Chapter 2
Evolution: Constructing a Fundamental Scientific Theory

The context for Darwin’s Theory

• Since Aristotle, the predominant worldview was of immutability.

• hierarchy of plants and animals, - humans showed the greatest perfection and complexity

The Great Chain of Being

God
Angels
Kings/Queens
Archbishops
Dukes/Duchesses
Bishops
Marquises/Marchionesses
Earls/Countesses
Viscounts/Viscountesses
Barons/Baronesses
Abbots/Deacons
Knights/Local Officials
Ladies-in-Waiting
Priests/Monks
Squires
Pages
Messengers
Merchants/Shopkeepers

Tradesmen
Yeomen Farmers
Soldiers/Town Watch
Household Servants
Tennant Farmers
Shephards/Herders
Beggars
Actors
Thieves/Pirates
Gypsies
Animals
Birds
Worms
Plants
Rocks

The context for Darwin’s Theory

1) Deep time
2) Earth is different now than before
3) That goes for flora and fauna too

Darwin drew on 5 scientific disciplines to generate his theory:

• Geology
• Paleontology (fossils)
• Taxonomy, Systematics
• Demography
• Evolutionary Biology
Geology: Reconstructing Earth’s Dynamic History

Deep time uniformitarianism

Charles Lyell (1797 – 1875)

James Hutton (1726 – 1797)

Paleontology: Reconstructing the History of Life on Earth

Robert Hooke (1605 – 1703)

Georges Cuvier (1769-1832)

catastrophism

Taxonomy and Systematics: Classifying Living Organisms and identifying Their Biological Relationships

John Ray (1660) defined species, grouped organisms according to similarities

(1628-1705)

Carolus Linnaeus (1707-1778)
Swedish naturalist
binomial nomenclature
genus
Demography: Influences on Population Size and Competition for Limited Resources

Evolutionary Biology: Explaining the Transformation of Earlier Life-Forms into Later Life-Forms

Darwin’s Contribution to the Theory of Evolution: Natural selection
Adaptation
Adaptive radiation

Alfred Russel Wallace

- Competition between species
- Warning coloration
- Biogeography “The Wallace Line”
Since Darwin: Mechanisms of Inheritance

- Gregor Mendel (1856)
- Gemmules and blended inheritance
- Genes and particulate inheritance

Since Darwin: Mechanisms of Inheritance

- Mendelian inheritance
  1. Dominance and recessive
  2. Law of independent assortment
  3. Law of segregation

Genotype, phenotype,
Since Darwin: the Modern Synthesis

- Mendel + Darwin - mechanism for evolution and how traits are passed on (variation)
- “Gene pool” – population genetics
- 4 causes of evolution:
  - Mutations, gene flow, genetic drift and natural selection

Since Darwin: the Discovery of DNA

- Watson and Crick (1953)
- chromosomes