

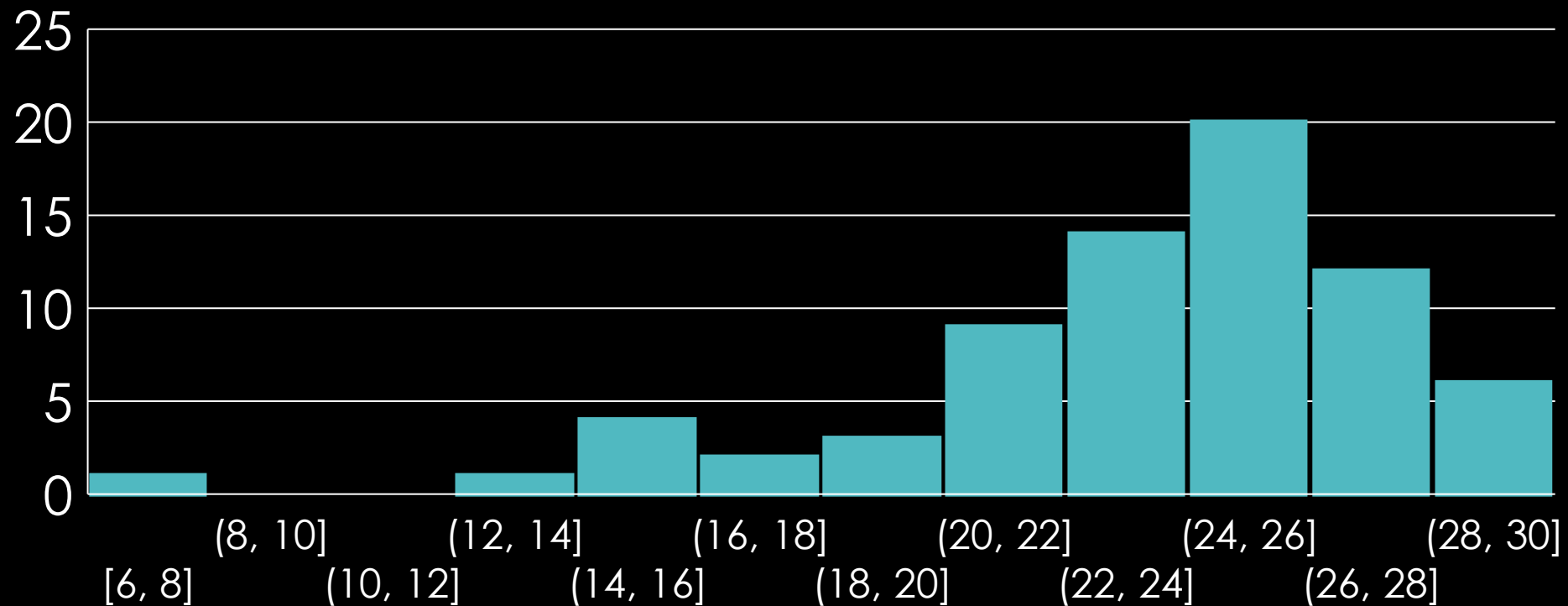
# HPS208 – How we think about life

# Second Essay

Explain one traditional position on the nature of life, and relate it to an issue of importance today. Explain how the traditional position can inform our current understanding, and/or how our current understanding sheds light on the historical position.

# Mid-Term Results

Avg = 24.3/30 (78%)



- 
- ▶ Preformationism
  - ▶ Epigenesis
  - ▶ Embryonic Development

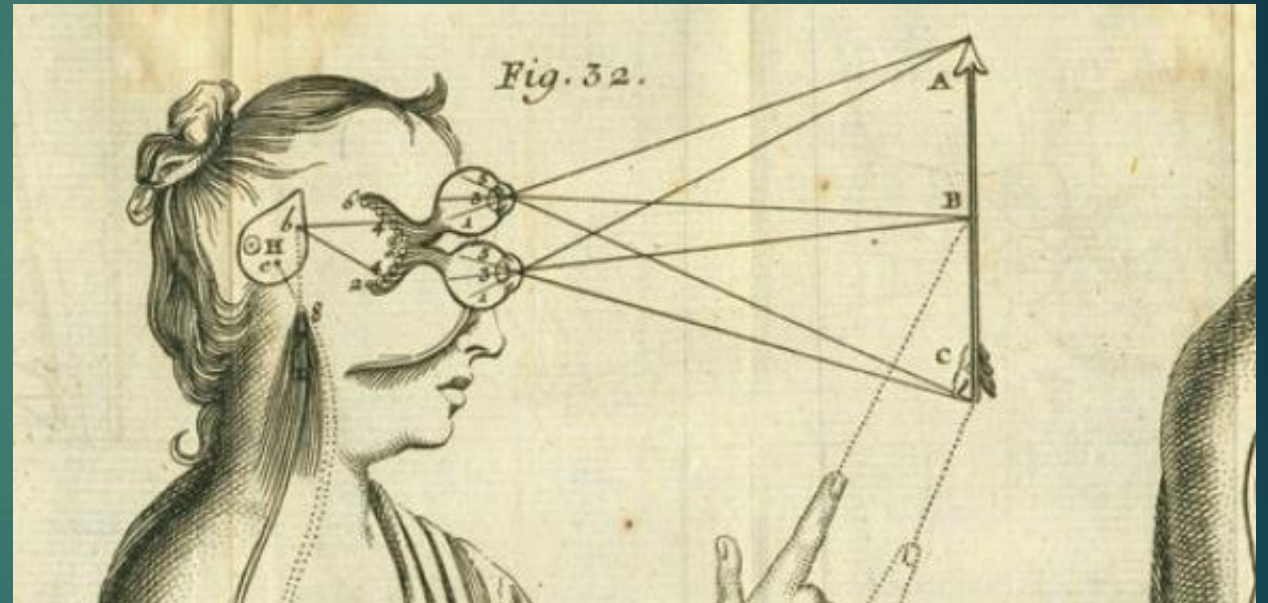
# Review

- ▶ Last week we talked about the history of mechanism
- ▶ Mechanism replaced the Aristotelian worldview (mostly)
- ▶ And while mechanism seems to have been a really good framework for thinking about physics, it left something to be desired when applied to living things



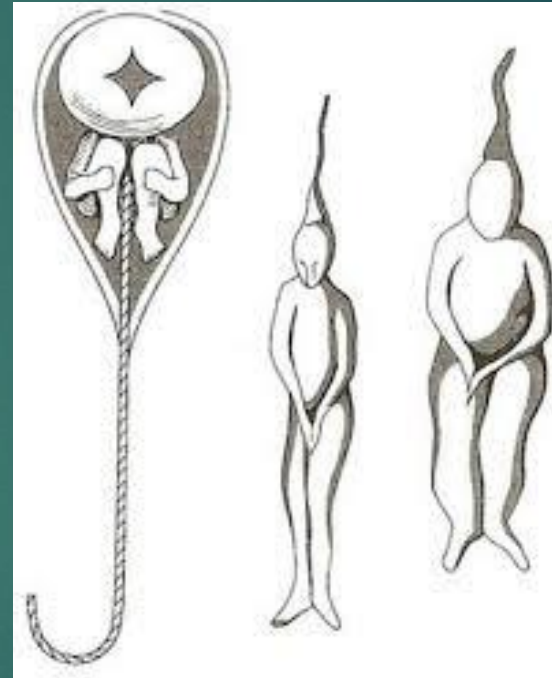
# Cartesian Dualism

- ▶ Descartes specifically thought it was impossible to explain human minds mechanistically
- ▶ But he was pretty ok with the idea that the rest of life could be explained mechanically



# This week

- ▶ This week we'll talk about some struggles to reconcile mechanism with what was known about living things
- ▶ Lots of features of life are hard to explain mechanically, but we'll focus specifically on embryonic development
- ▶ This remains pretty hard to explain to this day!





# Embryology in Aristotle

- ▶ Aristotle reports having studied the development of embryos by opening chicken eggs, one per day of development
- ▶ He saw development in terms of matter and form
- ▶ Sperm provides the efficient cause, final cause and form, while eggs provide the matter





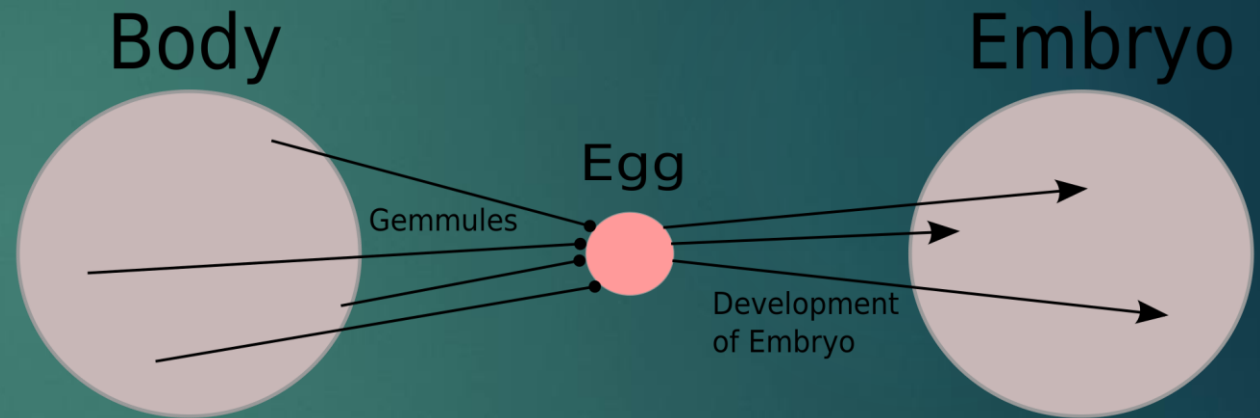
# Embryology in Aristotle

- ▶ He saw development as the form of the animal imposing itself on unstructured matter
- ▶ And development is guided by its purpose, the development of the adult animal



# Pangensis

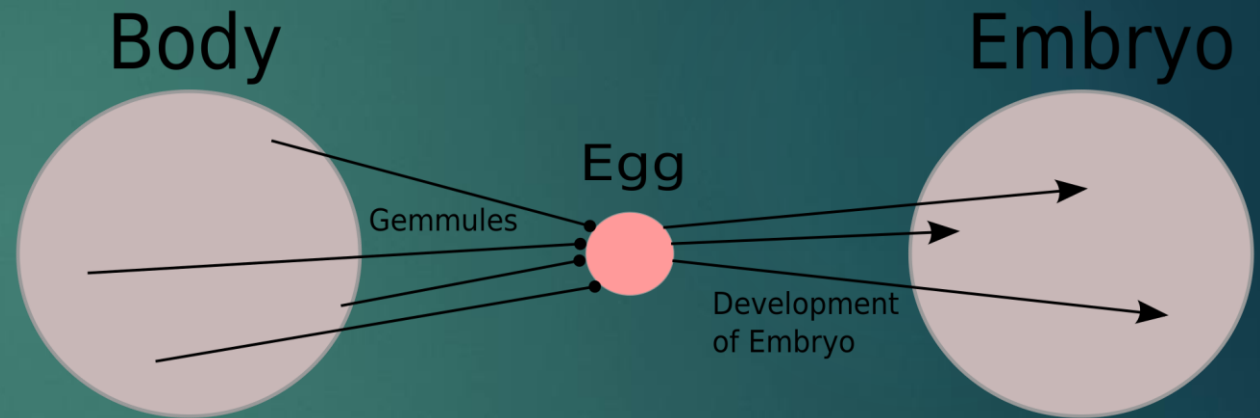
- ▶ Aristotle's theory was opposed to others from around the same time
- ▶ E.g., Hippocrates argued for pangenes
- ▶ That is the idea that every part of the adult body contributes something to the sperm or egg, and it is those contributions which give it form



# Pangensis

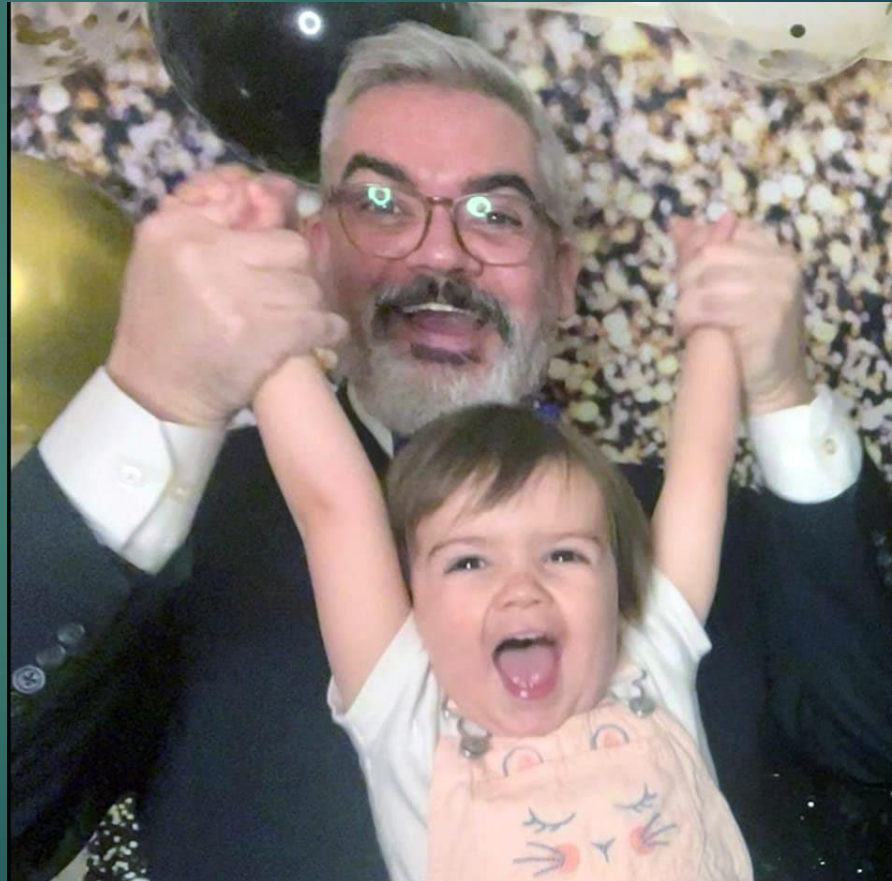
"The races that differ but little from one another I will omit, and describe the condition only of those which differ greatly, whether it be through nature or through custom. I will begin with the Longheads.<sup>1</sup> There is no other race at all with heads like theirs. Originally custom was chiefly responsible for the length of the head, but now custom is reinforced by nature. Those that have the longest heads they consider the noblest, and their custom is as follows. As soon as a child is born they remodel its head with their hands, while it is still soft and the body tender, and force it to increase in length by applying bandages and suitable appliances, which spoil the roundness of the head and increase its length. Custom originally so acted that through force such a nature came into being ; but as time went on the process became natural, so that custom no longer exercised compulsion. For the seed comes from all parts of the body, healthy seed from healthy parts, diseased seed from diseased parts."

Hippocrates **De aere aquis et locis** W. H. S. Jones,  
Ed. Part 14, section XIV



# Family Resemblances

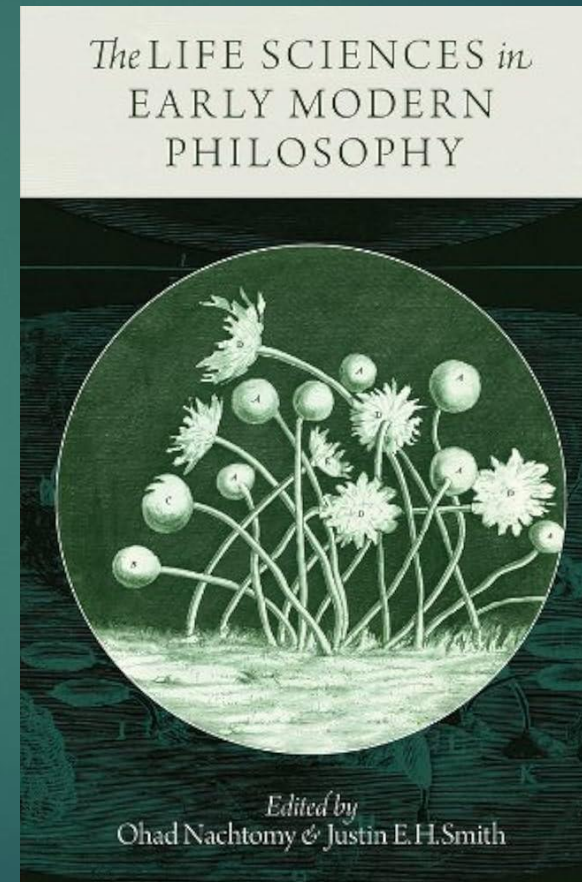
- ▶ With Pangenesis there is a clear explanation for why we resemble both biological parents
- ▶ But for Aristotle, that needed some further explanation, since the sperm provides the form
- ▶ He thought that disturbances from the maternal side caused deviations from perfect replication of the father





# Malebranche and Preformationism

- ▶ Let's turn now to the reading for this week
- ▶ It's a chapter from this book by Karen Detlefsen about Malbranche's theories about embryonic development



# Malebranche

- ▶ Nicholas Malebranche (1638 – 1715) was a Catholic priest and a philosopher
- ▶ Last week we saw his theory about the relation between bodies and minds – occasionalism
- ▶ In general, his philosophy is pretty God focused





# Preformationism

- ▶ Despite being a big fan of Descartes, Malebranche argued for a quite different picture of embryonic development
- ▶ His preferred view was Preformationism, the idea that every structure in a living thing exists in the egg/sperm
- ▶ Embryonic development is then just feeding matter into pre-existing structures



# Two Type of Arguments

- ▶ Detlefson tells us that there are two basic lines of argument that Malebranche used to defend preformationism:
  - ▶ Theological
  - ▶ Scientific
- ▶ She also briefly mentions metaphysical arguments from Leibniz, but let's ignore those



# Two Theological Arguments

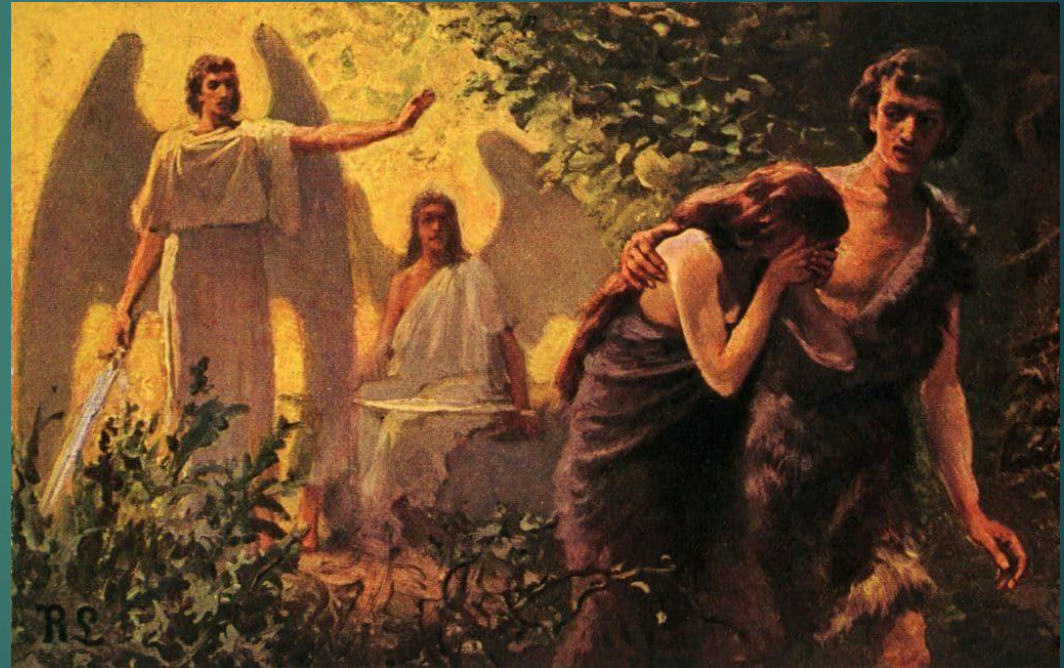
- ▶ We'll look at two distinct theological arguments
- ▶ One is about original sin
- ▶ The other is about God's role in the mechanical order of the universe



# Theological Argument 1

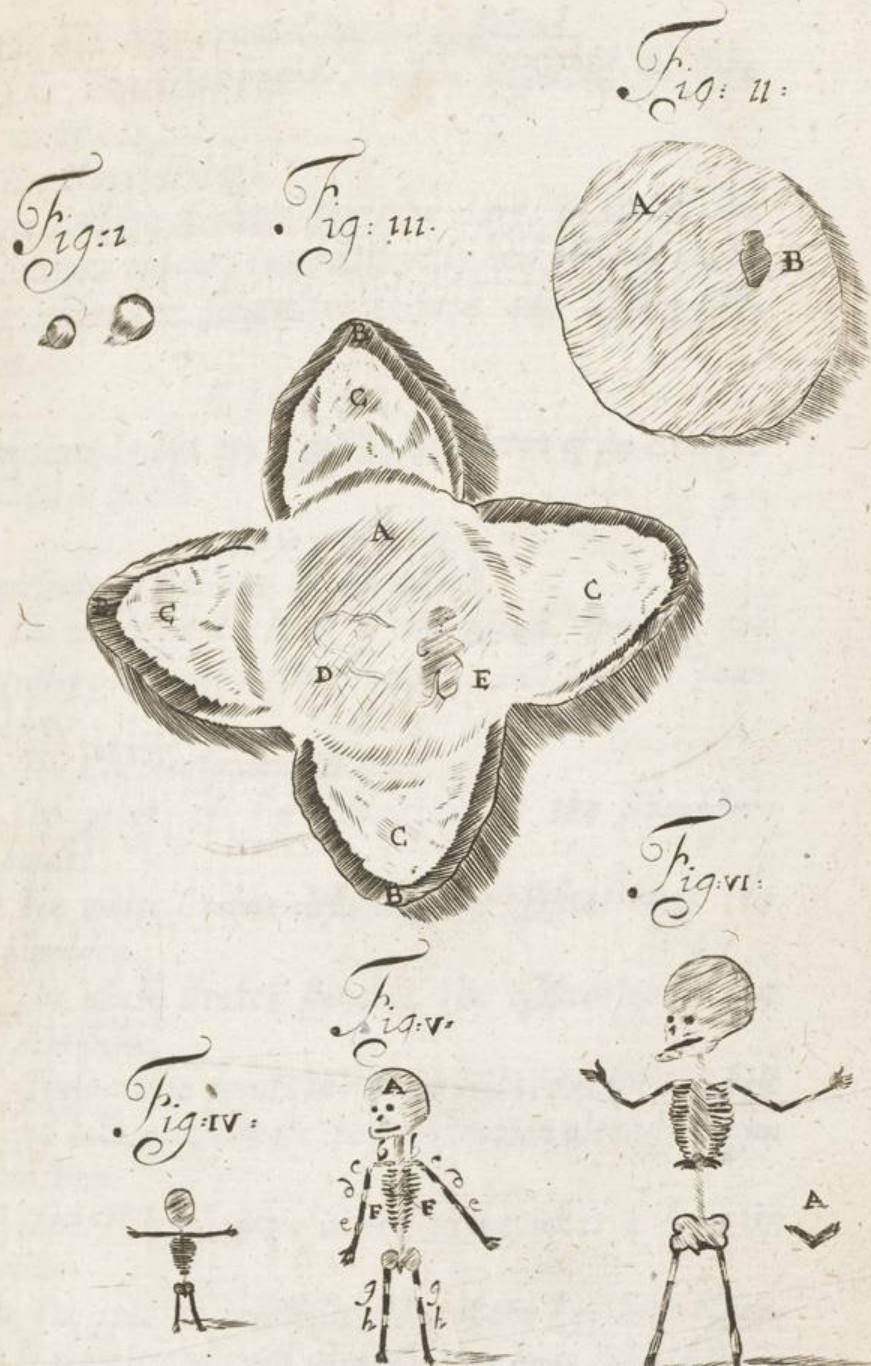
## Original Sin

- ▶ Original sin is the idea that all of humanity was stained by Eve when, in the Garden of Eden, she ate the fruit of the tree of knowledge of good and evil
- ▶ Suppose you 100% believe that
- ▶ Now the question is, how did that sin stain all of humanity? I don't remember being there at all!
- ▶ Preformationism says: you and I were there, in a very tiny form





# Ovism and Spermism



- ▶ There are two brands of preformationism, one which claims the mini-person is in the sperm (spermism) and one in the egg (ovism)
- ▶ Malebranche was an ovist
- ▶ So we were all right there, inside eggs inside eggs inside Eve, when the first sin was committed

▶ Image from The paradoxal (sic) discourse of F. M. Van Helmont, part 2, London: printed by J.C. and Freeman Collins for Robert Kettlewel, at the Hand and Scepter near St Dunstan's Church in Fleetstreet, 1685, f. 22. 19 x 11.5 cm.

# Theological Argument 2

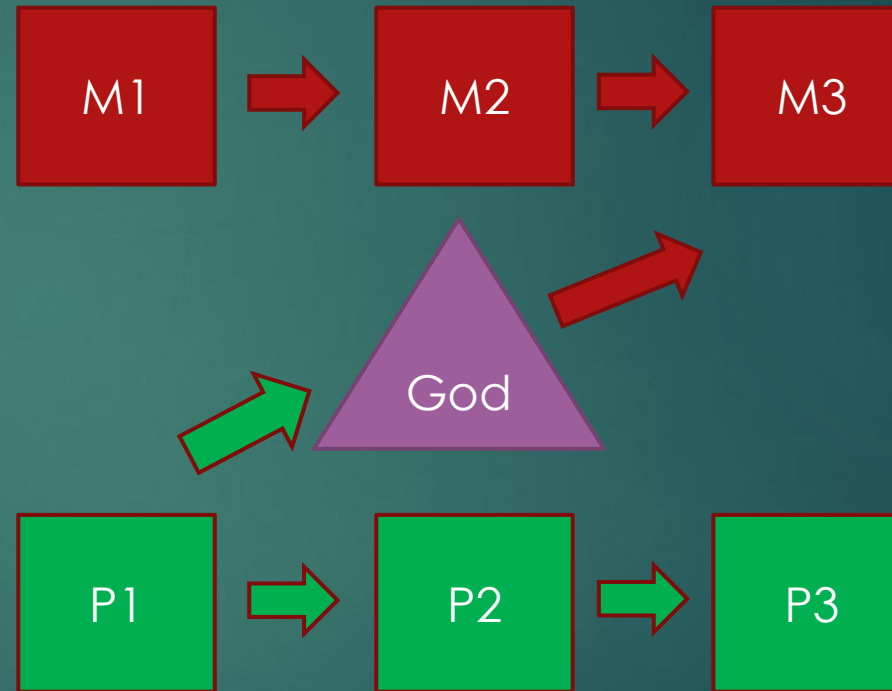
## God the Maker

- ▶ The other theological argument Malbranche offers is that preformationism opens up a perfect space for God to be a creator of all living things without having to constantly intervene
- ▶ This avoids a very literal 'deus ex machina'



# Occasionalism

- ▶ But wait, wasn't Malebranche the guy who thought God intervenes every time we think the mental and physical interact?
- ▶ Yes! Also, every time the physical and physical interact, or the mental and the mental



# Simple and General Laws

- ▶ Malebranche can reconcile these using another claim he makes about how God governs the world
- ▶ God organizes the material world according to simple and general laws, most of the time
- ▶ God can violate these laws at will, in the case of miracles, but mostly lets things follow them





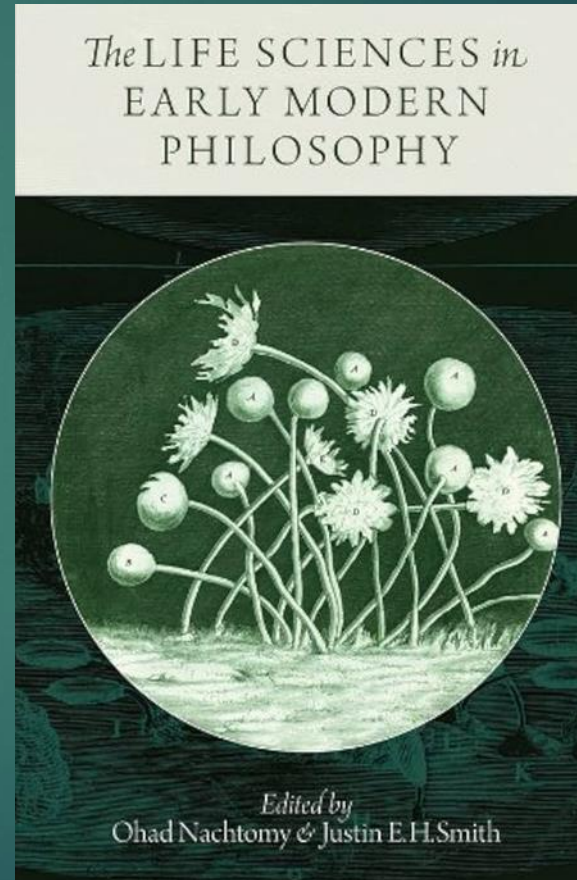
# God the Maker

- ▶ This means that for Malebranche, it would be bad for God to be regularly intervening in the course of events *in a way that violates the laws of nature*
- ▶ Preformationism allows for God to have designed us each as individuals, without having to change the rules of embryonic development for each of us
- ▶ (this is also Malebranche's theodicy, his explanation of why there is suffering)



# Scientific Arguments

- ▶ Detlefson gives two scientific arguments from Malebranche
- ▶ The first is about how hard it looks to explain embryonic development mechanistically
- ▶ And the second is about the structure of living things in general



# Scientific Argument 1

## Mechanism and Embryos

- ▶ “The evidence for mechanism’s inability to account for generation was produced by Descartes when he attempted to provide such an explanation and, many believed, failed abjectly.” Detlefson p. 142





# Epigenesis

“Descartes’s explanation for the phenomenon of organic generation runs roughly as follows: The seminal fluid from the female and male mix in the uterus. They begin a rapid vortical motion due to extreme heat caused by a sort of fermentation upon the mixing, and from this mechanically moving liquid, the heart, then brain, and then other body parts emerge one by one until a living being is formed.”

Detlefsen, K. (2014). Biology and Theology in Malebranche’s Theory of Organic Generation. In *The Life Sciences in Early Modern Philosophy*. Oxford University p.142



# Birthmarks

- ▶ Descartes attributed the existence of birthmarks to the imagination of pregnant mothers
- ▶ Babies will have birthmarks that resemble objects that their mothers desired strongly
- ▶ As an aside, he also thought that “female sex organs form if the fetus defecates first, while male organs form if the fetus urinates first”
- ▶ Wilkin, R. (2008). Essaying the mechanical hypothesis: Descartes, La Forge, and Malebranche on the formation of birthmarks. *Early science and medicine*, 13(6), 533-567.



# Scientific Argument 2

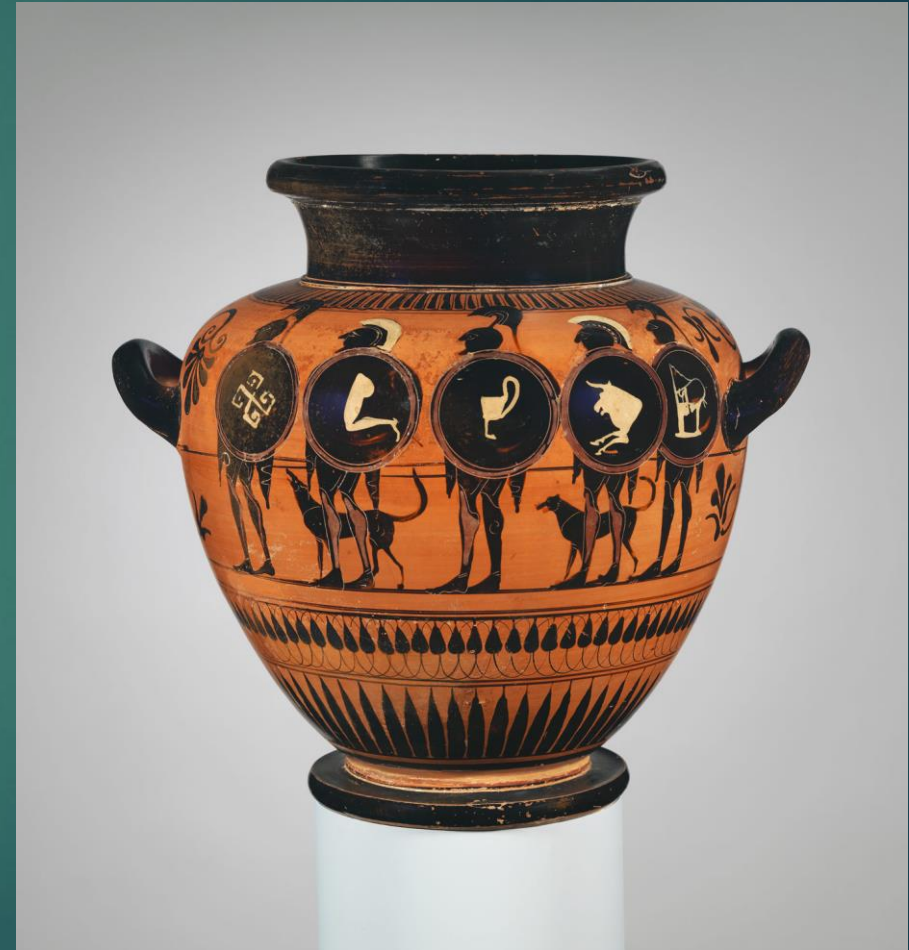
## Organic Unity and Purposiveness

- ▶ The other scientific argument Malebranche used came from a simple but profound observation about living things
- ▶ That is, we *look designed*
- ▶ Cats have eyes in the front of their head, to better stalk prey
- ▶ Their tails provide balance and mobility
- ▶ Their claws provide gripping and tearing tools
- ▶ Etc., etc., etc.,



# Four One 'cause'

- ▶ ~~Material~~
- ▶ ~~Efficient~~
- ▶ ~~Formal~~
- ▶ ~~Final~~





# Scientific Argument 2

## Organic Unity and Purposiveness

- ▶ The standard way today of explaining this apparent design is via natural selection
- ▶ But that's an idea that won't be developed for another century and a half
- ▶ So how to explain the apparent design and unity of the parts of living things?
- ▶ Someone must have designed them



# Epigenesis

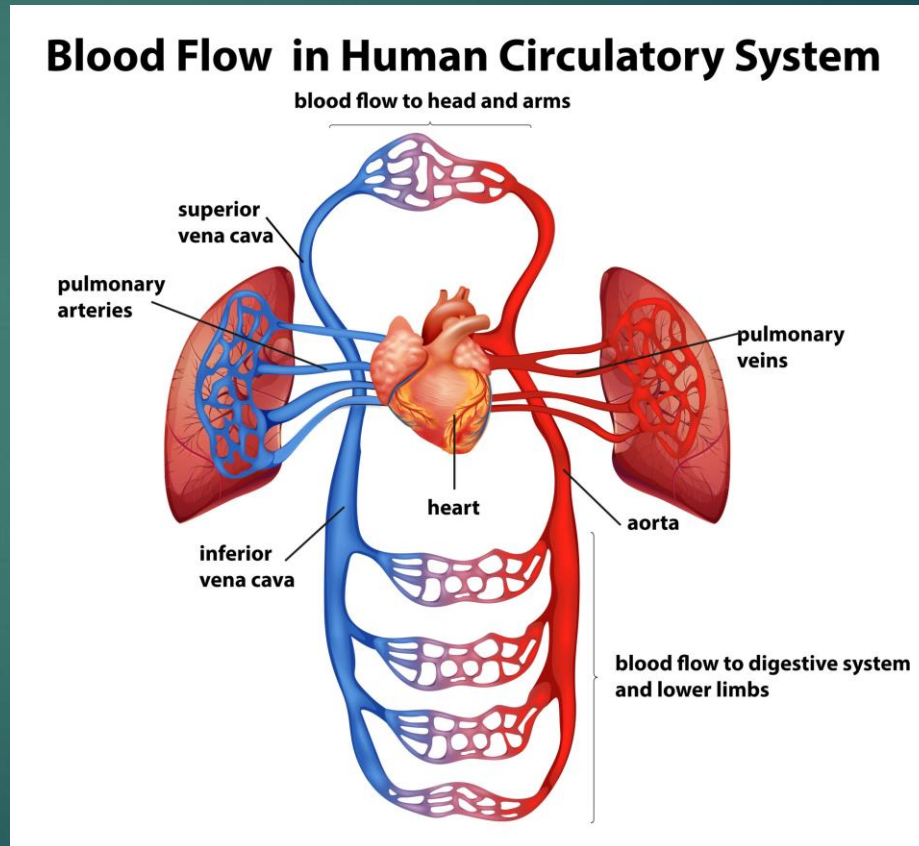
- ▶ And recall that people also had deep doubts about whether a purely mechanical process could put together something as complex as a living thing
- ▶ So not only are we organized, we're organized in a way that looks designed and intentional!



# Mutual Causal Dependence

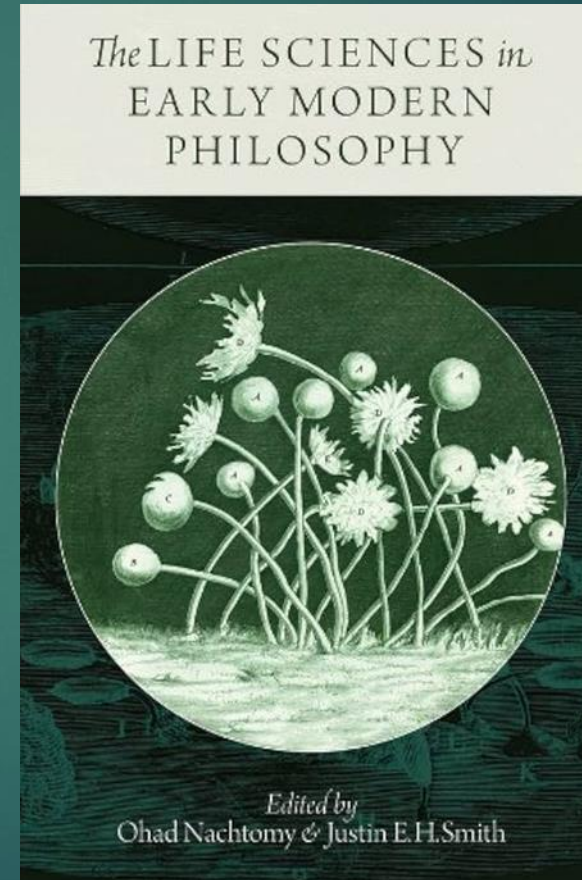
“An organized body contains an infinity of parts that mutually depend upon one another in relation to particular ends, all of which must be actually formed in order to work as a whole. For it need not be imagined with Aristotle that the heart is the first part to live and the last to die. The heart cannot beat without the influence of the animal spirits, nor can these be spread throughout the heart without the nerves, and the nerves originate in the brain, from which they receive the spirits. Moreover, the heart cannot beat and pump the blood through the arteries unless they, as well as the veins that return the blood to it, are already complete.”

- Malebranche, quoted in Detlefsen p. 150

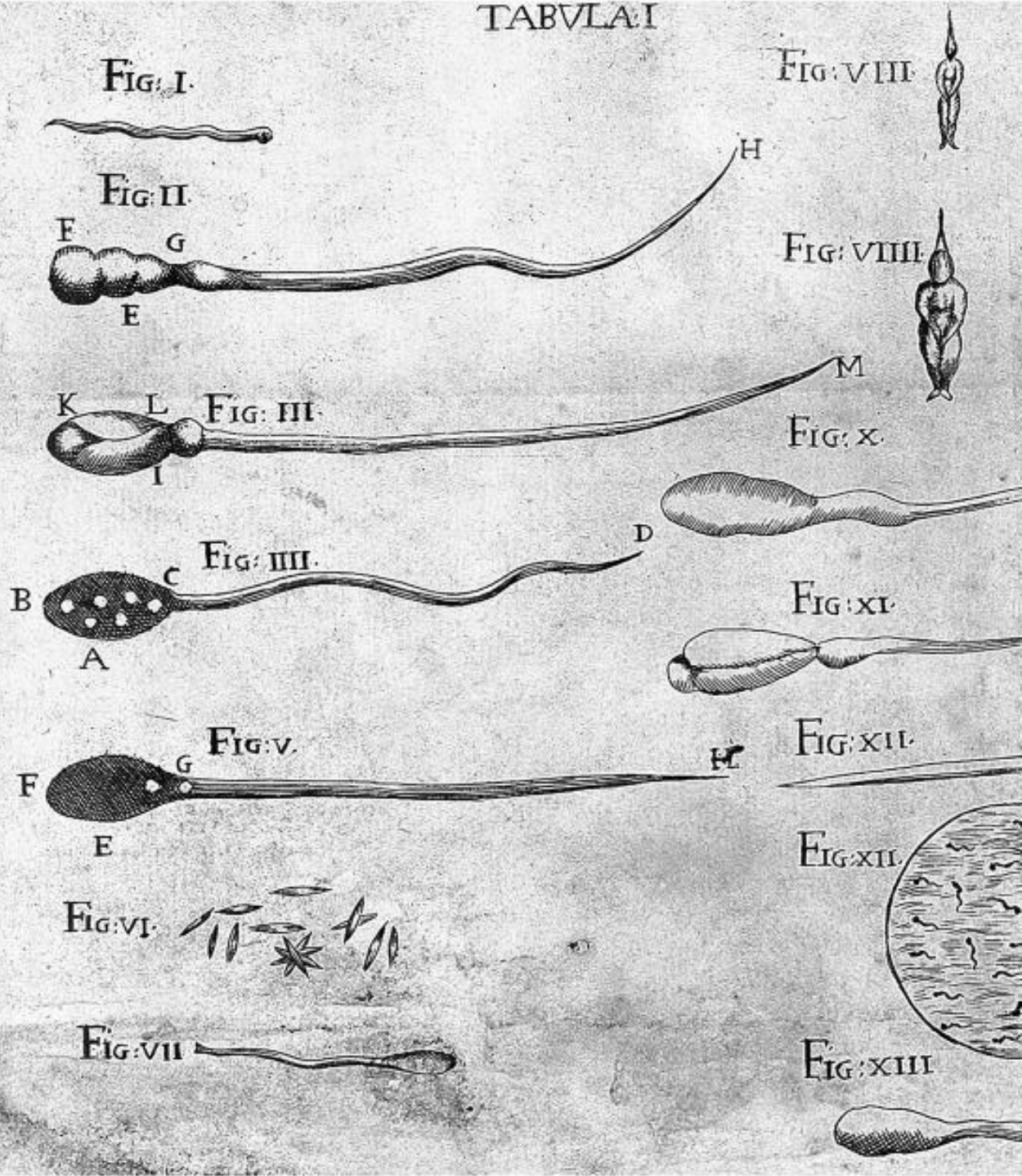


# An “all things considered” argument

- ▶ Detlefsen notes that none of these arguments, by themselves, are all that compelling
- ▶ To get to preformationism, you need each of them working together
- ▶ And even then, you don't get anything like proof, just that it looks likelier than not (if that)





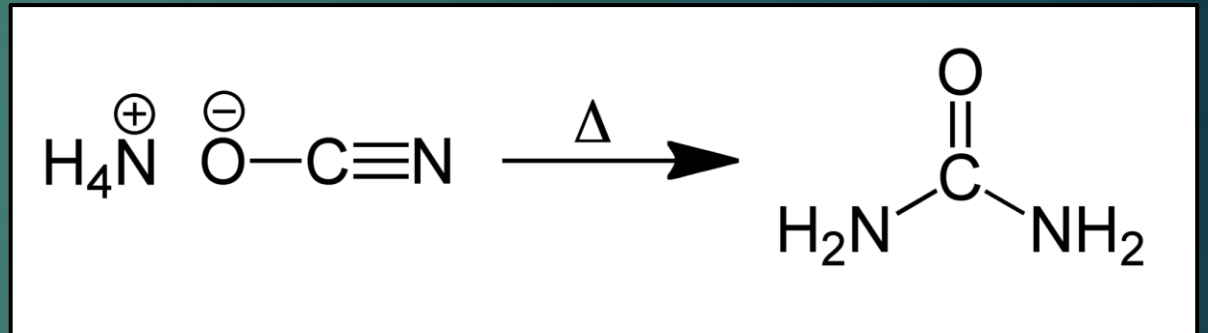


# Microscopy

- ▶ One would think that the introduction of microscopes would solve this debate easily
- ▶ But some of the first microscopists reported seeing tiny little people in sperm (top right)
- ▶ Drawings from Antonio Vallisneri's book entitled "Istoria della generazione dell'uomo, e degli animali, se sia da' vermicelli spermatici, o dalle uova (1721)".

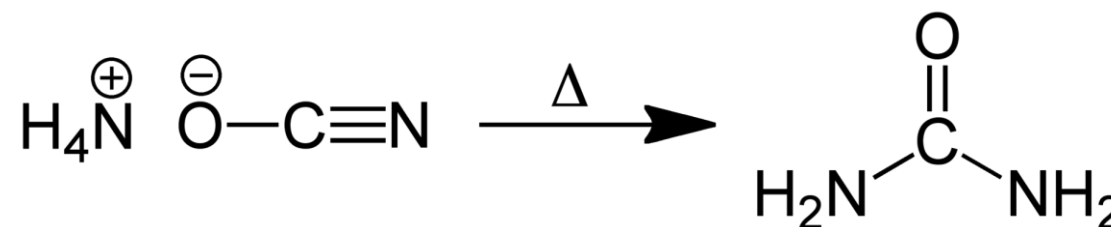
# Life and Mechanism

- ▶ It isn't until the mid 1800s that the scientific consensus moved towards there being basic physical and chemical explanations for all living processes
- ▶ The idea of vitalism (special physical forces that apply only to life) was a serious scientific hypothesis well into the 1800s



# Life and Mechanism

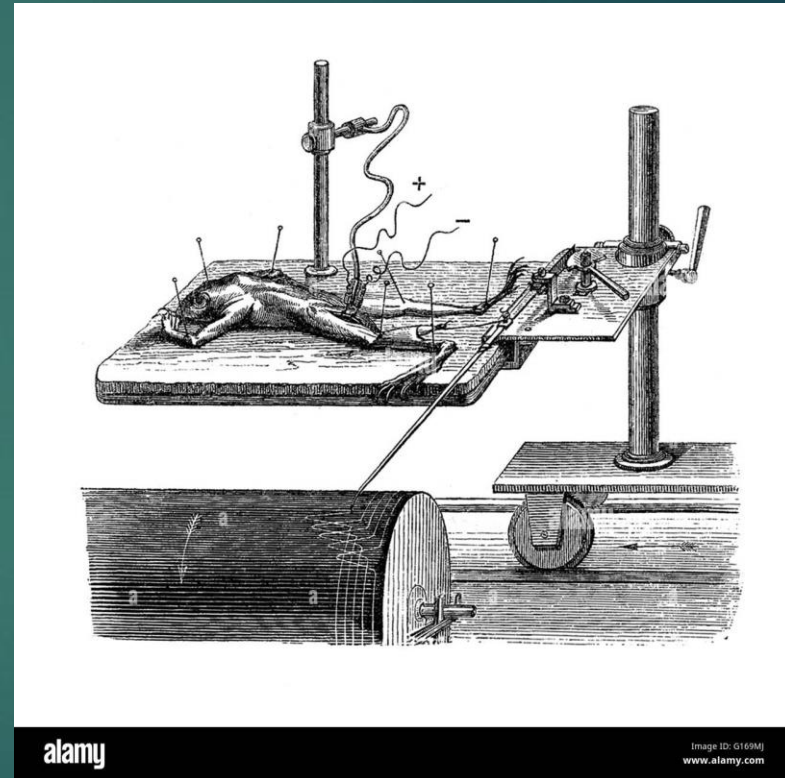
- ▶ Wohler synthesized Urea from inorganic (in the sense of not from life) reagents, showing that similar chemical principles apply to life as the rest of the world
- ▶ This was popularly taken to be the end of vitalism, but that exaggerates the actual historical impact





# Life and Mechanism

- ▶ Helmholtz's experiments on heat generation in organic tissue played an important role as well
- ▶ He provided strong evidence that the heat produced by living things was just the same in quantity and type as heat from any other chemical reactions





Next time: Is the Cell Really a  
Machine?