

Competing conceptual schemes

Mechanistic Vs Organic view

Reproduction sexual Vs sexual repr
and asexual (spontaneous
generation)

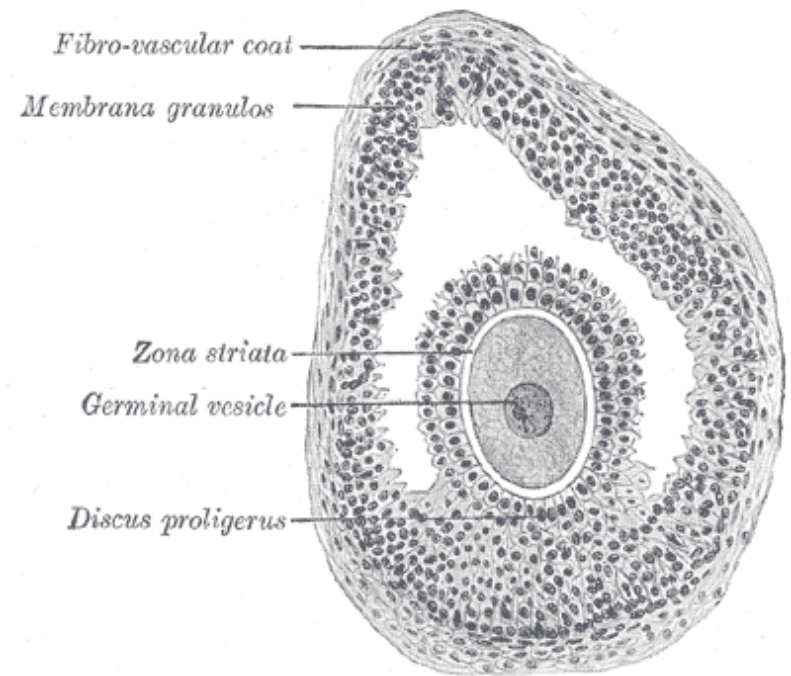
Male and females contribute to
offspring Vs male contribute soul,
female passive material

- Horowitz, Maryanne Cline 1976. Aristotle and Woman. *Journal of the History of Biology*, 9, No. 2 (Autumn, 1976), pp. 183-213.

Regnier De Graaf. 1641 to 1673.
Physician. Holland



Graafian follicles



William Harvey 1578 to 1657

- Considered that all life came from eggs. So rejected spontaneous generation and asexual generation.



What about the sperm?

- Harvey unable to find physical trace of sperm in uterus after copulation. Posited that sperm contribute the spirit or fertilizing aura to the embryo, but no material element.
- Most scientists were ovists...

17th century

- Mechanistic views tended to be preformationist.
- Like a Russian doll, each germ has the germ of all future embryos within.



Renee Descartes 1596 to 1650, France, Holland

- Mechanist. Believed all cause was mechanical in animals. Attributed free will to humans only.



Nicolas Malebranche 1638 to 1715.
French priest



Nicolas Malebranche. De la recherche de la verite. Paris 1673.

- “We may with some sort of certainty affirm, that all trees lie in miniature in the cicatride of their seed. Nor does it seem less reasonable to think that there are infinite trees concealed in a single cicatride since it contains not only the future tree whereof it is the seed, but also an abundance of other seeds which may all include in them new trees still, and new seeds of trees and thus *in infinitum*...”

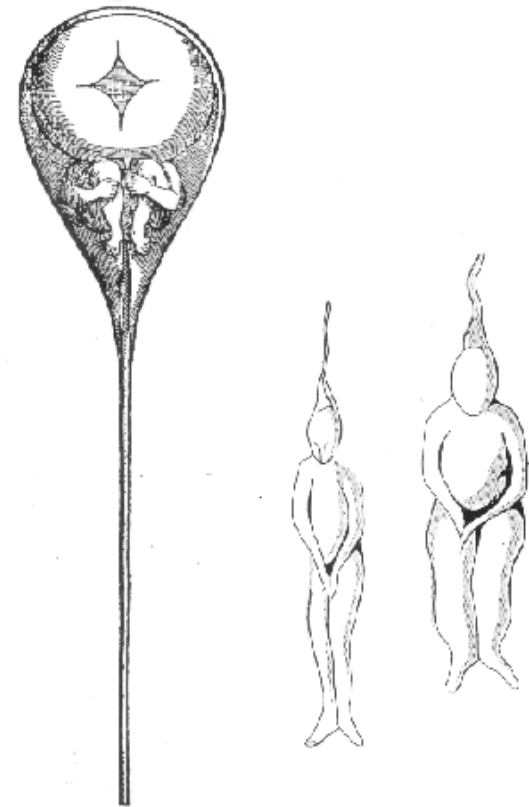
But Leeuwenhoek did find sperm.

- Recognized them as living things similar to animalcules he'd seen using his microscope.
- Concludes that human embryos develop from sperm; relegated eggs to supplying material only.



Nicolas Hartsoeker 1656 to 1725. Dutch. Physician, mathematician

- First postulated and illustrated the homunculus in sperm



Problems with spermism

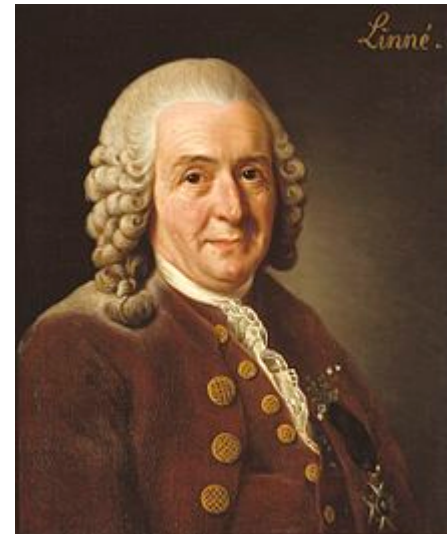
- Most sperm do not contribute. Waste
- Most educated observers were ovists rather than spermists.

The Homunculus, Sir, in however low and ludicrous a light he may appear, in this age of levity, to the eye of folly or prejudice;—to the eye of reason in scientific research, he stands confess'd—a Being guarded and circumscribed with rights.—The minutest philosophers, who by the bye, have the most enlarged understandings, (their souls being inversely as their enquiries) shew us incontestably, that the Homunculus is created by the same hand,—engender'd in the same course of nature,—endow'd with the same loco-motive powers and faculties with us:—That he consists as we do, of skin, hair, fat, flesh, veins, arteries, ligaments, nerves, cartilages, bones, marrow, brains, glands, genitals, humours, and articulations;—is a Being of as much activity, —and in all senses of the word, as much and as truly our fellow-creature as my Lord Chancellor of England.—He may be benefitted,—he may be injured,—he may obtain redress; in a word, he has all the claims and rights of humanity, which Tully, Puffendorf, or the best ethick writers allow to arise out of that state and relation.

Now, dear Sir, what if any accident had befallen him in his way alone!—or that through terror of it, natural to so young a traveller, my little Gentleman had got to his journey's end miserably spent;—his muscular strength and virility worn down to a thread;—his own animal spirits ruffled beyond description,—and that in this sad disorder'd state of nerves, he had lain down a prey to sudden starts, or a series of melancholy dreams and fancies, for nine long, long months together.—I tremble to think what a foundation had been laid for a thousand weaknesses both of body and mind, which no skill of the physician or the philosopher could ever afterwards have set thoroughly to rights.

Carl Linnaeus 1707 to 1778. Sweden

- Both egg and sperm contribute to embryo.
- Consider cross between donkey and a horse; why should it have characters of both parents?



Cannabis grown without male plants



Pierre Louis Maupertius 1698 to 1759.
France. Mathematician, Philosopher



Georges Louis LeClerc Buffon.
1707 to 1783. French.
Mathematician, naturalist,
encyclopaedist

- Rejects preformation:
 - Rejected infinite divisibility of egg or sperm.
 - Introduced a corpuscular theory whereby organism decay to organic molecules at death; these molecules are used to construct new organisms.



Buffon's experiment

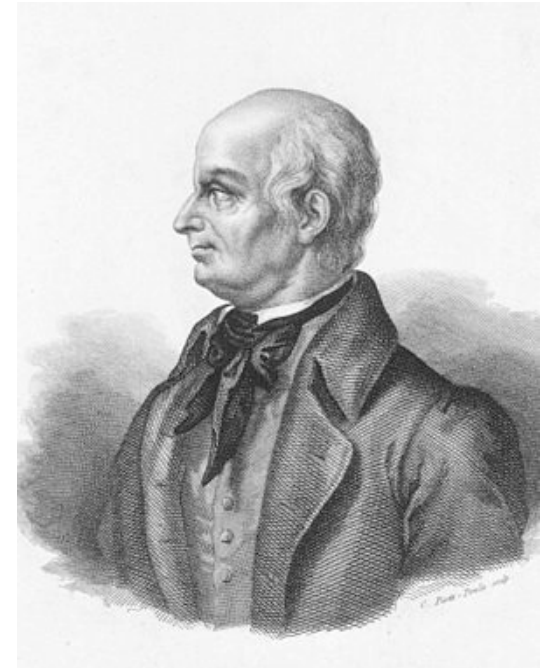
- Ejaculate into test tube
- Examine a few days later.
- Discovered all kinds of little animalcules.

- His interpretation: non living sperm had formed into creatures which were actively metamorphosing.

Lazzaro Spallanzani 1729 to 1799. Italy

- Attached frog eggs to a watch glass suspended over frog semen.
- Also attenuated effect of semen by passage through filter paper.

Only when eggs detached and placed in fluid did they develop.



Expmts with Basil



Caspar Wolff 1735 to 1794, Germany

- Detailed study of development using chicken embryos.
- Careful description revealed a gradual unfolding of order from no order to embryonic to adult.
- Describes leaf like layers of tissue which eventually become more ordered



Karl Ernst Von Baer. 1792 to 1856

Estonia

- Studied development of many organisms in detail
- Epigenesis: order comes from nonorder
- Thus each embryo is a new formation.



Baer's Laws

- **General characteristics** develop **before special** characteristics.
- **General structural relations** are likewise formed **before** the most **specific** appear.
- The form of any given embryo does not converge upon other definite forms, but separates itself from them.
- The **embryo** of a higher animal form never resembles the **adult** of another animal form, such as one less evolved, but only its embryo.

By early 19th century

- Epigenesis was becoming generally accepted over preformationism.
- Both egg and sperm were becoming recognized as important in development (though exactly how they contributed was still unclear)