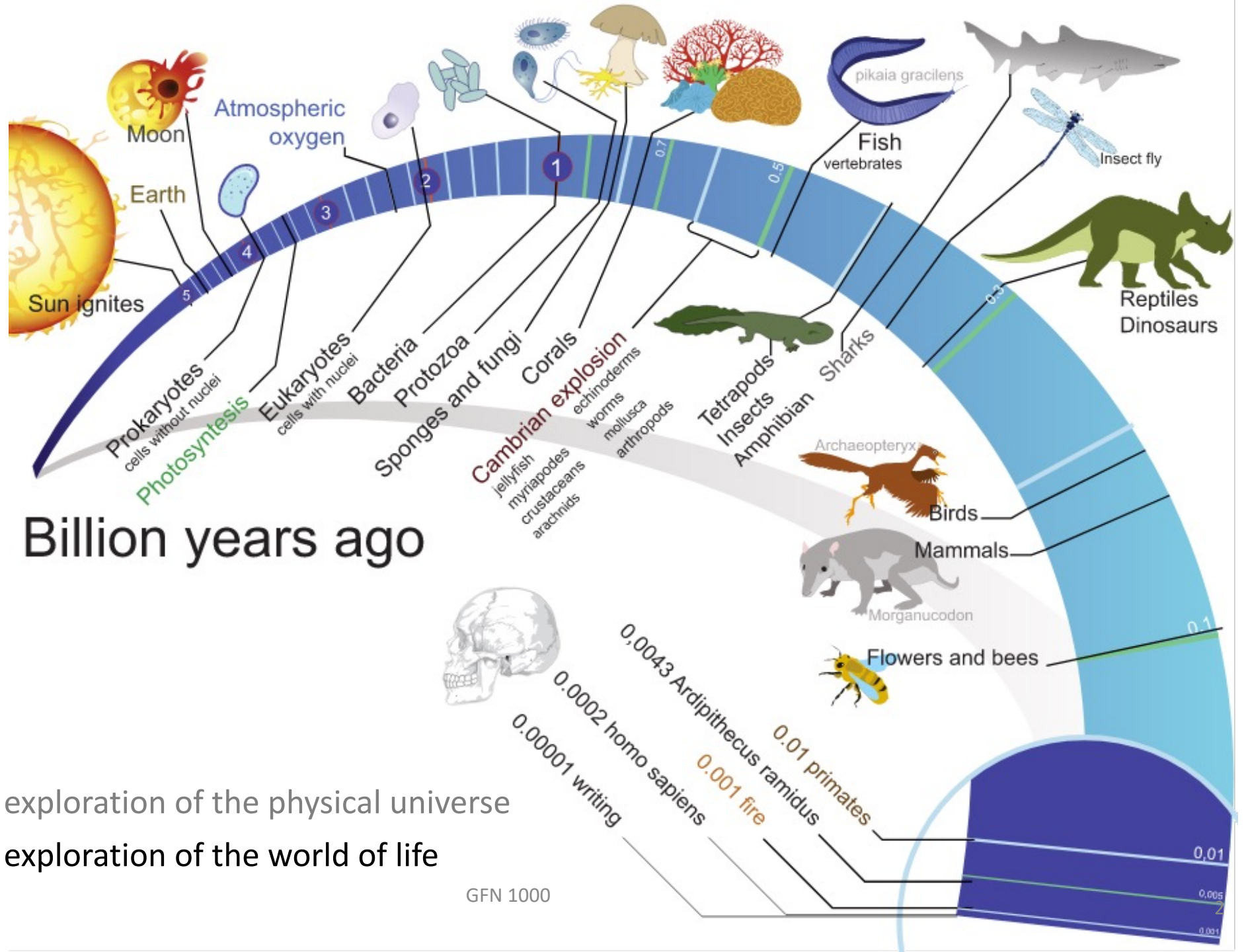


# Lecture 5

# Darwin

GFN1000 In Dialogue with Nature

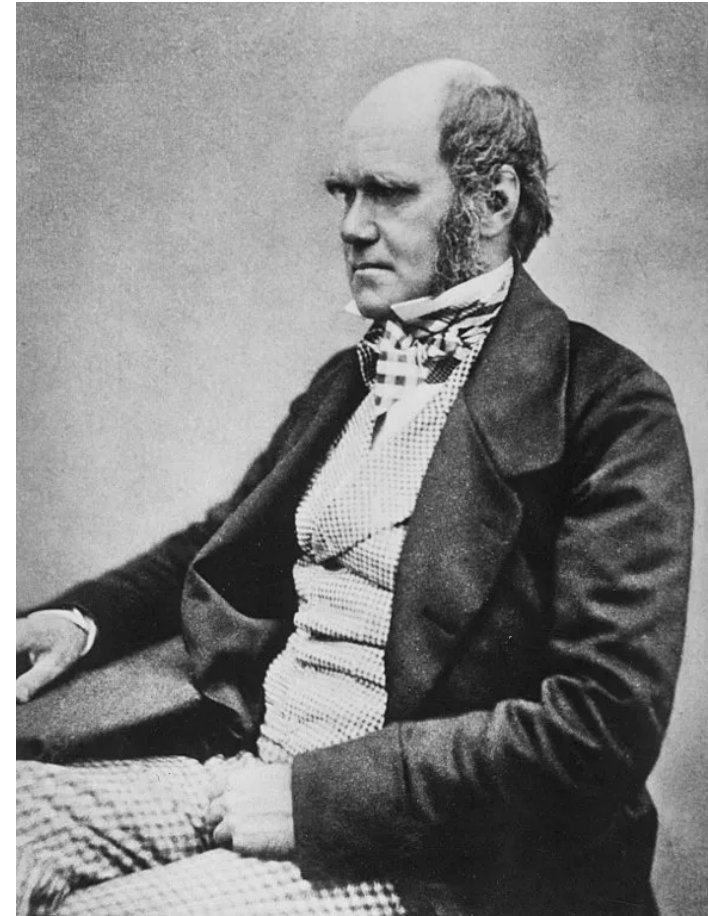


**Part 1.** Human exploration of the physical universe

**Part 2.** Human exploration of the world of life

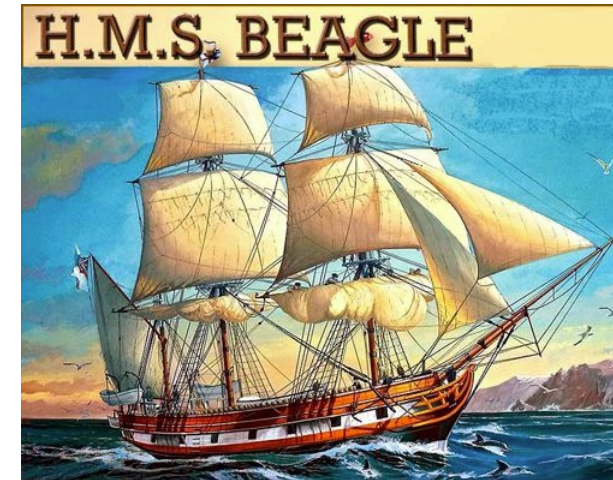
# Content

- Charles Darwin
  - The Person and His Family
  - Five-year Voyage on HMS Beagle
  - The Origin of Species
- Intellectual Antecedents
  - Jean-Baptiste Lamarck
  - Thomas Malthus
- Theory of Evolution
  - Natural Selection
  - Social Darwinism

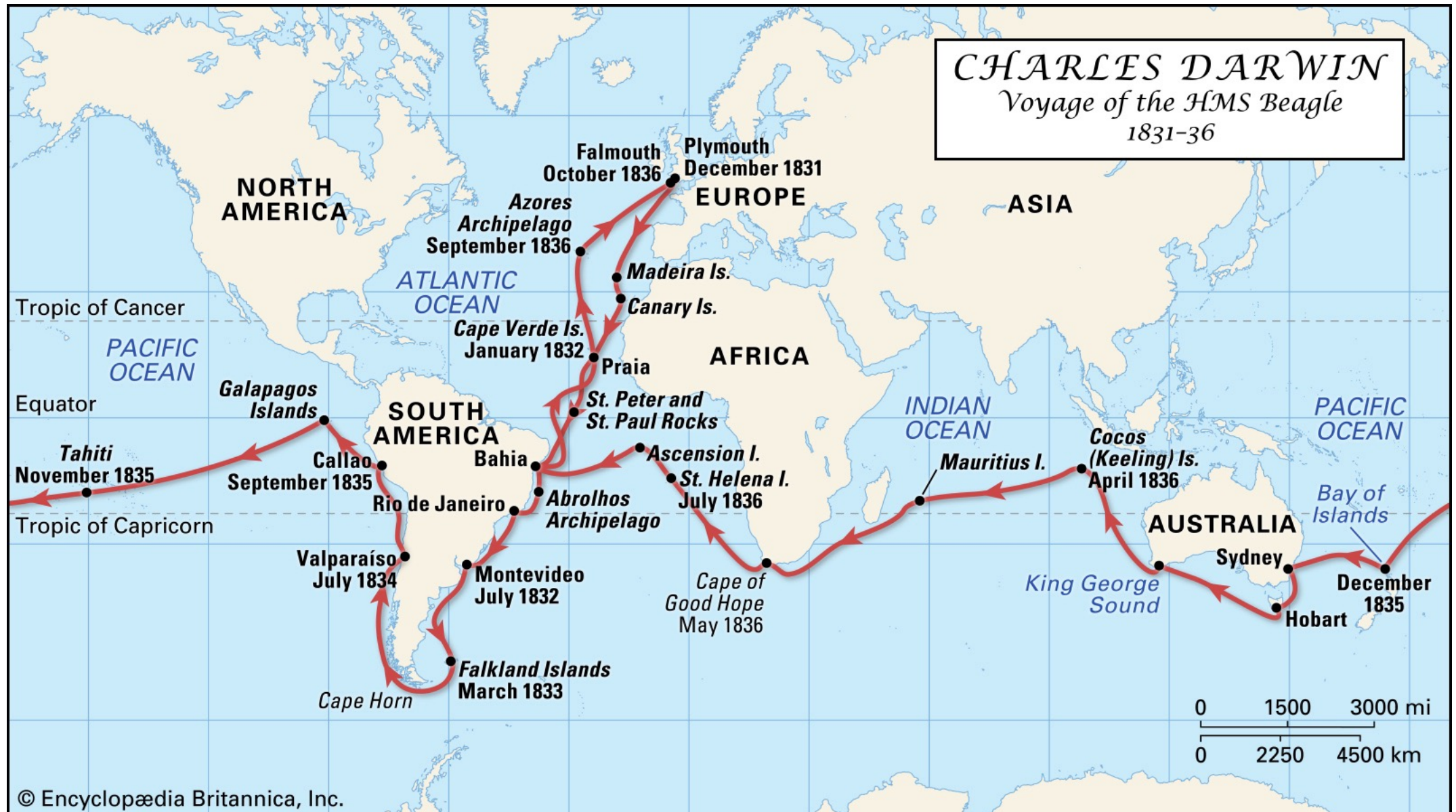


# Darwin (1809-1882)

- English naturalist and geologist
- Studied medicine initially (Medical School at the University of Edinburgh),
- Studied theology at Cambridge University
  - Adam Sedgwick (geology)
  - John Henslow (botany)
- Grew up in a wealthy family, sponsored by his father to go on the voyage with the Beagle (Dec 1831- Oct 1836)



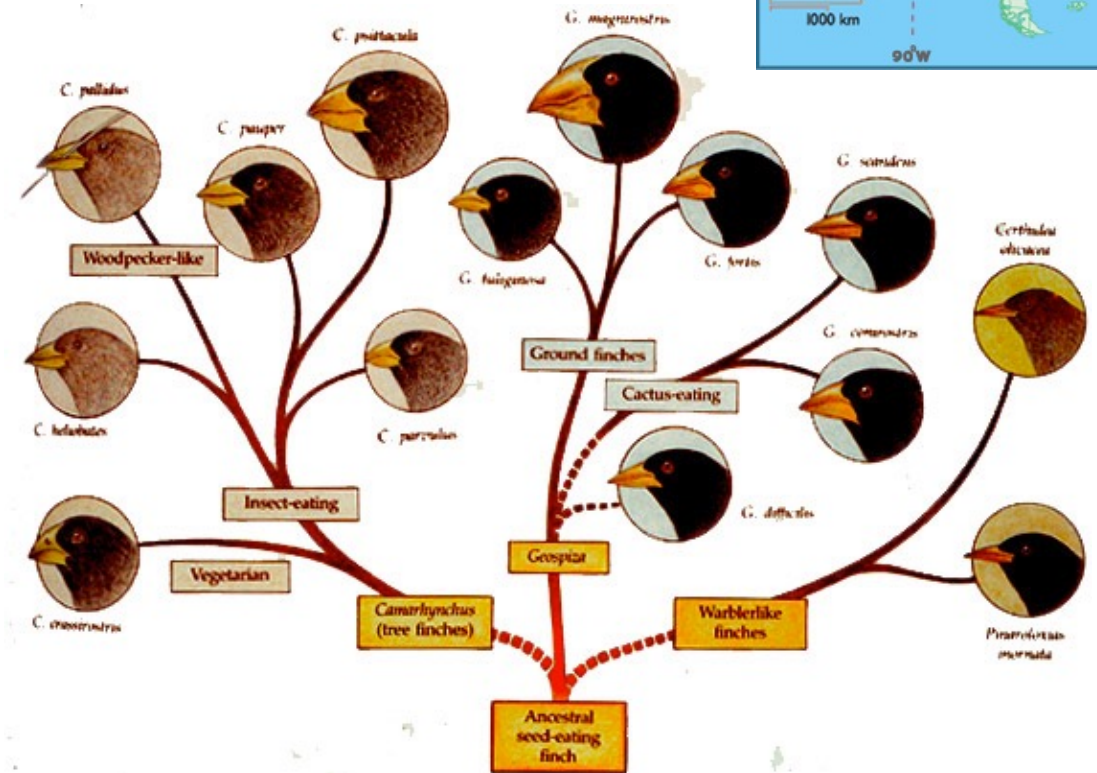
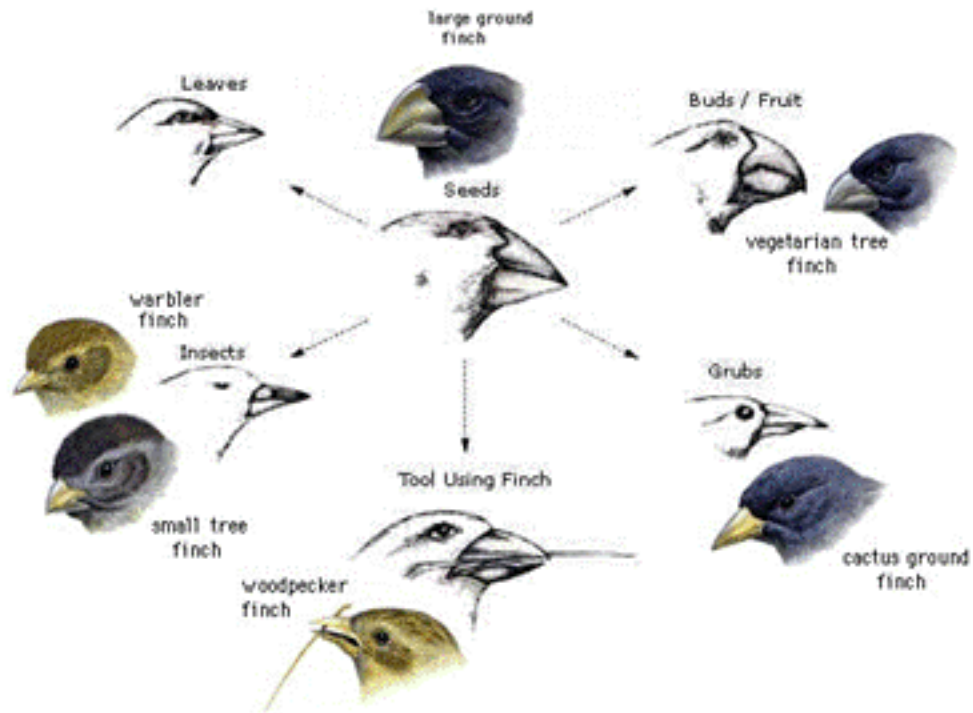




# Galápagos Finches



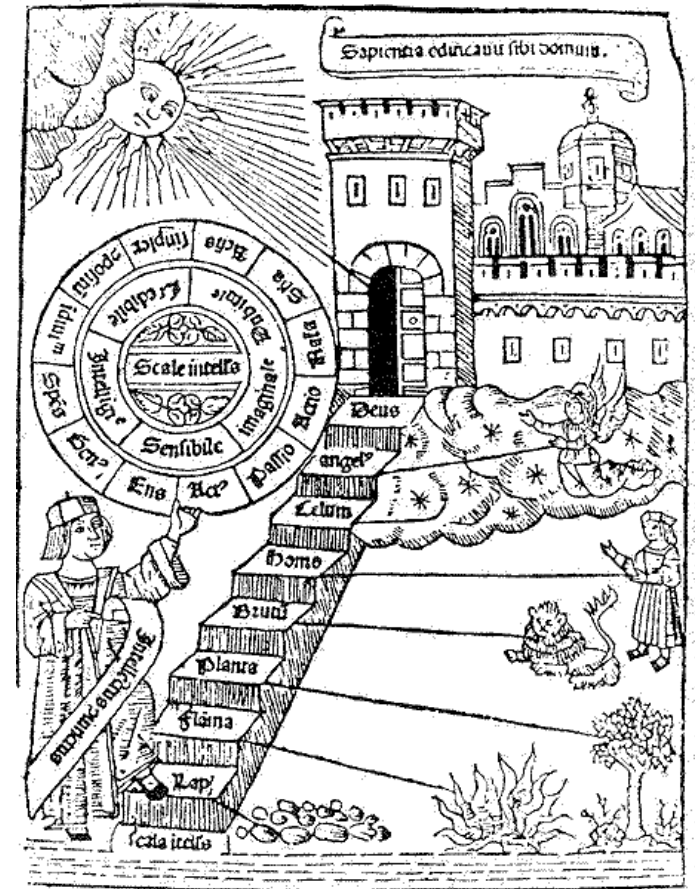
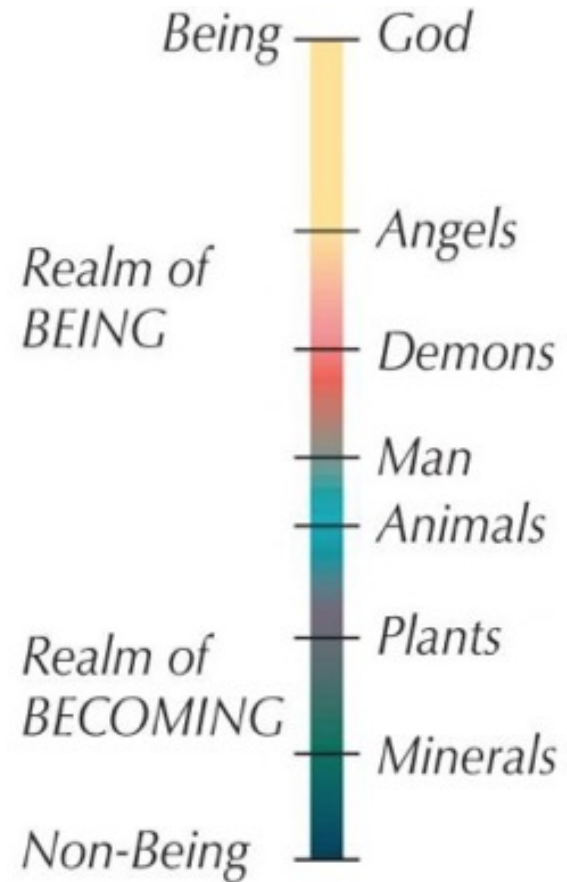
## Darwin's Finches: Adaptive Radiation





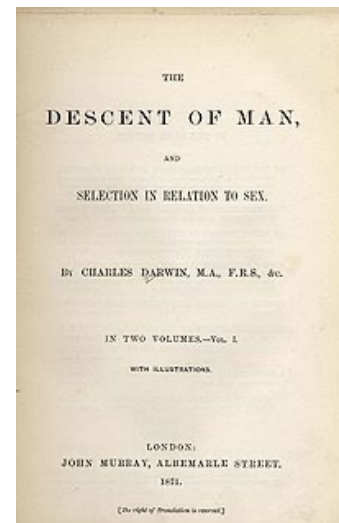
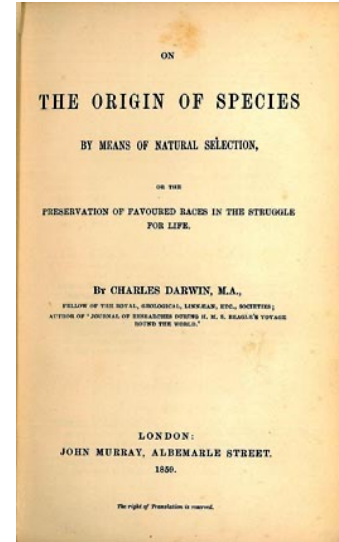
# Premodern Study of Nature

- Natural Theology
  - The Great Chain of Being
- Natural Philosophy
- Natural History
  - Anatomy
  - Geology
  - Biology



# Theory of Evolution

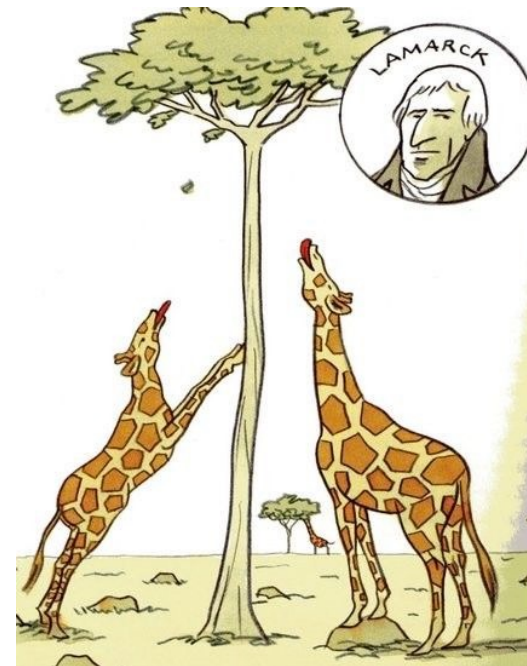
- On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life (1858)
- The Descent of Man, and Selection in Relation to Sex (1871)
- Populations evolve over the course of generations through a process of natural selection.
  - A common ancestor
  - Natural selection as the driving force of evolution



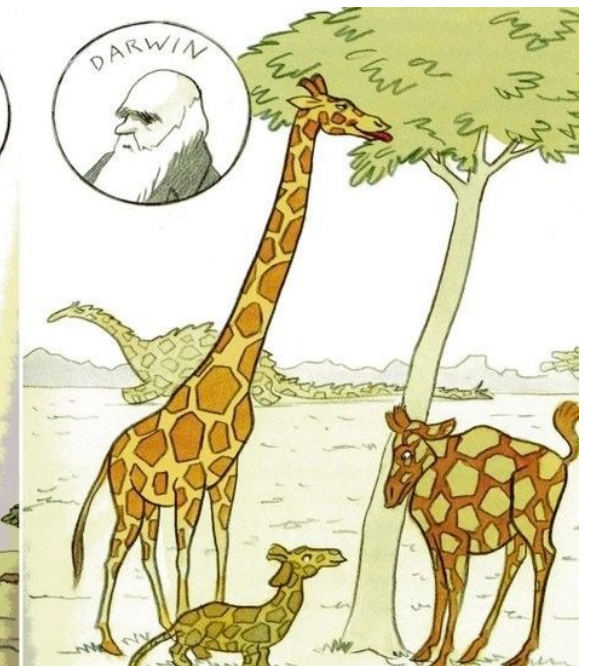


# Jean-Baptiste Lamarck (1744-1829)

- Lamarck claimed that an individual undergoes changes over its lifetime and passes on the **acquired** changes (traits) over the generations to the next.
  - Transmutation of specie
  - Organisms can change
- Lamarckian inheritance:
  - Use and disuse
  - Inheritance of acquired traits



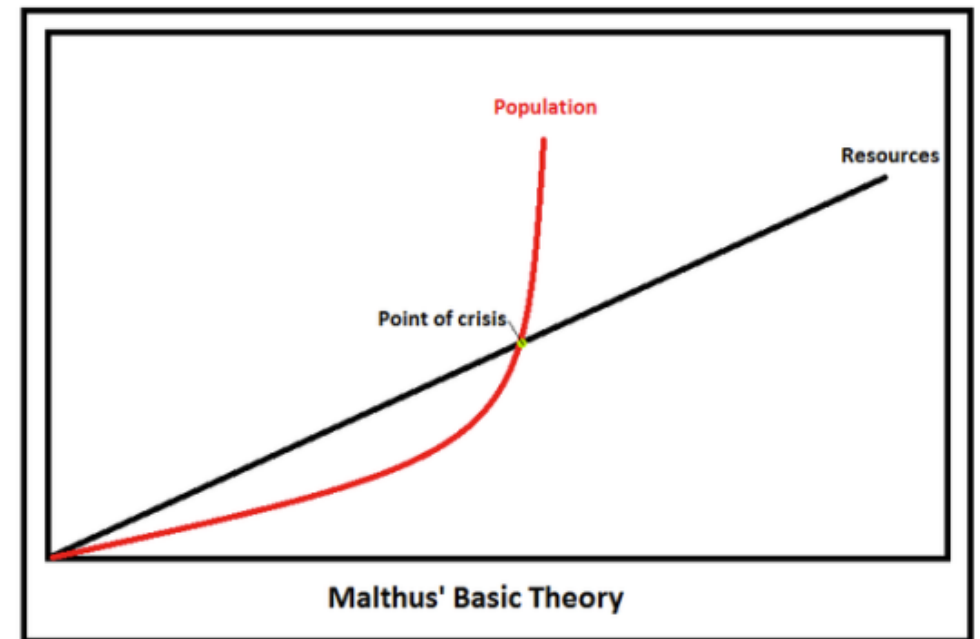
transformational evolution



variational evolution

# Thomas Malthus (1766-1834)

- Malthus observed that human populations can increase in size faster than their ability to produce food.
  - Struggle for existence will occur.
- Marx: It is remarkable how Darwin rediscovers, among the beasts and the plants, the society of England with its division of labour, competition, opening of new markets, "inventions" and Malthusian "struggle for existence".



# From Creationism to Evolutionism

## Creationism

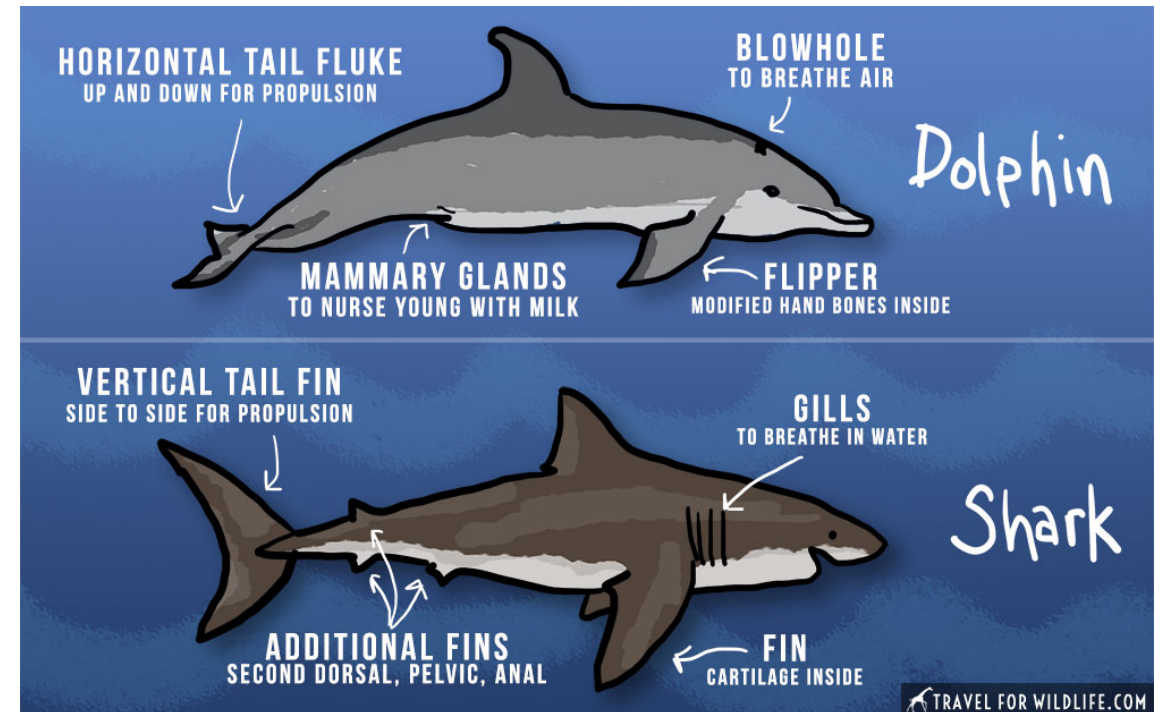
- The watchmaker analogy: the complex inner workings of a watch necessitate a designer.
- Species were **separately** created by God to be and will **remain** in their form.
- Human beings are **special** creations in the image of God.

## Evolutionism

- Species were not created separately and have not been **fixed**.
- Humans and apes share a **common** ancestry.
- Evolution is defined as any change in the heritable traits within a population across generations.

# Variation

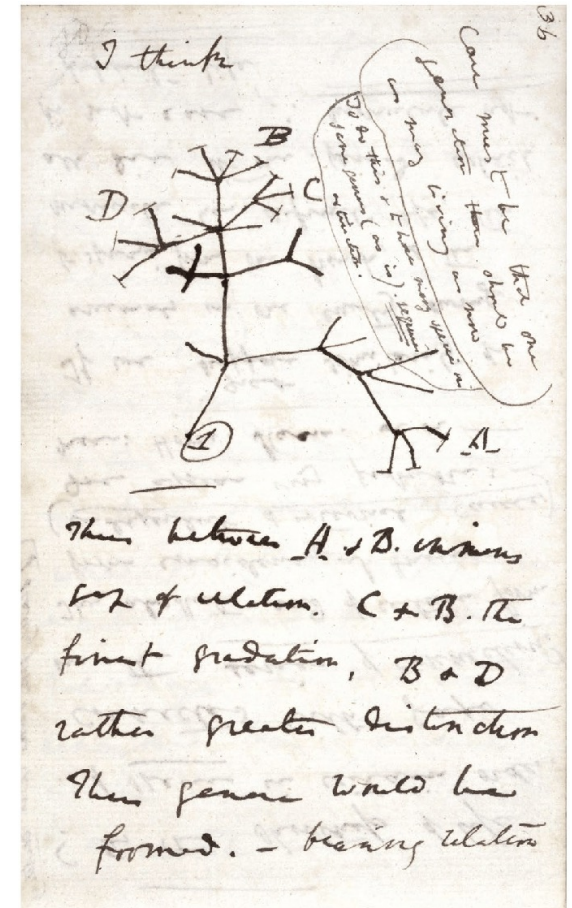
- Similarities and differences
- The more diversified the descendants of a species become, the more space they can seize.
- Extinction: any advantage gained by one variation almost invariably comes at the cost of others.
- Evolution is unpredictable and irreversible.





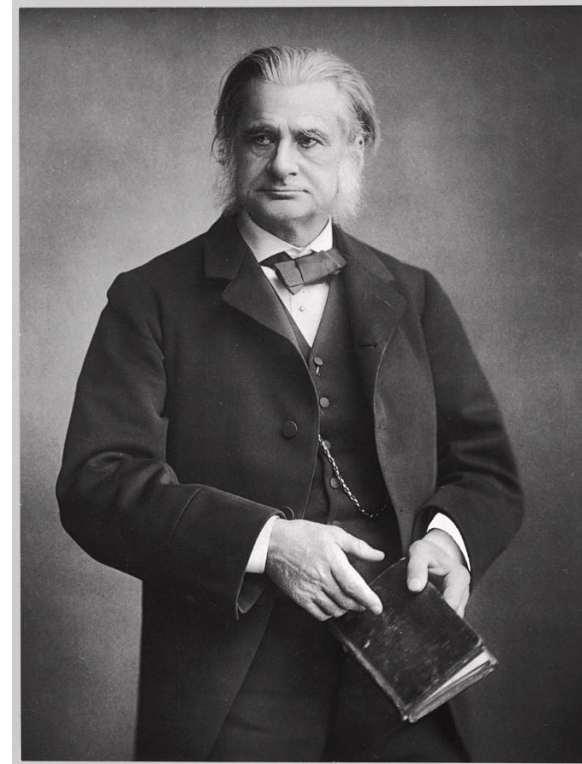
# Natural Selection

- The one better adapted to the environment survives.
  - The artificial selection analogy
- Natural selection does not actively **create** any new variation in any individual; it merely **selects** from those already created through random drift.
- Theory of evolution vs. teleology
  - Advantages and disadvantages are always relative.
- Natural selection vs. sexual selection



# Darwinism

- Thomas Henry Huxley (1825-1895): biologist, known as "Darwin's Bulldog."
- Disputed with churchmen about the Bible, campaigned Darwin's theory of evolution
- Victorian values: Darwinism; social contract theory (Hobbes); Malthusian population theory



Aldous Huxley (1894-1963)

# Social Darwinism

- Coined by Herbert Spencer in the 19<sup>th</sup> century.
  - The survival of the fittest
- The intersection between biology and sociology
- The (mis)application of and (over)extension of Darwinian ideas (e.g. evolution, struggle for survival) to justify human inequalities.



# Evolutionism in Modern China





# The Selfish Gene (1976)

- Clinton Richard Dawkins (1941- )
- A gene-centric view of evolution
- Variants of the same gene compete for the ability to program their **vehicle** to help them to be transferred in as many copies as possible.
- "We, alone on earth, can **rebel against** the tyranny of the selfish replicators."

