

has further, by his quantitative investigations of the variations in the plankton of Kiel Bay and off Syracuse, taught us the value of exact studies of this description.

Our future investigations will have to be conducted on three main lines:—

(1) In the first place, much study must be devoted to the biology, in the restricted sense of the word, of the algæ. We will have to learn how the forms adapt themselves to their conditions of life, and in particular to their floating existence. Here, however, a great advance should most certainly be made, now that W. Ostwald has shown us a new factor affecting their floating power, namely, the varying viscosity of sea-water, and since the instructive writings of Wesenberg-Lund have directed our attention to the seasonal modifications which the species adopt to suit variations in viscosity.

Ostwald.

Wesenberg-Lund.

(2) In the second place, the distribution of the species throughout the seas of the world requires further investigation at different seasons, and this must be founded on a careful characterisation of the different species. In recent years the peridineæ, after a long period of neglect, have received due attention at the hands of Ostensfeld, Ove Paulsen, Pavillard, Jörgensen, Broch, and Kofoid. A great deal, however, still remains to be accomplished.

Paulsen.

Pavillard.

Jörgensen.

Broch.

Kofoid.

(3) In the third place, we will have to deal with the laws of production in the sea. This great physiological question calls for observations on a very comprehensive scale, if we are to be in a position to discuss the interesting theories put forward by Brandt, Nathansohn, and Pütter. A brief discussion of their theories will be found at the end of this chapter.

Brandt.

Nathansohn

Pütter.

During the Atlantic Expedition of the "Michael Sars" we were able to make observations on all these three aspects of the subject; and in what follows I shall endeavour to summarise our results, and to consider, while doing so, the attitude at present taken up by the scientific world with regard to these three lines of investigation.

Most of the ocean plants exist in countless myriads of minute individuals, though they are invisible to the naked eye. Still, small as they are, they are in a way highly organised, and their organisation is in strict accordance with the particular conditions of life. On land a higher plant consists of a community of separate cells, each of which has a special function to perform in the service of the whole. It establishes an under-

General biology of the pelagic algæ.