Chapter 2 - Evolutionary Thinking Before Darwin

1. Transformism in Antiquity
    1. Anaximander
    2. Empedocles
    3. Democritus
2. Classical Thinkers
    1. Socrates and Plato
    2. Aristotle
3. The impact of Christianity
4. From fixity of species to transformism
    1. Linnaeus
    2. Buffon
    3. Lamarck
    4. Cuvier
    5. Hutton et Lyell

TRANSFORMISM

Anaximander

- Water is the central element of the universe; life comes from water and humans hatched directly from fish to invade the earthly world
- Animals were wrapped in spiny bark
- As they aged, they migrated on the mainland
- Their bark burst and they survived briefly in their new lifestyle.
- Water is the central element of the universe; life comes from water and humans hatched directly from fish to invade the earthly world

Empedocles

- All structures of the world (matter) is made from the 4 elements: earth, water, air, and fire
- These elements are simple, eternal and unalterable
- A combination of these forces created beings
- Two major forces - love (attraction or harmony) and strife or hate (repulsion or discord)
- Love and hatred are great forces that act on the four elements that make up matter.

Democritus

- Most scientific of the greek philosophers
- Two realities: atoms and emptiness
- Matter: group of atoms in movements. An atom cannot be created nor destroyed.
- There is an intrinsic property, a force of atoms that creates shapes
- Humans and animals are born directly from dirt (spontaneous generation)

- Life has two realities: atoms and emptiness. Humans and animals are the result of spontaneous generation

Summary of Transformism:

- Acts of creation are not due to Gods, but rather due to the innovative power of matter
- The origin of all things is not teleological (namely, with an ultimate goal), but is the result of chance.

CLASSICAL THINKERS

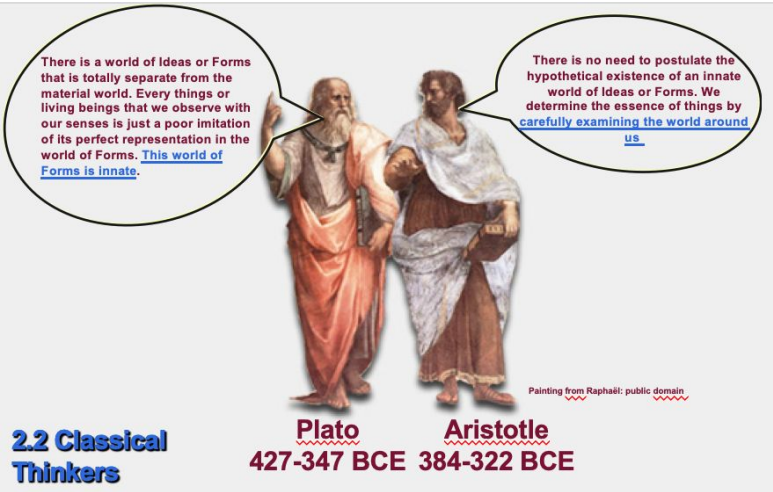
Socrates and Plato

- Materialistic approach of past philosophers gives way to contemplation of the soul
- Important questions are not materialistic but rather, linked to a search and an understanding of the concepts of beauty, kindness, justice, and sanity.
- Arguments about logical, ethical and political questions are more interesting than the search for truth.
- Answers lies not within nature but within the self.

- Theories of Ideal forms (Essentialism): the visible, imperfect and changing realm which surrounds us is a poor imitation of an Ideal World (permanent and perfect that we possess at birth: the world of Ideal Forms)
    - We have inside ourselves justice, an ideal image of things. We spend our life trying to express out ideal image of the world.
    - Plato thought we had all these notions about the world when we were born.
- Variations of forms is not important. Only the quest to define and understand the Ideal Form is.
- This philosophy will have a lasting impact on our perception of nature
- Gods are the creative forces.
- The variation of forms is not important, it is only the ideal form which is of value.

Aristotle

- Does not believe in the innate aspect of the world of Ideal Forms
- Importance of describing the essence of living things - observed in nature
- Species are static. Morphological variety is illusion and imperfect
- Vitalist (believe in souls). Perceives multiple levels of souls with cumulative effects:
    - Vegetal (plants)
    - Animate (animals)
    - Rational (humanity)
- Created the scata naturae (great chain of beings)
    - Species are organized in a static and unchangeable hierarchy
- First to believe in the hierarchy of souls in living beings



IMPACT OF CHRISTIANITY

- Christianity became the main ideology in the western world with the decline of the Roman empire
- Dark age for transformism
- God becomes the measure of all things, and the Christian bible , the word of the day
- Concept of scala naturae becomes purely metaphysical, proclaiming the perfection of the Creator.

FROM FIXITY OF SPECIES TO TRANSFORMISM

- During the Renaissance, people resumed their expeditions and trials to understand nature scientifically.
    - Discovering new world means discovering new species
    - Our notion of the world was challenged
    - Return towards experimentation and observation of nature
    - Idea of order replaced by idea of change
- The power of religion was progressively challenged
- Ordered systems like the monarchy was challenged as well
- Marks the beginning of the very gradual open-mindedness to science
- Attempts were to classify living organisms within the framework of the Great Chain of Beings and not to show evolution

Linnaeus

- Father of taxonomy (Systema Naturae)
    - Hierarchical classification
    - Binomial system of nomenclature
- Discovering each piece of the ultimate puzzle, the Plan of Creation
- Concepts valid until today
- Excellent application of the essentialism of Aristotle
- Finding order in nature

- Defined human species by trying to find out the essence of human
- Created the binomial system of nomenclature, and classified animals according to their hierarchical classification system

Buffon

- Objective: describe nature
- "Common origin"
    - All animals derived from a one animal, which then produced all animal species in existence
- His theories were censored because it contradicted religious views.
- He abandoned his evolutionary ideas and focused instead on observing nature
- Establishes that the earth is 75,000 years old and offered revolutionary ideas. These ideas were retracted following a censorship imposed by the religious clergy elites

Lamarck

- First evolutionist
    - Species modify their morphology through time
- Uses environment as a factor of change (environmental determinism)
- 2 principles
    - Principle of usage and non-usage
    - Principle of inheritance of acquired characteristics
- Gradual mechanism, adaptive and involved an innate ability of an organism to become more complex; the static ladder became an escalator
- Spontaneous presence explains the presence of simple organisms
- Acquired traits cannot be inherited
- Physical traits that parents have obtained during their lives will be handed down from generation to generation. Also created the principle of use and non-use and inheritance of characters.

Cuvier

- Field of interest - fossils
- Established the science of paleontology
    - The older the stratum, the more dissimilar the fossils are to the current species
    - From one layer to the next, species appear and disappear
- Theory of correlation of parts (organs)
    - E.g. jaw joint - typical trait of carnivores - same level to the row of teeth - allow for scissoring motion to tear meat
- Believed in fixity of species, extinction and catastrophism
- Progressive creationism
- Proposed catastrophism as a mechanism based on the fact that fossils are becoming increasingly complex in the more recent geological layers.

Hutton and Lyell

- Geological changes are the result of a slow, gradual and continuous process
- Uniformitarism - Principle of uniformity
    - Law of nature not affected by the passage of time
- Present = key to the past
- Vision of the world: "With respect to human observation, this world has neither a beginning nor an end"
- Lyell - established geology as a scientific discipline
- Proposed the principle of laws of nature are not affected by the passage of time.