

describe development in cellular terms. Some of the steps in this endeavour are of great historical moment, and must be discussed separately.

Although Schwann and Schleiden clearly recognized that every multicellular organism, reproduced in the ordinary way, begins its individual life as a single cell, or, in other words that *the ovum is a cell*, this momentous conclusion required extension and corroboration. In 1828 Von Baer had discovered the mammalian ovum, and in 1861 Carl Gegenbaur demonstrated that the egg of every vertebrate animal is a single cell. Studies of invertebrates yielded the same result, and the discovery of the egg-cells of plants soon followed. Subsequent research has had nothing to add to this simple but fundamental fact; it has concerned itself with the organization of the egg and with the problem of its origin.

As far back as 1677 Louis de Hamen or Ludwig Hamm, a pupil of Leeuwenhoek, observed the spermatozoa of animals, and Hartsoeker claimed a priority of three years. This matters little, however, for neither understood what he saw. For long afterwards these essential male elements were regarded by many as parasitic animalcules wholly unrelated to development (hence the name "spermatozoa"), while other observers, nicknamed "spermatists" or "animalculists", believed them to be the earliest stages of the young animal, which found the nourishment necessary for development by entering the egg. Even Von Baer (1835) was inclined to interpret the spermatozoa as minute parasites peculiar to the male fluid; Johannes Müller seems also to have been in doubt; and Richard Owen included them in his article on "Entozoa" (internal parasites) in Todd's *Cyclopædia of Anatomy and Physiology*.

In 1786 Spallanzani showed that the sperms were essential to fertilization, since the filtered fluid was impotent; in 1837 R. Wagner emphasized their constant presence in all sexually-mature males; Von Siebold demonstrated their presence in the invertebrates; in 1841 Kölliker demonstrated their cellular origin in

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