hardens to form the conchyolin are independent of each other and may be secreted in varying proportions." Under favourable conditions the secretions of the shell-secreting epidermis are so regulated that nacreous layers are formed. It is possible that under unfavourable conditions, such as a fall in temperature or the want of lime in the food of the animal, only the horny layer is secreted. It is therefore suggested that the brown horny layers found in the pearls of *O. edulis* and on the inner surface of the shell of *O. edulis* are identical.

The occurrence of concentric layers of horny periostracum-like substance in pearls generally and in the shells of oysters and other molluscs may therefore be due to a disturbance in the rhythmic action of the secreting epithelia whereby only the first part of a phase of shell-formation is completed with the oncoming of winter or at the end of a shell-growing period.

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The Absence of a Cellulase in Limnoria.

OWING to the almost invariable presence of fragments of wood in the stomach and gut of the wood-boring isopod, *Limnoria lignorum*, it has been assumed that this animal is capable of digesting cellulose. Thus Calman (Brit. Mus. (N.H.) Economic Series No. 10) states: "*Limnoria* certainly swallows, and probably digests, the wood which it gnaws away to form its burrow, but it is not known whether it has any other source of nourishment." In a report on the Marine Piling Investigation, published in the Bulletin of the American Railway Engineering Association (vol. 28, No. 290, Oct. 1926), the definite statement is made that "the main food of the *limnoria* is the wood into which it bores." No experiments on the digestive powers of Limnoria appear to have been made, and it is never advisable to draw definite conclusions as to the food of any animal from the contents of its stomach, for a great deal of material may be passed through the gut which cannot be acted upon by the digestive enzymes. Though it is known that wood is ingested intracellularly by Teredo which, as shown by Harington (*Biochem. Jour.*, vol. 15, p. 736) and Dore and Miller (*Univ. Calif. Publ. Zool.*, vol. 22, p. 383), possesses a cellulase, it by no means follows that a similar enzyme is present in the crustacean, Limnoria, in which both the alimentary system and mode of digestion are totally different.

In the hope of discovering whether wood can be digested by Limnoria, I carried out a series of experiments during a period of work on behalf of the Sea Action Committee of the Institution of Civil Engineers. Great numbers of Limnoria were collected by placing infected wood in sea water containing 20 per cent. of alcohol, as a result of which the animals came out of their burrows in great numbers and were collected from the bottom of the vessel. They were carefully isolated from other organisms, dried on filter papers and weighed. In the first experiment 2·6 grams of Limnoria (*i.e.* very many hundreds) were collected, and in the second 0·63 grams. They were then ground up with sand and an extract made in toluol water. The action of this extract was tested on sawdust, the digests being incubated at 32° C. for two weeks in the first experiment and for four weeks in the second. Control experiments were carried out with the boiled extract, while in the first experiment the action on starch was also tested. *No indication of any digestion of the cellulose* in wood was found in either experiment, although the starch was quickly digested, the presence of glucose being indicated by means of Benedict's solution.

It appears, therefore, that Limnoria does not possess an enzyme capable of attacking cellulose. Such enzymes are rare in the animal kingdom, as I have pointed out elsewhere (*Science Progress*, vol. 20, p. 242) in a résumé of the literature on the subject. There is, moreover, no evidence of the presence of protozoan symbionts in the stomach of Limnoria, such as are invariably present in the gut of the wood-boring Termites, which enable these insects to extract nourishment from the wood (Cleveland, *Biol. Bull.*, vol. 46, p. 177, and subsequent papers). There remains the possibility of bacterial digestion, but, owing to the difficulty of obtaining sufficient material from the minute stomachs, no experiments were carried out.

Examinations of the stomach contents revealed the presence of a certain quantity of microscopic plants and animals such as diatoms, peridinians, etc., and no doubt more would have been identified but for the triturition of the gastric mill and the action of digestive enzymes in the stomach. There is a large micro fauna and flora on the wood which may quite easily supply the needs of the animals. It would appear at first sight as though this would not be easily obtained in the burrows, but, as recorded by Calman (*l.c.*), Limnoria has been found boring in the insulating covering of a submarine cable in the Mediterranean, so that it obviously can feed in this manner, since it is in the highest degree unlikely that it can digest the substance of the cable! Teredo is never found burrowing in anything but wood (though the giant Teredo apparently spends at least the latter part of its life encased in its calcareous tube buried in the sand), but Xylophaga—an allied genus resembling Teredo in its burrowing apparatus but *not* in the modifications of the gut which enable it to digest wood—has also been found burrowing into the covering of cables.

The amphipod borer, *Chelura terebrans*, resembles Limnoria in all respects. Experiments revealed the absence of a cellulase, there are no symbionts, the stomach contents are similar to those of Limnoria, and it has been found boring into the covering of cables.

There appears, therefore, to be every indication that Limnoria and Chelura bore into wood solely for *protection* and that, though they possess adaptations which fit them for boring, they are not so highly adapted as the Teredinidae, which are alone amongst wood borers—either molluscan or crustacean—in their capacity for actually feeding on the wood into which they bore.

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Nomenclature of the Vertebrate Gut.

IT is, of course, well known to all zoologists that certain names have been applied to structures in different animals without due regard to the real significance either of the name or of the structure, with the result that by now these names have lost their definiteness and with it their scientific utility. This is particularly the case of certain terms used to designate parts of the vertebrate alimentary canal, and this letter is to ask for criticism upon the following attempt to clear up at least part of the matter. Excluding many names which still have a sufficiently accurate meaning for all practical purposes (although they vary widely in significance, as some are simply topographical, others presume a similarity of function, while others again imply a true homology), I want to focus attention upon the terms 'œsophagus,' 'stomach,' 'small and large intestine,' and 'rectum.'

It is obvious that 'stomach' should only be