tion of this compound by X-ray analysis. It seems likely that this synthetic approach may prove useful in other still more complex investigations of natural products.

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An Effect of Antibiotics produced by Plankton Algae

THE clear blue oceanic water in the tropics and subtropics, where the standing crops both of phytoplankton and zooplankton are extremely low—the reason why the water is so clear and blue—should on this account show very low organic productivity by the plankton algae. Measurements with the carbon-14 method have shown this to be true¹.

So-called 'light-and-dark bottle' oxygen experiments by Riley², verified by other workers, seem, however, to indicate that the areas with the clear, blue water should be some of the most productive sea areas of the world. Steemann Nielsen³ therefore rejected the use of the oxygen method in clear oceanic water. The difference in oxygen consumption between light and dark bottles, which was assumed by Riley to be due to photosynthesis, may have nothing to do with this process. It was suggested that antibiotics produced by the plankton algae in the light reduce the intense bacterial activities occurring in the dark bottles as soon as natural sea water is enclosed in bottles. In ocean water from all depths, about 5 mgm. organic matter is present per litre. The intense bacterial activity does not occur if the water is *in situ* (Keys, Christensen and Krogh⁴). The presence of the surface at the inner walls of the bottles is responsible for the bacterial growth⁵.

Laboratory experiments with the freshwater green alga *Chlorella pyrenoidosa* and the marine diatom *Thalassiosira nana* have now produced the experimental background for this suggestion. Two of these experiments are presented below.

(1) Normal culture medium for *Chlorella* containing 8 mgm. glucose and 4 mgm. peptone per litre was incubated with bacteria, and a definite very small number of *Chlorella*. The rate of photosynthesis per cell was measured in advance in a special experiment using a higher concentration of the alga but the same oxygen technique as in the main experiments. Normal 'light-and-dark bottle' oxygen experiments were carried out here lasting three days including three light periods (44 hr. altogether) alternating with three dark periods. The rate of photosynthesis during the whole experiment, computed from the special experiment and corrected for growth, was 0.024 ml. oxygen per litre.

Oxygen consumption in dark bottles 3.59 ± 0.02 ml. oxygen per litre
Oxygen consumption in light bottles 2.92 ± 0.03 ml. oxygen per litre
Reduction in oxygen consumption in
light bottles compared with dark
bottles 0.67 ± 0.04 ml. oxygen per litre

The oxygen consumption in the dark bottles is due to the respiration by the bacteria. The rate of this respiration is thus reduced in the light bottles. It is evident that the difference between the light and the dark bottles is not due to *Chlorella* photosynthesis, which constitutes only 3–4 per cent of this difference. In a corresponding series made simultaneously with bacteria but without *Chlorella* added, the oxygen consumption was the same in the light and in the dark bottles.

(2) Similar experiments were carried out with a culture of the marine plankton diatom *Thalassiosira nana* inoculated with bacteria from the Sound. In a 'light-and-dark bottle' oxygen experiment lasting three days (48 hr. in the light), oxygen consumption was 4.96 ml. per litre in dark bottles and 4.34 ml. in light bottles. The reduction in light bottles compared with dark bottles was 0.62 ml. oxygen per litre. According to experiments made with a 300-times higher concentration of the diatom during 4 hr., the rate of photosynthesis per 48 hr. in the main experiment—corrected for growth—was 0.035 ml. oxygen per litre. Photosynthesis presents thus only 5.7 per cent of the difference between the light and dark bottles.

The experiments presented show that the presence of algae, presumably due to production of antibiotic, effects a reduction in the oxygen consumption of the bacteria in the light bottles. The production of antibiotics by plankton algae has been shown, for example, by Pratt *et al.*⁵. It was verified during the present investigation that antibiotics may be found in filtrates from algal cultures.

Whereas in oligotrophic water in Nature the reduction of bacterial respiration due to antibiotics makes the oxygen technique inapplicable for measuring organic productivity, the influence in eutrophic water must be very limited.

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A Possible New Vitamin A₁ Isomer in the Eyes of Crustaceans

IN a recent communication, Kampa¹ reports a new photosensitive pigment in the eyes of euphausiid crustaceans. This prompts the recording of some observations at this laboratory from a series of investigations of vitamin A components in marine animals.

During this investigation we recently obtained a fresh sample of the deep-sea prawn, *Pandalus borealis*. The vitamin A content of the eyes of this decapod was determined by our routine method, namely, chromatography of the unsaponifiable matter mainly according to Gridgeman *et al.*². The ultra-violet absorption curve departed to the left from the expected vitamin A₁ curve, $E_{310m\mu}/E_{325m\mu} = 0.926$, $E_{335m\mu}/E_{325m\mu} = 0.823$, and $E_{350m\mu}/E_{325m\mu} = 0.424$. The vitamin A content was 150 i.u. per gm. fresh tissue. No vitamin A₂ was present, $E_{693m\mu}/E_{613m\mu}$ in the Carr-Price reaction being 0.005.