Absorption of water.

Numerous forms absorb water to such an extent that their water-contents may amount to 90 per cent of the whole organism, as in the medusæ, ctenophores, and many fish eggs. In fish eggs chemical analysis shows how the amount of water decreases during development, and how this decrease continues as the larvæ seek deeper water and finally settle on the bottom. Salpæ and Pyrosomidæ with large soft integuments also contain a high percentage of water.

Air-bladders.

All the forms living in the surface waters of the sea, which have developed special floating devices in the shape of air-bladders or bells, may also—at all events in order to avoid a too formal classification—be ranged into this group. These remarkable devices are specially noticeable in the wonderful group of the siphonophores. The air-filled lungs of whales and seals and the air-bladders found in most fishes are also instrumental in diminishing the specific gravity of these animals.

(2) A reduction of the specific gravity of the kind mentioned above must necessarily reduce or abolish the surplus gravity, which tends to make the animals sink. But even if a surplus gravity is present they will float, if they can offer a sufficient amount of surface resistance, which may be effected either actively by swimming, or passively as a consequence of the shape of the body.

In order to understand the various and complicated adaptations within this field, we should have to compare the various types of shape found in pelagic animals. I will at present limit myself to pointing out the main laws as laid down by Ostwald and Chun. In considering surface resistance two points are essential: (1) the size of the organism, and (2) the shape of the organism.

If we take two bodies, for instance two balls, consisting of the same substance but with different diameters, and let them sink in the same fluid, the larger one, that is, the ball in which the relation between surface and volume is smallest, will sink the faster; thus the smaller the body the slower will it sink. Ostwald terms the relation between surface and volume the "specific surface," and gives the above-mentioned fact in the following words: "small bodies sink slower than similar large bodies which have the same surplus gravity, because their specific surface is greater."

Specific surface.

Next it is important to take into account the diameter of organisms transverse to the direction in which they sink. A thin plate sinks much faster in a vertical than in a horizontal