

CS 346U
Exploring Complexity in Science and Technology
Fall, 2009

Week 3 Reading Questions (Chapters 5 and 6)

Due Monday, October 19.

1. In a few sentences, describe two major differences between Lamarck's account of how biological evolution occurred and the account due to the modern interpretation of Darwin's theory summarized on p. 78-79.
2. Describe in a few sentences one disagreement between the early Darwinists and the early Mendelians, and how this disagreement was resolved under the Modern Synthesis.
3. In one or two paragraphs, define "punctuated equilibria" and "historical contingency" in biological evolution, and describe the ways in which these two ideas are counter to the tenets of the Modern Synthesis.
4. Stephen Jay Gould and other evolutionary theorists have argued for the notion of "group selection", in which natural selection works at the level of groups of individuals. A possible piece of evidence for this would be the common appearance of "group-level" traits that are adaptive at the group level but maladaptive at the level of an individual organism. In a paragraph or so, discuss an example of such a trait in some biological group – that is, a trait that helps groups of individuals survive and give rise to "offspring" groups, but that is maladaptive for individuals. Explain why you think your example has these properties.
5. Many people have made analogies between Turing machines, on the one hand, and the way DNA is transcribed and translated into proteins, on the other hand. Given what you know about the latter mechanisms (from Chapter 6 or from other knowledge you have of genetics), what elements of the transcription and translation process do you think best correspond to the following elements of a Turing machine: *tape*, *tape-head*, *states*, *input symbols*, *output symbols*, *rules*? (There is no single "correct" answer here.) Write in a few sentences why you think this is a good—or a bad—analogy (or both).