

Chapter 2 : Evolutionary thinking before Darwin

First idea of transformism, materialistic thinking	2.1 Transformism in Antiquity
Idea of 4 components of matter	2.1.1 Anaximander (610-546BC) <ul style="list-style-type: none">• Animals originated from the sea and invaded the mainland• Water is the central element• Not testable
Idea of atoms and emptiness	2.1.2 Empedocles (483-423BC) <ul style="list-style-type: none">• All matter is made from fire, water, earth, air• These elements are unmodifiable• Forces acting upon them to create other forms<ul style="list-style-type: none">○ Love○ Hate
Definition of transformism	2.1.3 Democritus (460-360BC) <ul style="list-style-type: none">• The most 'scientific'• Atoms and emptiness make all matter• Matter: a group of atoms in motion, an atom cannot be created nor destroyed• Atoms create shapes and organisms through glue-like forces <p>Conclusions</p> <ol style="list-style-type: none">1. Acts of creation are not due to gods, but due to the power of matter.2. Origin of all things is not teleological, but due to chance.
Abstract ways of thinking	2.2 Classical thinkers
Ideal forms	2.2.1 Socrates (469-399AD) - Plato (427-347AD) <ul style="list-style-type: none">• A more abstract way of thinking, not materialistic• Linked to the understanding of concepts such as beauty, kindness, justice• Debate about such concepts were more interesting than the truth of nature• Understanding of the self
	<ul style="list-style-type: none">• Theory of ideal forms (essentialism)

Defining the essence of species

Scala naturae

Christianity as the basis of nature

Return to transformism

Open-mindedness of science, The Great Chain of Beings

Taxonomy and classification of organisms

- All ideal forms are in **our mind**, the forms of the world **confuse** that image
- **Gods** are the creative forces

2.2.2 Aristotle (384-322AD)

- Disagreed that ideal forms exist
- Defining the **essence** of living beings is important, done through observation
- Believes that species are **unchangeable**
 - Morphological variability is imperfection
- A vitalist, multiple **levels of souls**
 - Created the ***scala naturae*** in which species are organised in a static hierarchy
 - Rational/supernatural souls at the top, animated souls at the bottom

2.3 The impact of Christianity

- **Christianity** became the main ideology of the western world
- Very **static** way of describing nature
- **God** becomes the measure of all things, created all of nature
- The concept of ***scala naturae*** became purely metaphysical, any new species were fit into the scale
- **Transformism** ideas were **ignored**/frowned upon

2.4 From Fixity of Species to Transformism

- Renaissance in Europe (14th to 17th century)
 - Most important, **return to nature** through expedition and discovery
 - Power of religion is progressively changed, ideas were **challenged**
- French revolution
 - Challenge of ordered systems (monarchy) for an active **pursuit of progress**
 - More **open-mindedness** toward science, return to experimentation
 - Many things and luxuries were more available
 - **The Great Chain of Beings**

2.4.1 Linnaeus (1707-1778)

- Father of modern **taxonomy** (*systema naturae*, 1758)
 - Hierarchical classification, specific → general

First evidence of evolutionism

First believer of morphology changing over time

Principle of usage and non usage

Principle of inheritance

Expression of the gene is transmissible

Using fossils to determine

- Binomial system of nomenclature (e.g. homo sapiens)
- These concepts **remain valid** today to identify species
- An excellent **application** of **essentialism** of Aristotle

2.4.2 Buffon (1707-1788)

- **Objective:** Describe nature (44 volumes)
- Began the idea of **evolution** and built on **transformism**
 - All animals have a **common ancestor**
- His ideas were **censored** because of **conflicts** with **religious beliefs**
 - Abandoned his ideas and began to focus on observing nature

2.4.3 Lamarck (1774-1829)

- **First evolutionist** (species modify their morphology through time)
 - The **environment** was a **factor of change**
- **2 principles** that affect individuals:
 - Principle of **usage** and **non-usage**
 - Principle of **inheritance** of **acquired characteristics** (not accurate)
- **Gradual mechanism** involves the adaptive ability of an organism to become more complex.
- **Spontaneous generation** explains the presence of simple organisms.
- Theory not well received.

2.4.3 Epigenetics

- **Epigenetics:** field of research which is interested in mechanisms modulating the expression of genes
- **Acquired traits** have **no effect** on the genes, but can sometimes **affect** the **expression** of the gene
 - Mouse, electric shock and artificial odor, **children reacted** to the odor
- **Effect is transmissible** over a few generations and is potentially reversible
- **Marginal process** if we compare to the Darwinian mechanism

2.4.4 Cuvier (1769-1832)

- French scientist interested in mammal fossils

<p>change in morphology</p> <p>Catastrophism</p> <p>Geology</p> <p>Principle of uniformity</p>	<ul style="list-style-type: none"> ● Established the science of paleontology. <ul style="list-style-type: none"> ○ The older the stratum, the more dissimilar its fossils are to current species ○ Newer species in more shallow layers ○ From one layer to the next, species appear and disappear. ● Theory of correlation of parts (organs). <ul style="list-style-type: none"> ○ If you find one bone, you can reconstruct the entire skeleton using the relationship between bones ● Believed in the fixity of species, extinction and catastrophism <ul style="list-style-type: none"> ○ Catastrophism: Catastrophe would trigger the extinction species ○ God would create more species that are improved <p>2.4.5 Hutton (1728-1797) and Lyell (1797-1875)</p> <ul style="list-style-type: none"> ● Geological changes are the result of a slow, gradual process ● Principle of uniformity: The laws of nature are not affected by the passage of time ● The world has neither a beginning nor end with respect to human observation
<p>Important definitions</p>	<p>Transformism: the doctrine of gradual transformation of one species into another by descent with modification through many generations.</p> <p>Principle usage and non-usage: when certain organs become specially developed as a result of some environmental need, then that state of development is hereditary and can be passed on to progeny</p> <p>Catastrophism: the theory that changes in the earth's crust during geological history have resulted chiefly from sudden violent and unusual events.</p> <p>Principle of uniformity: the principle that the course of nature continues uniformly the same over time</p> <p>Geology: the science that deals with the earth's physical structure and substance, its history, and the processes that act on it.</p>

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