

breathing, and also to supply building material for their growth and propagation. Pütter has endeavoured to find out whether organic matter dissolved in the sea-water does not provide this. He investigated its amount, and got surprisingly high values. Improved methods have enabled Raben to check his experiments; in water from Kiel there were 10.9 to 13.9 milligrams, or on an average 12.25 milligrams, of organic combined carbon per litre of sea-water, and at a station in the Baltic 3 milligrams. These are really high values, if we compare them with the quantities of organic substance we are able to point to in the form of living organisms. Lohmann's studies show that the total amount of the organic combined carbon in the plankton at Laboe in Kiel Bay varied during the year between 12.7 mg. and 189.8 mg. per 1000 litres of sea-water. According to Raben's investigations at a place close by, the mean value of organic combined carbon in dissolved form is 12,250 mg. per 1000 litres, or in other words about sixty times as much.

Too little is known, unfortunately, about the occurrence of organic matter, and there are many difficulties to be overcome before we can look for conclusive results. Perhaps the most discouraging thing is that even the best filters allow a good many organisms to pass through them. The water-samples to be examined ought possibly to be freed from all suspended insoluble matter by means of the centrifuge, but even this method will not always give entirely satisfactory results, since some of the algæ (cyanophyceæ, *Halosphæra*) are lighter than sea-water, while the nimbler animals will swim up from the bottom before one can separate the clear water from the deposit. Pütter's hypothesis, however, certainly deserves to be further tested. If it be really true that in the salt-water of the open sea there is organic substance in sufficient quantities to be compared with what is combined in plants and animals, then this substance must be due to the production of plants. We will accordingly be forced to conclude that the pelagic algæ distribute to their surroundings through their surface comparatively large quantities of organic substance, and that their production is thus in actual fact much more considerable than we are led to believe, when we merely measure what they store up in their cells during growth and augmentation. Even if it seems strange biologically that they should evince such want of economy in regard to valuable nutritive matter, it would be unwise to reject the hypothesis, and the best plan is to await the results of continued investigations. Some