

LETTERS TO THE EDITOR.

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The Oyster Question.

PROF. THORPE'S allusion to myself in connection with oysters and their ways in a recent¹ number of NATURE (p. 106) has reminded me that I also have something to say on the subject, à propos of the "Yellow Book" issued by the Local Government Board.

First, I wish to state that several references to my work, made in that and other recent publications on oysters and disease, ought rather to be to the work of my colleague Prof. Boyce, or to our joint work.

In conjunction with Prof. Boyce, I have published three notes on the subject, and the bacteriological parts of these have, naturally, been contributed by my colleague. The first note was read (and circulated) at the Ipswich meeting of the British Association in September 1895, the second was brought before the Liverpool Biological Society in January 1896, and was published that same month in the Annual Report of the Lancashire Sea Fisheries Laboratory for 1895, while the third was read (by Prof. Boyce) to Section I at the Liverpool meeting of the British Association last September, and reprints have since been circulated. The points that we believe we have demonstrated (I do not say that they were all new when announced—some were known, others suspected, some denied; but I think we have given definiteness to all) are as follows:—

(1) The beneficial effect of free change of water round the oysters.

(2) The deleterious effect of keeping the oysters in stagnant water.

(3) The considerable toleration of sewage shown by the oyster, and its power of absorbing large quantities of fæcal matter.

(4) The great increase (e.g. from 10 colonies to 17,000 per sample) in the bacterial contents of the pallial cavity and of the rectum when the oyster is laid down in close proximity to the mouth of a drain.

(5) The presence of more bacteria in the pallial cavity than in the alimentary canal of the oyster.

(6) The fact that the typhoid bacillus does not flourish in sea water. There is no initial or subsequent multiplication; on the contrary, it seems to die off very rapidly as time increases after inoculation.

(7) The fact that the typhoid bacillus does not multiply in the stomach or tissues of the oyster.

(8) The presence of a "pale green" disease, characterised by a leucocytosis, in certain oysters.

(9) The fact that the dark blue-green colour of the Marennes oysters has nothing to do with copper.

(10) The fact that perfectly fresh oysters contain fewer bacteria than those that have been stored or kept in shops.

(11) The enormous number of the common colon bacillus present in very many oysters obtained from shops.

(12) The possibility of getting rid of bacterial infection by placing the oyster in a stream of running water. There is a great diminution or total disappearance of the *B. typhosus* under these circumstances in from one to seven days.

Perhaps it is on the last of these conclusions that Prof. Thorpe has founded his remark, that the oyster has confided to us its preference for clean water. Whatever it may prefer, Dr. Bulstrode has abundantly demonstrated in his report, that the oyster is not always found in clean water; and the practical conclusion of all these investigations and reports ought to be the enforcement of the two sanitary measures which Prof. Boyce and I recommended a year ago, viz. "(1) the strict examination of all grounds upon which oysters are grown or bedded, so as to ensure their freedom from sewage, and (2) if practicable, the use of "dégorgeoirs" in which the oysters should be placed for a short time before they are sent to the consumer"² ("Rep. Lanc. Sea-Fish. Lab." 1895, p. 72).

¹ This letter was written before the Christmas vacation, but has been delayed by examination and other engagements.

² Probably the most satisfactory method for all concerned—producers, customers, and sanitary authorities—would be to have all oyster beds, parks, layings and ponds inspected and "licensed," and to have no oysters exposed for sale except such as come from a certified locality.

I am interested to see that Dr. Bulstrode (in the Local Government Board Report) independently corroborates our discovery of a pale green disease in some relaid oysters in this country. This is especially important, since Dr. Carazzi, of Spezia (whose results differ from those of most other investigators of molluscan structure and physiology), in a recently published paper, has doubted the existence of this green disease—probably because he has never met with it. He has drawn his conclusions mainly from the normal green Marennes oyster. We distinctly stated that the pale green disease had nothing in common with the dark blue-green of the "huitres de Marennes," and that we regarded the latter as being healthy and normal.

It is evident, then, that there are several distinct kinds of greenness in oysters. All recent investigators are agreed (except, possibly, Dr. Carazzi—I cannot venture to answer for him) that the green colour of the Marennes oyster has nothing to do with copper. Prof. Boyce and I have shown, and Dr. Bulstrode supports it, that the green of the (e.g. Fleetwood) relaid American oyster is due to a disease or leucocytosis, while now Prof. Thorpe tells us that (as was originally supposed, and then doubted) the greenness of the Falmouth oyster is really due to copper.

W. A. HERDMAN.

Liverpool, January 9, 1897.

P.S.—In connection with the correspondence which has taken place in NATURE, since Prof. Thorpe's article, I am glad to be able to add my testimony to that of Dr. Cartwright Wood and others as to the purity and healthy state of the Pyfleet oyster. I have visited the locality, have seen the oysters dredged up, and have examined (both biologically and gastronomically) many specimens, with entirely satisfactory results.

The Symbols of Applied Algebra.

I AM glad to see that attention is being forcibly drawn to the value and importance of considering the symbols in physical equations as primarily denoting quantities, and not mere numerical multiples of some unincluded standards. The latter mode of considering them, though often practically convenient, is entirely subsidiary, and a deduction from the primary equations between the quantities themselves.

The equation $w = mg$ is a special case of Newton's second law; it represents a fact of nature, and has nothing to do with systems of units. It is true in any units:—e.g.

$$981 \text{ dynes} = 1 \text{ gramme weight} \\ = 1 \text{ gramme-mass} \times 32 \cdot 18 \text{ ft./}(\text{sec.})^2.$$

The curious discussion about so simple an equation is kept up by those who wish to make all equations numerical only. To do this they must have a system of standards or units which themselves satisfy the equation. The numerical coefficients will then also satisfy the same equation, and the standards or units may be cancelled or omitted. The metric system has acquired the desired units by the invention of the dyne; and to do the same for the British system requires one of three alternatives:—(1) To take as unit of mass 32·18 lbs. or (say) a "perry," instead of 1 lb.; (2) to take g (32·18 ft./sec.²) as unit acceleration; or (3) to employ a special unit of force, based directly upon Newton's second law, and upon the pound, the foot, and the second. Any of these conventions will serve: they are only needed for arithmetical interpretation of the equation, and, of them, the last is, in the whole, the simplest for general application, besides being in accordance with the universally adopted metric convention.

ALFRED LODGE.

Coopers Hill, January 18.

PROF. LODGE gives the formula $s = \frac{w}{\rho}$ as connecting the weight, volume, and specific gravity of a body. Does he seriously suggest that this is "independent of every system of units"? Surely it requires that the unit of weight should be the weight of unit volume of the standard substance. Would he give this formula to a student who measured forces in poundals?

The formula neatly illustrates the objection to the poundal. The C.G.S. system is theoretically perfect; the system in which the pound is the unit of force is, no doubt, theoretically objectionable, but is practically extensively used.