

Ovism

Ovism was one of two models of preformationism, a theory of generation prevalent in the late seventeenth through the end of the eighteenth century. Contrary to the competing theory of epigenesis (gradual emergence of form), preformationism held that the unborn offspring existed fully formed in the eggs or sperm of its parents prior to conception. The ovist model held that the maternal egg was the location of this preformed embryo, while the other preformationism model known as spermism preferred the paternal germ cell, as the name implies.

The beginnings of ovism are found in the work of William Harvey, the sixteenth century anatomist who discovered circulation. While Harvey himself adhered to the theory of epigenesis, the research he performed on eggs in other animals convinced him that all animals involve eggs at some point in their reproductive cycle. He coined the Latin phrase *ex ovo omnia* ("from the egg, all") to describe this idea, and his work influenced future scientists to place more importance on the maternal contribution to generation than the paternal.

However, Harvey's work did not establish that offspring are present in the maternal egg prior to fertilization, or that the adult structure exists fully formed rather than emerging gradually. These two principles, central to the theory of ovism, were first established by Marcello Malpighi and Jan Swammerdam. Malpighi worked with chicken eggs at early stages of incubation, and observed under the microscope well-formed organs and structures that already resembled the chick they would become. Swammerdam did extensive research with metamorphic insects. He treated late-stage larvae of silkworms in a boiling vinegar solution, and then discovered upon dissection that the structure of wings, legs, and other parts of the adult silk moth were clearly visible, as though the adult form were simply contained within the larval form. This demonstration, reported by observers from the time to be very dramatic, convinced many scientists that form did not organize itself gradually, as it would under epigenesis.

The ovist model was further supported by the discovery of parthenogenesis by Charles Bonnet (published in *Traite d'insectologie*, 1744) and by the work of ovism's greatest champion, Albrecht von Haller. Observing that female animals as complex as salamanders give birth to young without ever needing to be fertilized by a male, Bonnet concluded that the offspring must necessarily exist totally within the egg of the mother. He hypothesized that the task of the seminal fluid was to open the egg, spurring it to start growing. In parthenogenetic animals, he wrote, the mother provided this fluid to herself. Bonnet's contemporary Haller examined young chicken embryos under the microscope and formulated the "membrane continuity proof" of preformationism. Noting that the yolk appeared to be attached to the embryonic chick's small intestine, Haller pointed out that the embryo must be created at the same time as the yolk, and that since unfertilized eggs also have yolks, the embryo must exist there prior to fertilization.

One of the last supporters of ovism was Lazzaro Spallanzani. In the 1780s Spallanzani conducted experiments with unfertilized frog eggs and progressively more filtered frog semen. To those who read them now, many of Spallanzani's experiments point clearly to the information that spermatazoa are necessary for fertilization, but he never drew this conclusion himself, instead becoming further convinced that the egg contained a fully-formed tadpole that only needed to be fertilized with seminal fluid to begin the process of unfolding. Indeed, when he discusses this work in his *Experiences pour Servir à L'Histoire des Animaux et des Plantes*, he uses the words tadpole and egg almost interchangeably.

Ovism saw its heyday in the middle to late eighteenth century, but by the turn of the nineteenth century, it had fallen out of fashion. However, the work done by ovist naturalists promoted the study

of the egg and thus greatly increased the understanding of the process of embryonic development.

Sources

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