditions of temperature equilibrium can hardly be determined by the Boltzmann-Maxwell law.

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#### Poincaré's Thermodynamics.

RENTRANT à Paris après une assez longue absence, je prends seulement connaissance de la dernière lettre de M. Tait. Je ne veux pas continuer une discussion qui ne saurait se prolonger sans dégénérer en une simple logomachie. Il résulte en effet des débats que M. Tait n'attribue pas le même sens que moi à certaines expressions, et en particulier au mot force électromotrice. Il me semble seulement, puisque c'était mon livre qu'il critique, que c'était à lui d'adopter mon langage, qui est d'ailleurs celui de tout le monde. Je m'arrêterai donc là, quoiqu'il arrive.

Je suis pourtant obligé d'insister sur un point, parce que je ne veux pas laisser suspecter ma bonne foi. M. Tait a écrit: "Nothing is said, in this connection, about Joule's experiments." En ne tenant pas compte de ces mots "in this connection," j'aurais dénaturé sa pensée. Ces mots ne m'avaient pas échappé. Ils signifient, si je ne me trompe: "dans ses rapports avec la détermination de la température absolue." Et c'est pourquoi, après avoir rappelé que j'avais décrit ces expériences à la page 164, j'ai ajouté que j'avais expliqué à la page 169 comment elles permettent de déterminer la température absolue.

POINCARÉ.

[I need scarcely say that I never dreamt of doubting the good faith of M. Poincaré. What I did (and still do) doubt is my having made my meaning clear to him. For I cannot see how such a discussion could degenerate into a mere war of words. So far as I understand myself, I have been dealing mainly with the validity of certain modes of establishing physical laws, not with the mere terms employed in describing the experimental facts on which they are founded.—P. G. T.]

#### Land and Freshwater Shells Peculiar to the British Isles.

THERE cannot be any reasonable doubt that the inland Mollusca of Britain present some peculiar features, but it is surprising, considering the amount of attention that has been devoted to them, how little exact knowledge we have of this subject. This want of knowledge is doubtless due to two principal causes—first, that so many conchologists consider varieties, and especially slight varieties, to be of little or no importance; and secondly, because those who study our native shells are, as a rule, but ill acquainted with foreign species and varieties. The publication of a list of supposed peculiar forms in the new edition of Dr. Wallace's "Island Life," will, it is hoped, direct attention to this matter. Although this list is more or less provisional, and will doubtless require much alteration as time goes on, I anticipate that the number of forms actually peculiar to our islands, when fully ascertained, will considerably exceed eighty-three, the number at present listed. On the other hand, no doubt, several at present in the list will have to be eventually struck out.