

"PRINCIPLES OF PHYLOGENETICS: ECOLOGY AND EVOLUTION"

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March 23, 2007. "**Speciation**" (**Diversification**)

As discussed previously, there are two fundamental kinds of things in evolutionary theory (Hull, Dawkins):

*replicator* = things of which copies are made -- a succession of replicators forms a *lineage*

*interactor* = things that interact in a common environment such that replication is differential

Both of these form nested hierarchies.

Four things can happen to lineages:

1. Origin
2. Extinction
3. Divergence
4. Reticulation

For today, will focus on divergence, which leads to diversification of lineages.

Constraints: Why is morphospace not filled in completely?

Adaptive landscapes vs developmental landscapes

GENERAL CLASSES OF CAUSAL FACTORS ADVANCED TO EXPLAIN  
COHESION/INTEGRATION OF "SPECIES":

- 1) GENE FLOW
- 2) STABILIZING SELECTION -- ECOLOGICAL CONSTRAINTS
- 3) DEVELOPMENTAL CONSTRAINTS

THE NULL HYPOTHESIS: RANDOM WALK; ACCIDENTS OF HISTORY

Implications for studies of "speciation":

The study of speciation involves an interplay between empirical research and concepts of species (the units of speciation). As emphasized before, the converse is true in that an understanding of processes impacting on species can influence species concepts for a group.

Studies of pattern (i.e., phylogenetic reconstructions) and process (underlying causal mechanisms) are related to each other in a reciprocal manner (Hull 1988). We must ask not just what species are and how they are to be defined, but also how they came into being and how they are maintained. General evolutionary theories about species, their origin and nature, can (and should) be examined in such a manner.

Three examples:

- Lynch (1989) -- vertebrates
- Theriot (1992) -- diatoms
- Mishler (1990a) -- mosses