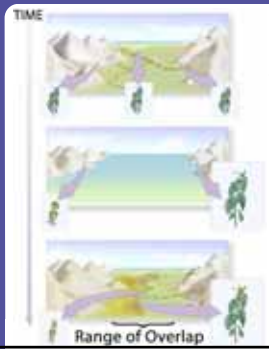
Species and their Formation

Evolution of Populations I

University of Idaho

Start Audio Lecture!

What Is Evolution?

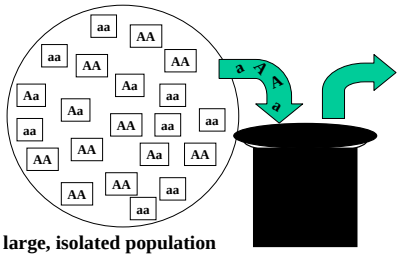


Evolution is the change in the genetic structure of a population. This occurs by:

1) changing the frequencies of existing alleles of a gene in a population
2) changing the alleles themselves

Here, one continuous population of a plant species is split by rising water. Over time, the gene pools of the two populations diverge, perhaps due to different selective pressures or genetic drift. As a result, two new forms of the plant evolve, which may be two different species.

Populations That Are Not Evolving



A + a,
A + A,
a + A,
or a + a?

large, isolated population of diploid individuals

Calculating Allele Frequencies

Population has 40 AA individuals, 40 Aa individuals, and 20 aa individuals…

frequency of allele A = 40 x 2 (40 AA's, with two A's each)

plus 40 (40 Aa's with one A each)

divided by 200 (100 diploid ind's with 2 alleles each)

= **0.6 or 60%**

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Calculating Genotype Frequencies: The Hardy-Weinberg Equation

$p^2 + 2pq + q^2 = 1$

p = allele frequency of A
q = allele frequency of a

$p^2 = A^2 = A \times A = 0.6 \times 0.6 =$ **0.36** (36%)

$q^2 = a^2 = q \times q = 0.4 \times 0.4 =$ **0.16** (16%)

2pq = 2Aa = 2 x 0.6 x 0.4 = **0.48** (48%)

1.0

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Assumptions of Hardy-Weinberg

All of these assumptions must be true for populations to be in Hardy-Weinberg equilibrium:

1) population size is large
2) mating is random
3) there is no migration into or out of the population
4) there is no mutation
5) there are no selective forces on the alleles under consideration

If any of these assumptions are violated, allele and genotype frequencies will change → population will evolve

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Causes of Evolutionary Change

There are many mechanisms that lead to the evolution of populations, including:

1) natural selection
2) mutation
3) sexual selection
4) gene flow
5) genetic drift

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