and that in the cœlomate phase a fleshy ectosome replaces a membranous ectoderm. This substitution is accompanied by an increasing complication of the sensori-motor system and, in the segmented invertebrates (annelids and arthropods), the ventral portion of the ectosome includes, besides the body wall, the ventral nerve-chain. In the frog the ventral ectosome comprises the skin, the subcutaneous lymph space and the abdominal musculature.

In the simplest living cœlenterate animal, the freshwater polyp, *Hydra*, the largest cells of both ectoderm and endoderm are drawn out at their juxtaposed bases into smooth, contractile filaments called muscle-processes or Kleinenberg's fibres, those of the ectoderm running lengthwise, the others around the body. Such cells, combining the qualities of epithelial and muscular elements, are called epithelio-muscular cells ('myoepithelial cells'; 'musculo-epithelial cells'; 'muscle-tail cells'). Their muscle-processes are comparable to the axial filament ('myophan axis'), which is a prolongation of the ectoplasm, in the contractile stalk of Vorticella, the bell animalcule. The passage from an epithelio-muscular to a dermo-muscular condition of the body wall, though we cannot comprehend its *modus operandi*, is nevertheless suggestive and easily grasped by the imagination.

Kleinenberg's fibres

Myophan ('muscle-seeming') mechanisms represent the beginnings of muscular contractility, and it is worthy of note that they exist in some Protozoa side by side with ciliary mechanisms, as in *Vorticella*, which has a permanent stalk, and in *Stentor*, the trumpet animalcule, which has the power of temporary fixation. *Vorticella* procures its food by ciliary action; *Stentor* does that and also swims freely by the same mechanism. Muscular contractility, in its earliest manifestations, is thus intimately bound up with the relation or reaction of the organism to the substratum; whilst ciliary action has opposite tendencies. In *Vorticella* the cilia are confined to the rim of the bell-shaped body *Hydra*, with its sedentary habit and looping gait, has no vibratile cilia at the surface. Amongst higher forms we find, in the order of development, that the ciliary precedes the myophan period, the latter not coinciding with the *gastrula* or cœlenterate phase, but commencing only after the establishment of the cœlomate ('myocœlomic') phase.

Myophan mechanisms

In every cell of the Metazoon or multicellular animal, and probably in the Metaphyta (multicellular plants) as well, the distinction between ectoplasm and endoplasm can be more or less clearly drawn, and, in many tissues, the ectoplasm is produced into intercellular bridges connecting neighbouring cells together. These are seen at their best in *Volvox*, the globe animalcule or sphere alga, whose free-swimming revolving spheres consist of numerous biflagellate zooids assembled in a common mucilaginous matrix surrounding a central cavity containing water. It is undecided whether *Volvox* stands at the threshold of the Metazoa as some would have it [cf. Richard Hesse: *Der Tierkörper als selbständiger Organismus*, Leipzig u. Berlin (B. G. Teubner), 1910, p. 502] or whether it is a downright green alga. In *Principles of Botany*, by Joseph Y. Bergen and

Intercellular bridges