Lecture 12
Evolution
Review genetic terminology in your intro.
bio. book
(which you did not sell for cash…)
Read article 12
S&S p. 78-79

Time to Shift Gears!

Ecological Theater and
Evolutionary Play
Ecology Now, Evolution Over Time

Related Fields, Shared Questions

Theory and Real World
- Develop models of how evolution works
- Test model predictions in the real world
Hardy-Weinberg Law

- Evolution describes genetic change over time
- Hardy-Weinberg theory is the ‘null model’ of evolution

Terminology Refresher!

Chromosome - nuclear strand of DNA (and associated proteins) containing genes coding for enzymes and other proteins that carry out cell functions

Terminology Refresher!

Diploid organisms (2n) - contain 2 like (but not identical) chromosomes termed ‘homologous chromosomes’, one from each parent
Terminology Refresher!
(REVIEW 'CENTRAL DOGMA' ON YOUR OWN IN A BASIC BIO BOOK)

- Gene - section of DNA on a chromosome coding for a single polypeptide strand

- Locus - position of the gene on the chromosome

Gene -> Protein
(REVIEW 'CENTRAL DOGMA' ON YOUR OWN IN A BASIC BIO BOOK)

- mRNA formed via transcription
Gene -> Protein
(REVIEW ‘CENTRAL DOGMA’ ON YOUR OWN IN A BASIC BIO BOOK)
- mRNA sequence translated into amino acid sequence

Terminology Refresher!
(THESE ARE IMPORTANT FOR POPULATION BIOLOGY)
- Alleles - alternative DNA sequences for a gene that give rise to slightly to radically-altered gene products (Allele A, a; or A₁, A₂)

Terminology Refresher!
(THESE ARE REALLY IMPORTANT FOR POPULATION BIOLOGY)
- Genotype - alleles present at a given gene locus (e.g., A₁A₁ or Aa)
- Dominance - the manner of expression of alleles in the presence of other alleles
**Dominance (KNOW THIS COLD!)**

- A Mendelian backcross reveals how dominance works in seed color of peas

**Terminology refresher!**
(I CANNOT EMPHASIZE ENOUGH HOW IMPORTANT THIS IS!)

- **Phenotype** - external 'appearance' or physiological expression of trait
  - Discrete traits - in 'classes'; e.g., color (?), hairy/not, male/female, diseased/not
  - Continuous traits - measurable traits that can take on a continuous range of values (not in classes); e.g., photosynthetic rate, running speed, growth rate, height.

**Terminology Refresher!**
(NO, SERIOUSLY, I MEAN IT!)

- **Heterozygous** - contains different alleles at a gene locus (e.g., $A_1A_2$)
- **Homozygous** - contains the same alleles at a gene locus (e.g., $C_1C_1$ or $C_2C_2$)
New Terms!

- **Polymorphic** -

![Image of Dr. McGraw's Newfoundland, Chewbacca (RIP)]

New Terms!

- **Frequency** - ________________________
- **Allele frequency** - ___________________
- **Genotype frequency** - ________________________
- **Phenotype frequency** - ________________________

Mini-clicker review

- If no one of these phenotypes comprises more than 95% of the population, we would call this lizard population:
  - A. Monomorphic
  - B. Polymorphic
  - C. Homozygous
  - D. Heterozygous
Clicker Review 2

In this dihybrid cross, what proportion of offspring would be expected to be heterozygous at both loci?

- A. ½
- B. ¼
- C. 1/8
- D. 1/16

Clicker Review 3

In this dihybrid cross, what proportion of offspring would be expected to be homozygous at both loci?

- A. ½
- B. ¼
- C. 1/8
- D. 1/16

Review: Genetic terms to know

General terms:
- Chromosome
- Diploid
- Gene
- Locus
- Transcription
- Translation
- Codon/anti-codon
- Allele
- Dominance
Evolution (population genetic sense)

Genetic change.

Measured as change in allele frequency over time.

\[ p_{t+1} = f(p_t) \]

What is this function? How are the 'particles' of evolution differentially passed on to future generations?
Purpose of Hardy-Weinberg Law

To answer the following question: In a population with known allele frequencies at time t, what will the genotype frequencies be at generation t+1?

We will extend this to answer the evolutionary question: Given allele frequencies p and q at time t, what are the allele frequencies at time t+1? (Has there been evolution?)

Hardy-Weinberg

The H-W Law predicts genotype frequencies (t+1) from allele frequencies (t)

Combined with the relationship between allele and genotype frequencies within generations, we can solve H-W problems.
Summary

- Review your basic genetic terminology!
- From here on, I am going to use it as if you know it…