

salter water, on the other hand, such a cell will give off water ; its volume will decrease, and it will attain a higher specific gravity. These alterations will, however, react on the surface resistance of the cell and influence its relations to the viscosity of the water, as we shall subsequently see.

These three elements—specific gravity, viscosity, and osmotic pressure—constitute the external conditions governing the faculty of floating at different depths. Ostwald has in various ways attempted to explain many of the peculiar features of pelagic organisms. He cites instances from interesting experiments made by Chun, Verworn, and Brandt, showing how organisms decrease in size and volume with increasing salinity, when sea-water evaporates in open vessels. The animals sink when the sea-water is diluted with fresh water, and rise towards the surface when the salinity increases. After some time the difference in osmotic pressure becomes adjusted, so long as the difference between the cell and its surroundings has not been too great. These ideas due mainly to Chun and Ostwald have, during recent years, largely stimulated the scientific world to study the influence upon organisms of variations in the external conditions.

All groups of pelagic plants and animals are now known to have a wonderful power of adaptability pertaining to their faculty of floating in surroundings of varying specific gravity, viscosity, and osmotic pressure. As regards the pelagic plants, Gran has in Chapter VI. mentioned some important and characteristic instances of the alterations in shape to which certain plants are subject in various waters. When dealing with the various groups of pelagic animals I mentioned a few instances of the differences in the general characters of the animals as to shape, size, and appearance in warm and cold waters.

The various means adopted by different organisms in order to increase their faculty of floating may perhaps be classified as follows :—

(1) Certain organisms seek to diminish their specific gravity by secreting and depositing specifically light substances in their cells. A very important part is here played by the fats and oils, which are also of enormous importance as a reserve food for the animals in question. From the radiolarians to the whales, the fats are of great significance to pelagic life. In the crustaceans, for instance the northern *Calanus finmarchicus*, in fish eggs, which frequently possess oil-globules, in fishes and in pelagic mammalia, the fats are specially important.

Floating devices.

Secretion of fat.