Ingenious methods were devised to photograph the tidal movements at fixed points and also the variations in the surface currents. The currents at a specified depth were also observed.

Two main experiments were carried out:—

1) In which currents only were generated.

2) In which both currents and vertical oscillations were generated.

It was noted that in the two experiments, though the range and phase of the wave motion were very different, the modes of horizontal oscillation at the surface and also the arrangement of the small vortices were more or less the same. This was surely due to a masking of the currents from the vertical displacements by those which were generated.

A comparison between the results of the model and the tides in Sagami Bay raises one interesting point regarding the reliability of such models. When ranges and phases change fairly rapidly in nature a model may be expected to show similar rapid changes, and attention may be concentrated on this apparent and even spurious "agreement" to the exclusion of consideration of the differences.

In the case of Sagami Bay the tidal range is almost constant, ranging from 80 cm. on the west coast to 68 cm. on the north-east coast, and the tidal currents run across the mouth of the bay in a north-easterly direction. Consequently the difference in range may be expected on account of the earth's rotation. The model, therefore, should be expected to reproduce practically a constant range of tide over the bay. Similarly the phases of the tidal oscillation range from 159° in the west to 130° in the east. Now the experiments do not reproduce a constant range of tide over the bay, but in the first experiment the observed range increases progressively to the north and ranges from 50 % to 150 % (approx.) of the mean range. In the second experiment the variation of range is less, from 80 % to 120 % of the mean.

Again the experiments indicate a phase which increases (not steadily), from south-west to north-east, though this is opposite to the change indicated by observation.

It is thus difficult to agree that the tidal motion has been reproduced qualitatively.

R. H. Corkan.

G. M. Spooner. "Observations on the Reactions of Marine Plankton to Light". Journ. Mar. Biol. Assoc. N. S., Vol. XIX, No. 1. Plymouth, 1933.

It has been known for a long time that marine plankton organisms show very strongly phototactic responses under laboratory conditions. The vertical migrations of the plankton, which have been investigated during the last few years specially by F. S. Russell at Plymouth, are mainly due to changes in intensity of light. It is highly probable that the vertical movements of a plankton population are due to the individual phototactic responses of the units composing it. The aim of Spooner's work is to establish the basis for a physiological explanation of the vertical movements. The fact that organisms assemble in the illuminated part of a vessel may be due either to the directing influence of the light-rays or to the influence of differences in light intensities in different parts of the vessel. The same alternatives are valid for photo-negative behaviour. The author succeeded

by special experimental devices in separating these two different factors. In a parallel beam of light the approach to the light is accompanied only by a very slight change of intensity. "In a convergent beam of light the light intensity diminishes toward the source of light". "In a gradient of light given by a filter increase of intensity can be opposed to direction; the light source can be made to diminish as the animal moves toward it; both direction and change of total intensity can be eliminated by opposed parallel beams; while direction is eliminated but change of intensity maintained if a convergent is opposed to an exactly similar divergent beam". To these different experimental arrangements were subjected numerous species of Copepoda, nauplii of *Balanus*, larvae of decapods, young larvae of the herring, small Polychaet larvae, *Sagitta elegans*. The results showed that all these different animals moved in the direction of the light-rays quite irrespective of accompanying changes of light intensity. They moved toward the source of light in a parallel or convergent beam of light as well as in ordinary divergent light. If a convergent beam was opposed by a divergent beam of corresponding intensity (change of intensity preserved, but direction eliminated), some of the species lose orientation, others still orientate to one of the sources. If a gradation of intensity is opposed to direction of light, the animal follows the direction of the light, though not moving toward the bright end of the vessel. It chooses therefore the path of incidence of light, but not the path of increasing intensity. The removal of the intensity factor did not noticeably affect their capacity for movement in the direction of the light-rays. In most of the animals studied the movement takes place in the direction of incidence of the light and may be regarded as "true topotaxis" (orientation in an excitation equilibrium for symmetrically placed receptors).

The daily vertical migrations of the plankton are due to change in light intensity and are explained as movements toward an optimum of light intensity. It can be concluded from observation of movements of plankton animals in the laboratory that under natural conditions in the sea the optimum is reached by topotactic behaviour. "Positive phototaxis is of itself sufficient to bring animals from low intensities toward their optimum." "When the light intensity increases beyond the optimum one must suppose, in so far as light conditions regulate behaviour, either that the animal becomes negatively topotactic or that movement is inhibited and the animals sink back into their optimum zone."

G. Fraenkel.

T. J. Hart. "On the Phytoplankton of the South-West Atlantic and the Bellingshausen Sea, 1929—31." Discovery Reps. Vol. VIII, pp. 1—268. Cambridge, 1934.

Das Material dieser Bearbeitung des antarktischen und subantarktischen Phytoplanktons wurde auf einer grossen Anzahl von Einzelfahrten in den Jahren 1930 und 1931 gewonnen. Der Untersuchung liegen Fänge mit dem G r a n'schen Netz von 50 cm. Durchmesser aus feinster Gaze zu Grunde, die sich regelmässig von 100 m. Tiefe bis an die Oberfläche erstreckten. Sie betreffen zunächst die Umgegend von Südgeorgien, wo eine Anzahl radial angeordneter Fahrten ausgeführt worden sind, ferner die Scotiasee, die Weddellsee, die Bransfieldstrasse und die Bellingshausensee, in denen weniger