

## GAME PLAN

### 1. Discuss the intellectual climate leading to the Development of Darwin's Theory.

- A. Age of the earth?
- B. Origins of Species
- C. Adaptation

**Thesis: Darwin was one of a long line of thinkers to approach the topic of evolution.**

**His theory was radical, but not because it predicted change.**

## The age of the earth?

1. The Pre-History Conundrum.
2. Creation myths.
3. Cycles and Philosophy.
4. Stratigraphy.

Nicolaus Steno (1638-1680) – Principle of superposition

Comte de Buffon (Georges Louis Leclerc ) (1707-1788)

James Hutton (1726-1797), – erosion, uplift, and buckling.

"no vestige of a beginning,--no prospect of an end."

Georges Cuvier (1769-1832) Catastrophes

Charles Lyell (1797-1875) – gradualism and Uniformitarianism.

Darwin (1809-1882) Most important publication in 1859

## Origin of Species

Special Creation

**Jean Baptiste Lamarck (1744-1829)**

Buffon -- believed there was no real differences between animal, mineral or vegetable, under proper conditions new species could arise spontaneously.

Erasmus Darwin (1731-1802)

Étienne Geoffroy St. Hilaire (1772-1844) Variation of species within limits of body plan. (formalist)

Cuvier – Multiple creations and progress

## Erasmus Darwin

Organic life beneath the shoreless waves

Was born and nurs'd in ocean's pearly caves;

First forms minute, unseen by spheric glass,

Move on the mud, or pierce the watery mass;

These, as successive generations bloom,

New powers acquire and larger limbs assume;

Whence countless groups of vegetation spring,

And breathing realms of fin and feet and wing.

Erasmus Darwin. *The Temple of Nature*. 1802.

## Adaptation

Étienne Geoffroy St. Hilaire (1772-1844)

**Lamarck** Acquired traits, Vitalism, Scala Nature

**Natural Theology** (John Ray 1628-1705, William Paley 1743-1805)

Study organisms to understand god, Adaptation is interpreted as the wisdom of a creator.

Others

## Cuvier and Darwin Two Examples of Good Science

Cuvier is sometimes portrayed as a unempirical theorist who always supported the orthodox interpretation of nature.

Cuvier's actual contributions and writings are not consistent with this portrait.

## Cuvier

- Cuvier and anatomy
  - Founded modern Comparative Anatomy.
  - Based a classification system on detailed knowledge of shared common characters.
  - Functionalist interpretation of adaptation
- Cuvier and Fossils
  - Cuvier conducted some of the most extensive studies of fossils ever done.
  - He used knowledge of anatomy to compare fossil forms to current forms and show they were different
  - He is often credited with "proving" that species could and did go extinct.

## Cuvier

Cuvier and Catastrophism

Studied not only isolated fossil but also studied the location of fossil within the geological strata.

Observed that frequently species found in one layer would be not be found in the layer above it. The layer above would contain new and different species.

Seldom observed intermediate forms and never observed long sequences of intermediates leading to modern forms.

Observed that older layers contained "simpler" species and the younger layers contained "more complex" species

Concluded:

1. Periodic catastrophes had destroyed species and then new species replaced them.
2. That this replacement resulted in the creation of more and more advanced species leading eventual to humans one of the most recent species to appear.

Was vague on time scales, but did not argue for truly young earth.

Rarely equated his catastrophes with literal biblical events

Used other creation myths as well as biblical events to argue for worldwide catastrophes

## Quick Summary

- The Concepts of old earth and mutable species were common before Darwin
- Good Scientists Interpreted the Fossil record in a number of different ways.

## GAME PLAN

- Introduce my concepts of why Darwin's Theory were radical
- Review Darwin's Life
- Summarize Darwin's Theory of Natural Selection

## Importance of Charles Darwin's Theories

1. Darwin's theory provided a compelling argument of **how** evolution might occur.
2. Darwin provided the most extensive review of the evidence for evolution to that date (1859).
3. Darwin's theory did not predict progress only change.

### Ernst Mayr's List of "Darwin's Five Theories"

- "Evolution as such" (= Transmutationism)
- Common Descent
- Gradualness
- Populational speciation
- Natural Selection.

### Timeline of Events in Darwin's Life

- 1831 Graduated from Cambridge with a degree in theology
- 1832 Begins circumnavigation of globe.
- 1836 returns from Beagle Voyage
- 1837 First scientific articles published  
begins notebooks on transmutation
- 1842 Writes essay on "Origin of Species" distributes it only to few close friends
- 1858 Wallace proposes an identical theory to Darwin's
- 1858 Wallace and Darwin's papers are presented back to back at a scientific conference
- 1859 Publishes 600 page "abstract" of detailing and defending his theory
- 1872 Published 6<sup>th</sup> Edition Of Origin of Species
- 1882 Dies.

### Outline of Darwin's Theory

- Postulate 1.  
There is variation within species.
- Postulate 2.  
There is some form inheritance such that offspring are likely to share common traits with their parents
- Postulate 3.  
All species have the biotic potential to produce more offspring than the environment can support. Meaning there is a struggle for survival.
- Postulate 4.  
A very old earth.

### Outline of Darwin's Theory

#### Logical construction

Theorem 1:

If postulate 1 is true and postulate 3 is true then it follows that some individuals will have variations that make them more likely to survive in a given environment.

## Outline of Darwin's Theory

### Theorem 2:

If theorem 1 is true and postulate 2 is true it follows that those individuals with traits that allow them to survive more frequently will produce offspring that share those traits and therefore over time those traits will become more common in the population.

## Outline of Darwin's Theory

### Theorem 3:

If theorem 2 is true and postulate 4 is true over a long period time small variations could gradually lead to large changes in species.

## Quick Summary

- Darwin really proposed at least five theories the most important being Natural Selection
- Darwin's Theory of Natural Selection develops logically from a relatively few postulates.
- Those being
  - There is variation within species
  - There is inheritance of variable traits
  - Every species has the ability to grow exponentially
  - The earth is very old.

## Game Plan

- Discuss some critically misunderstood term related to Darwin's Theory
- The Radical Ideas embedded in Darwin's Theory of Evolution.

## Darwin's Theory and Catch Phrases

- **Natural Selection**
- **Survival of the fittest**
- **Nature red in tooth and fang**
- **Descent with modification**
- **Local Adaptation**

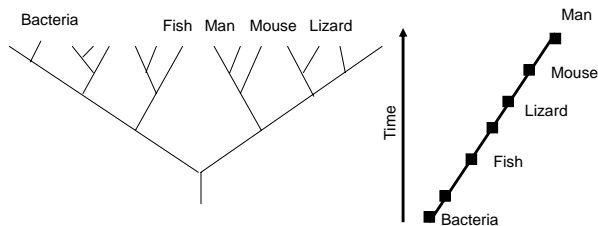
## The Origin of Species

Original Title – *On The Origin Of Species By Means Of Natural Selection, Or The Preservation Of Favoured Races In The Struggle For Life.*

The word “*evolution*” does not appear in text. The word “*evolved*” occurs only once as the last word in the text.

## Radical Ideas Embedded in Darwin's Theory

- **Non-directional selection**
  - Tree of life vs. Ladder of progress
  - Selection only favors adaptation to local conditions, Not progressive improvement!



## Radical Ideas Embedded in Darwin's Theory

- **Thinking about Populations not Individuals**
  - Populations evolve, individuals do not
  - Probability and chance play a major role.