

BIOS 317 - Evolution - Spring 2009

Lecture 41 (29 April)

Final—75 questions, one week from today, 6 May 12:00 (**not** 1:00), MO442

Final covers all the material not covered by the first and second exams; like the second exam it builds on earlier material. Lecture notes can serve as a study guide (lecture 23-41).

Reading: F&H cha. 4, 13 - 19
MS&S cha. 1- 6, 10

Lecture topics: selection and adaptation (senescence), systematics, speciation, major transitions, origin of life, origin of cells, origin of complex cells, origin of multicellular organisms, evolution of multicellular organisms, levels of selection.

How much chemistry? Do know basic things discussed in lecture, e.g., early atmosphere, “high-energy” compounds, what makes reactions spontaneous, photosynthesis, respiration, anaerobic, aerobic, syntropy.

Even if you didn’t do well on the hour exams, if you do well on the final, you can still do well in the course!

Evolution of Multicellular Organisms (F&H, cha 18)

A closer look at animals based on recent phylogenies (**Figure 18.12**):

basal metazoans: sponges, placozoans, cnidarians, ctenophores; these latter two groups are not united by sequence data or by a reasonable interpretation of the morphological data.... (remarkable none of these are major model systems of biology....)

flatworms: no anus! but likely polyphyletic, one group clearly a secondarily simplified group of protostomes, not basal; another group may be basal bilaterians or maybe not...

nematodes: claims that these are basal metazoans and much at stake here in biomedical work: yeast, "worm," "fly," and vertebrates... but nematodes and the "worm" are turning out to be a sister group of arthropods and the “fly”!!!

crown groups of metazoans: deuterostomes, lophotrochozoans, ecdysozoans... Note that deuterostomes which contain chordates may be basal to the other two! Maybe to understand vertebrates we need to know more about basal metazoans....

New views and old views of animal phylogeny....

Well, there’s not much time left to talk about human evolution, but you should have the tools to understand human evolution if you read about it on your own from the texts or if you go on to take another course. Indeed, evolutionary themes are now pervasive in political science, philosophy, sociology, psychology, and even literature. There is much that is fascinating about human evolution, much that relates to topics in this course:

vestiges: Who here has all their wisdom teeth? wisdom teeth that don't fit in our jaw (suggestive that the sister group of humans [apes] have larger jaws...)

sexual selection: likely very important in the evolution of humans (this was Darwin's thesis in the *Descent of Man*), perhaps in ways you wouldn't expect: consider in the context of the evolution of language; imagine how female choice would affect this, say, between a male that could only point and grunt and one that says things like, "Your smile is like a summer's day."

levels of selection: many of the conflicts in human society today are similar to the conflicts in the major transitions in evolution. You have the government as the higher level unit, people as the lower level units, constant tension, constant mediation (Bill of Rights in US Constitution). But this is far from the first human society, which was likely the family group. Consider human emotions such as romantic love in this context. Human children have a very long development time. Children that have both parents bringing them up likely have a higher fitness. But there are various temptations for both parents to defect from this higher level unit, this marriage. (Marriage is one of a number of "human universals" that may unite modern humans regardless of culture.) The male may be tempted to have other mates, the female may be tempted to secretly mate with other males, then raise these illegitimate children with her partner. To have a successful marriage and high fitness children, mechanisms have to evolve to mediate these conflicts. Romantic love is such a mechanism; not only does it draw the partners together, but it also alienates them from other potential partners.... Role of family still central to human life, e.g., typically political candidates success depends in part on being part of a family (perhaps makes sense because this requires a sense of government).

Highest level of selection (planet level): Earth will have a limited existence. If life on Earth is to survive the demise of its home planet, life must colonize other planets. This will likely require the emergence of greater cooperation in humans—a planet-level society.... It's still a ways off!