

Jan 22 – Introduction to the class and each other

Jan 24 -- Before the Greeks and Aristotle

- Introduction and Chapters 1-3 from Moore's *Science as a way of knowing*
- Aristotle. Excerpts from *De Partibus Animalium* translated by Ogle. Book I. [download from class website].

Focus questions:

1. Is the explanation for animism provided here convincing? What do we make of the observation that belief systems like this persist in modern and scientifically literate societies?
2. How could science have arisen out of an animistic way of thinking about nature? Moore begins the chapter with the observation that civilization has resulted in increased distance between humans and nature? Could that have been important in movement towards a strictly rational explanation of nature?
3. Enumerate the ways in which Aristotle's natural history provided precedents for what became the science of biology you are familiar with. Concentrate in particular on his motivation for describing the characteristics of organisms (and their variation) and his method of doing so. Are these the methods/motivations in use today?

Jan 26 – The Enlightenment

- Moore, Chapters. 4-5
- Francis Bacon, *Novum Organum* (read the preface and browse the aphorisms)

Focus questions:

1. Consider Moore's description of Scholasticism's influence on biology (and thought in general). How is Scholasticism's emphasis on argument via reference to authority different than modern scientific attitudes toward past scientific discoveries?
2. Moore discusses in depth the role of induction in Bacon's description of the how science should be done. Does Bacon's metaphor of the bee (vs. the ant or spider) well capture the role of facts and theories in scientific discovery? What (if anything) is left out of Bacon's method?

Jan 29 – Theories of evolutionary change

- Moore, Chapters 6-7
- Lamarck, *Zoological Philosophy, Chapter 7* [online]
- Darwin, *On the origin of species, Recapitulation and conclusion* [online]

1. Chapter 6 outlines the lines of geologic evidence that challenged the dogma of special creation. Compare the arguments used to explain this challenge raised by Cuvier, Lamarck and Lyell. Why did these figures differ in their interpretations of the data? Why do we think of Cuvier and Lyell as heroes and Lamarck as a goat?

2. Read these excerpts from *The Origin* with attention towards Darwin's method of argument, his use of evidence and his use of metaphor. Are each effective? Consider the potential benefits and dangers of Darwin's metaphors. How do Darwin's arguments differ from Lamarck's?

Jan 31 – Theories of inheritance

- Moore, chapters 11-14
- Mendel, G. 1865. Experiments in plant hybridization. [online]

1. Was Darwin's approach to the understanding inheritance similar to his approach in understanding descent with modification? If so, why didn't it succeed to the same degree? If not, what differences contributed to its failure?

2. Moore emphasizes the importance cytological research to the eventual formation of the theories of inheritance. Why are the physical details of reproduction so important to the (slowly) developing understanding of inheritance? What are the critical details that were unavailable to Darwin?

3. Mendel's paper is often described as strikingly "modern"? What makes it so? Or is just that the results seems so familiar?

Feb 2 – Genetics

- Moore, chapters 15-17
- Watson and Crick, A structure for deoxyribose nucleic acid (annotated) [online]
- Genetical implications of the structure of deoxyribonucleic acid -- Watson and Crick [online]

1. In Chapter 15, Moore compares the value of the logical arguments of Sutton with the experimental results of Boveri. Not forgetting the example of Darwin, how do you evaluate their relative contributions?

2. Consider Morgan's statement reprinted on page 336. Is his criticism valid? To what extent is Morgan's later work guilty of the same argumentation he criticizes? Is Darwin equally guilty?

3. Chapter 17 goes over many experiments the results of which you have read in textbooks. What is surprising to you about Moore's treatment? In your opinion, what important historical perspectives (if any) are left out of genetics texts?

Feb 5

Moore, Chapter 18-19.

Aristotle, Excerpts from *De Generatione Animalium* (online) Chaps 1-2 (pp.1-3) Chaps 17-23 optional (pp. 10-25) for those interested

Haeckel, E. Chapter 1 from *The Evolution of Man* (1879) (online)

Gilbert, SF. *Ernst Haeckel and the Biogenetic Law* (online)

Focus questions:

1. As Moore suggests, Aristotle is interpreted as an epigeneticist, when it comes to explaining development. How can this be seen in the details of his developmental theories? How is it related to the issues we discussed for the last Aristotle reading (his motivation for studying organismal variation)?
2. You've most likely heard before of Haeckel's "ontogeny recapitulates phylogeny" theory. Does the version brought forward in modern textbooks adequately characterize Haeckel's belief, at least as seen in this excerpt? What other agendas can you derive from this excerpt?

Feb 7

- Moore, Chapters 20-22

What light does the history of analytical embryology shed on the issues of universality of findings? Why was this a problem in development, but not in genetics? Is it a problem for cell and molecular biology today?

Feb 9

Reading: Bowler and Morus *Making Modern Science – Chapter 1* (online)
Moore, Conclusion

1. In Moore's conclusion, he reiterates his view of what science is and is not. He also considers the relative importance of theories and inventions (technology) in scientific progress. Has he made his case for his views?
2. Does Moore's book work as a history? As a biology text? What should the role of scientific knowledge ("facts") be in histories? What should the role of history be in biology texts?
3. Bowler and Morus provide a very readable synopsis of the history of history of science, including the interplay between philosophical, sociological, political, and historical methods. How would you place Moore in their taxonomy? What do you make of their conclusions?