

Biology 352: GENETICS AND EVOLUTION

Course Objectives

By the end of Biology 352 you will have learned much about genetics and evolution. Below is a broad outline of this material. You can think of these as the BIG QUESTIONS that you will be able to answer. We strongly suggest that you keep this list of objectives accessible. On each exam, you will be expected to integrate the detailed lecture material with these broader objectives.

TRANSMISSION GENETICS

- I. Students should have a mechanistic understanding of segregation, independent assortment, linkage and crossing over and how these influence patterns of inheritance.
- II. Students should have an understanding of the nature of the basic structural elements of genetics (chromosomes, genes, and alleles) and how these elements are related to one another.
- III. Students should have an understanding of the basic modes of Mendelian inheritance: dominance/recessiveness, incomplete dominance, sex-linkage, and epistasis. They should be able to discern these modes from distributions of phenotypes resulting from crosses and from pedigrees.

POPULATION GENETICS

- I. Students should understand Hardy-Weinberg equilibrium, the null model that provides a basis for population genetics. This includes knowing the assumptions of the H-W model, and being able to determine departures from H-W equilibrium statistically.
- II. Students should qualitatively and quantitatively understand the sources of genetic variation: gene flow and mutation.
- III. Students should qualitatively and quantitatively understand modes of sorting in population genetics. These include drift, assortative mating, inbreeding, and natural selection.
- IV. Students should understand how quantitative (continuously distributed, metric) characters are treated in population genetics. This includes the concept of heritability, and the relationship between single-locus, multi-locus and quantitative traits.

EVOLUTIONARY BIOLOGY

- I. Students should know the basic principles and ideas underlying evolutionary theory and its history.
- II. Students should understand how one determines phylogenetic relationships using morphological and molecular data.
- III. Students should have a general understanding of modes of sorting for biological variation (e.g., natural selection, sexual selection, group selection, kin selection, random drift, neutral theory).
- IV. Students should know broadly what species are and how they form.
- V. Students should know how evolutionary changes are related to developmental processes
- VI. Students should know the broad outline of major evolutionary events in the history of life and how they have shaped the biota.