

History of Science 423/523: Science and Religion

Lecture 7: Geology, Genesis, and Evolution

I. How do we know the age of the earth?

- A. Sacred chronology: biblical records supplemented by non-biblical sources of Egypt, Babylon, Greece, and Rome
- B. James Ussher (1581-1656) and the age of the earth (calculated to be 4004 B.C.)
- C. Physico-theology: the harmonization of biblical chronologies with natural philosophy

II. Theories of the earth

- A. Diluvialism and catastrophism; the Noachian (biblical) Flood
- B. Accounts of a Deluge (great flood) in the literature and legends of many civilizations
- C. The growing feeling that a short chronology could not accommodate new discoveries
- D. Early attempts at an extended chronology: Comte de Buffon; James Hutton

III. Charles Lyell (1797-1875)

- A. His early exploration of volcanoes in France and of Mt. Aetna in Sicily
- B. The publication of *Principles of Geology* (1830-33)
- C. Uniformitarianism: 'The present is the key to the past' (Archibald Geikie)
- D. The rapid acceptance of uniformitarian geology
 - 1. By William Buckland (1785-1873) and Adam Sedgwick (1785-1873)
 - 2. Clerical v. professional geologists; Mosaic or Scriptural geologists
 - 3. Abandonment of the Noachian Flood as an organizing principle in geology

IV. The influence of the Baconian Compromise: The interpretation of the Bible should yield to new scientific knowledge

- A. Attempts to harmonize the new geology with the Genesis account of Creation
 - 1. The Day-Age theory (the six days of Creation are periods of geologic time)
 - 2. The Gap Theory (a long period between the creation of the world and Adam)
- B. The revision of sacred chronology: William Henry Green and biblical genealogies
- C. The antiquity of the earth: Lyell, Lord Kelvin (1824-1907), radioactive rocks (1896)
- D. Does the age of the earth have theological implications? It depends on assumptions

V. Evolution ('transformationalism')

- A. Natural history; the teleology of Aristotle; natural theology
- B. The Enlightenment's rejection of natural theology for a mechanistic model of life
- C. Pre-Darwinian transformationalists
 - 1. Jean Baptiste Lamarck (1744-1829): the inheritance of acquired characteristics
 - 2. Erasmus Darwin (1731-1802) and Robert Chambers (*Vestiges*, 1844): early evolutionary theories
- D. Charles Darwin (1809-1882)
 - 1. The voyage of the HMS Beagle (1831-1836)
 - 2. The influence of Lyell and Thomas Malthus on Darwin's thinking
 - 3. His theories of struggle for existence, random variation, and natural selection
 - 4. *The Origin of Species* (1859); Alfred Russel Wallace (1823-1913)
 - 5. His agnosticism

VI. The reception of Darwin's ideas

- A. Mixed reception across conventional scientific and religious boundaries
 - B. Widespread concern over the implications of Darwin's materialism
 - 1. Publication of *The Descent of Man* (1871)
 - 2. Criticism of Darwin's materialism by Charles Hodge ('Darwinism is atheism') and Alfred Wallace
 - 3. Cautious Christian acceptance of Darwinism without its materialism: James McCosh, Asa Gray, B. B. Warfield (all Protestant); St. George Jackson Mivart (1827-1900) (Catholic)
- VII. The long-term implications of Darwin's ideas
- A. General acceptance by cultural elites in late 19th century
 - C. Secularization of the sciences
 - B. Social Darwinism, eugenics, imperialism, and evolution as the organizing principle of culture and human institutions

Pentateuch (five books of Moses)	Robert Chambers' <i>Vestiges of the Natural History of Creation</i> (1844)	Herbert Spencer's <i>Social Statics</i> (1850)
Noah's Ark	Galapagos Islands	Walter Bagehot's <i>Physics and Politics</i> (1872)
Genesis 6-9	Herbert Huxley	imperialism
Mt. Ararat	agnosticism	Nazism
Epic of Gilgamesh	Great Chain of Being	Social Darwinism
George Adam Smith	Aristotle	
James Cook	Teleology	
Georges Cuvier (1769-1832)	William Paley's <i>Natural Theology</i> (1802)	
Comte de Buffon (1707-88)	Jean Baptiste Lamarck (1744-1829)	
James Hutton's <i>Theory of the Earth</i> (1795)	transformationalism	
Louis Agassiz (1807-1873)	acquired traits	
Oxford, Cambridge	Erasmus Darwin (1731-1802)	
diluvial catastrophism	uniformitarianism	
Geological Society of London	Charles Lyell	
Mesopotamia	Thomas Malthus (1766-1834)	
Francis Bacon (1605)	Darwin's <i>Origin of Species</i> (1859)	
Augustine	random variation	
exegesis, hermeneutics	natural selection	
stratigraphy	Alfred Russel Wallace (1823-1913)	
geologic column	Asa Gray (1810-1888)	
Thomas Chalmers	St. George Jackson Mivart (1827-1900)	
Princeton Seminary	theistic evolution	
thermodynamics	Ernst Haeckel	
Ernest Rutherford	William Graham Sumner	
William Paley's <i>Natural Theology</i> (1802)		
nebular hypothesis		