

thread of undifferentiated protoplasm. From the surface of a cell there may project one to fifty cilia. This surface may appear like a hyaline layer, but it is a false appearance, and is due to the swollen bases of the cilia. Each cilium, indeed, is enlarged at its base, but narrows immediately above. This narrow neck is succeeded by a swollen portion which gradually becomes attenuated towards the tip. They vary in length, those 1-3000th of an inch long being of medium size, some are shorter, others longer. Vigorous lashing movements are characteristic of cilia. The movements are too rapid to be distinctly seen, the vibrations being usually 700 to 800 per minute.

If a fragment of the ciliated lining, say the mucous membrane from the roof of a frog's mouth, be microscopically examined in normal salt solution, the surface shows an unceasing shimmering appearance, comparable to a rapidly waving field of barley. Each cilium, it has been found, is erect and straight. Then it bends rapidly on itself, and, very much more slowly, resumes the straight condition. The force of the vibrations is in one direction, and as successive rows of cilia do not bend simultaneously, but in regular succession, the result is a progressive rhythmic undulation. When the cilia are arranged in a circle or crown, as in a Rotifer, say *Meliceria*, the appearance produced is that of a swiftly rotating wheel. Hence the Rotifers have been erroneously called wheel-animalcules.

The vibrations of the cilia continue for some time after death : but, in an injured, feeble, or dying condition, they are abnormally slow, and can then be best observed. Heat (up to 104° F.) increases their vigour, carbonic acid gas arrests them, while under the influence of oxygen, and of induced electrical currents, the vibrations may be repeatedly revived. They are independent of nervous control. They are automatic and as inexplicable as the inherent contractibility of muscle. Ranvier's experiments, indeed, show that the living protoplasm, of which cilia are composed, is essentially the same as that of ordinary protoplasmic cells.