


Bio 115 Cells & Evolution of Life

Species and their Formation

Evolution of Populations II



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Assumptions of Hardy-Weinberg

For populations 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

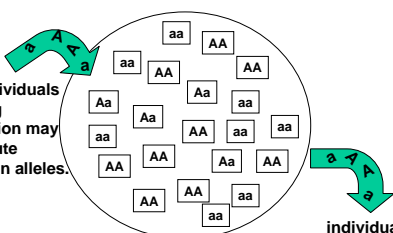
If any of these assumptions are violated, allele and genotype frequencies will change → population will evolve

What factors cause assumptions to be violated?

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Gene Flow: Immigration and Emigration



new individuals entering population may contribute their own alleles.

individuals leaving population take their own alleles out.

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Genetic Drift: Chance Changes in Allele Frequencies

Genetic Drift

if this individual does not mate, allele 'a' will be lost in subsequent generations

Genetic drift is an important factor to consider in the conservation of species with small populations and low genetic diversity, like the cheetah.

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Genetic Drift II: Founder Effects

Founder Effect / Bottlenecks

these two individuals survive catastrophic event, or found new population, resulting in...

different allele frequencies in new population

Scientists believe that the diversification of *Drosophila* on the Hawaiian islands is due at least 45 founder events. (Numbers on the islands represent the number of species present on that island)

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Sexual Selection: Non-Random Mating

Individuals may display certain phenotypes that indicate they have a higher fitness than other individuals.

This may result in that individual mating more often, and increasing the frequency of his or her genes in the gene pool of the population.

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Natural Selection: Differential Survival and Reproduction

Individuals may carry certain genotypes that give them an advantage in an environment.


As a result, those individuals are more likely to survive and pass on their genes.

Because of this, their genes may become more prevalent in the gene pool of a population.

(a)



(b)



If the food source of an environment is primarily very hard seeds, birds with bigger, stronger beaks (b) will likely be able to eat more than birds with smaller, weaker beaks. Because of this, larger-beaked birds will likely survive and reproduce more effectively.

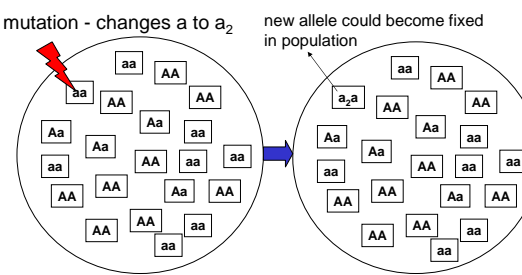
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Mutations: Novel Genetic Material

mutation - changes a to a_2

new allele could become fixed in population



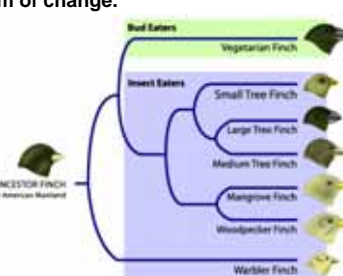
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Evolution: A Result of Many Factors

The evolution of populations is usually not a result of one, single mechanism of change.

The diversification of finches on the Galapagos Islands was likely due to a combination of founder effects, natural selection, sexual selection, and possibly mutation.



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