has been and how much work has been accomplished. About one hundred and fifty new determinations of atomic weights have been made in the last twenty years. Still a great deal more work remains to be done.

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HERMAPHRODITISM IN OSTREA LURIDA.

While doing some work for the United States Fish Commission, during the summers of 1897 and 1898, to determine the possibility of propagating Eastern oysters on the Oregon coast, I had an excellent opportunity to study the question of the sex of this West coast oyster. To the best of my knowledge, this question has never been approached hitherto.

During the spawning season of 1897 individuals emitting sexual products which

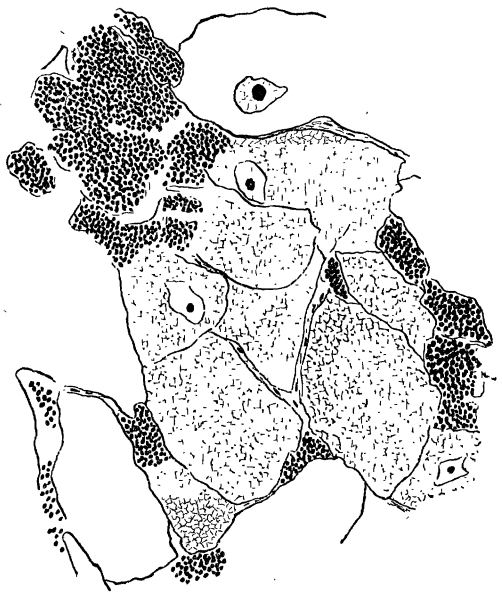

Fig. 1.

proved under a magnifier to be in some cases sperm and in other cases eggs were carefully labelled and separately preserved in different media. As in *Ostrea Virginica*, there is no possibility of mistaking the identity of these sexual products obtained from the visceral mass; even with the naked eye the granular appearance of the eggs is distinct and pronounced, and the thick, creamy consistency of the non-granular male fluid can never be confounded with them.

In my notes for 1897 there is no mention of finding ova mingled with spermatozoa in the examination of living products with the microscope. But, after staining and sectioning a number of individuals, *all of which are labelled males, I almost invariably found ova in the generative follicles*, and amongst them I observed small, deeply-stained bodies in dense masses, which I was led to conclude, even on a preliminary examination, were masses of spermatozoa (see Fig. 1, *Camera lucida* drawing B. & L., O_c 1. Obj. $\frac{1}{6}$). This belief was strengthened on using a $\frac{1}{12}$ hom. imm., by which I could see occasional faint projections from the small bodies referred to, which projections I assumed to be the tails of the spermatozoa, the dots representing the nucleated heads. The finding of ova in these sections was, of itself, startling, for when alive and tested for sex they gave unmistakable evidence of being males. In the figure, which only represents a portion of one generative follicle, four of the ova show germinal vesicles.

This season I gave more particular attention to the microscopic examination of living specimens. The seemingly conclusive results from the study of many individuals is here given. In a specimen of fluid from a male I observed, among free spermatozoa covering the field, collections of sperm cells which I will call 'sperm masses.' Each sperm cell in a mass possessed a tail, and these tails, actively waving to and fro in the salt water under the cover slip, caused the mass to move about. These tails were seen fairly well with a $\frac{1}{6}$ obj. These living sperm masses I regard as identical with the deeply-stained masses seen among the ova

in sections, an example of which is shown in Figure 1. Figure 2 shows free sperm and sperm masses as they appeared in the

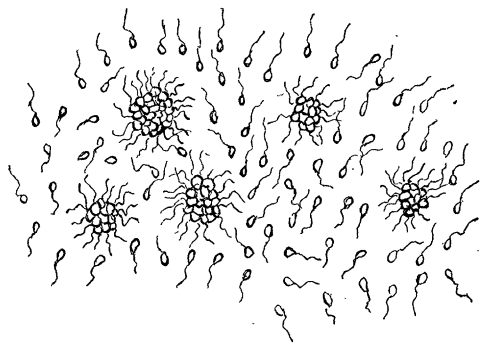

FIG. 2.

field of the microscope. Several oysters, evidently males, were opened with the same results. It yet remained to find living ova in specimens containing spermatozoa in order to more fully support my conclusions as regards the bisexual conditions of this species. This was not difficult, for I shortly discovered in a specimen several immature eggs floating amongst spermatozoa and sperm masses. None of these ova were be-

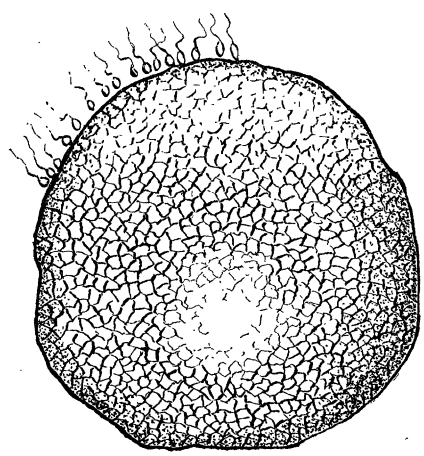

FIG. 3.

ing attacked by the male cells. Later, in a specimen full of spermatozoa, I found a mature egg, completely surrounded by male cells, which were attacking it with great vehemence. Figure 3 (cam. luc. O_c. 1, Obj. $\frac{1}{6}$) shows this egg, the light area evidently denoting the position of the germinal vesicle.

In the drawing only a portion of the periphery is represented as being attacked. We know that in *Ostrea Virginica* the egg does not become round until fertilized. Arguing from analogy the egg shown above has been fertilized.

From the results of the work described above I have no hesitation in declaring that *Ostrea lurida*, the native oyster of the Northwest coast, is hermaphroditic.

In this connection it is interesting to note that Karl Möbius, in 1871, claimed that the sexes of the European oyster, *O. edulis*, are separate at the breeding season (*vide* his 'Untersuchungen über die Fortpflanzungsverhältnisse der Schleswigschen Austern.' In 1877 ('Die Austern und die Austernwirtschaft') he concluded that the sex of the European oyster changes after the reproductive elements have been discharged from the body. He has hardly valid reasons for this conclusion. Professor John McCrady ('Observations on the Food and Reproductive Organs of *Ostrea Virginiana*, with some account of *Bucephalus cuculus*;' Proc. Boston Soc. of Nat. Hist., Dec. 3, 1873) declares that he saw in *O. Virginica*, among small immature ovarian eggs, spermatozoa, separate and in masses, moving about without attacking the eggs and without any apparent change taking place in the young germinal vesicle. *

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* In connection with Professor Washburn's paper it may be desirable to quote the following note, from the Proceedings of the Academy of Natural Sciences of Philadelphia (1892, p. 351), to which Professor Conklin has called our attention. "*The Hermaphroditism and viviparity of the Oysters of the Northwest Coast of the United States.* Professor J. A. Ryder reported on behalf of Professor R. C. Schiedt of Franklin and Marshall College, Lancaster, Pa., the latter's discov-