

Violating Random Mating

1.) Disassortative mating - opposites attract.

ex.) MHC genotype

2.) Assortative mating - like mates with like

ex.) Degree of education

3.) Inbreeding - mating among relatives

Inbreeding affects all genes, not just specific loci like disassortative and assortative mating.

With inbreeding, we expect an increase in the number of homozygotes, but no change in allele frequencies.

Evolution by Natural Selection- the mechanism that produces adaptation

Darwin's insights:

- 1.) Organisms cannot reproduce without limit, more individuals are born than can survive; ie. there is going to be selective pressures on populations.
- 2.) Organisms differ from one another in characteristics that contribute to success or failure in the "struggle for existence"; ie. some organisms have greater fitness than others due to characteristics which confer increased fitness.
- 3.) Offspring tend to resemble their parents; ie. there is a genetic component to the characteristics conferring an increase in fitness.

fitness - the probability of having offspring x the number of offspring produced. This definition takes into account survival and reproduction.

A characteristic is under selection if it allows an increase in fitness, ie. differences in survival or reproduction.

Evolution takes place only if there is a genetic component to the characteristic under selection.

ex.) Imagine that a severe cold spell occurs this winter, which kills all house sparrows except for the very largest, which can keep themselves warm. We would say that selection is favoring large body size. But what if body size only depends on the diet of the bird, not genetics? Larger birds just happened to find more food. In this case we wouldn't say that *evolution* has occurred by natural selection.

The Hierarchy of Selection

In principle, Natural Selection can act on all levels of biological organization, including: genes, cells, organisms, populations, species, clades, etc. We usually think of natural selection acting at the organismal level, but there are known exceptions:

gene level selection: remember the mouse *t* allele example from lecture. This allele is favored by selection at the gene level, but disfavored at the organismal level!

organismal level selection: this is the level we normally think of. Think about the brown anole example we discussed in lecture.

group level selection: remember the *Tribolium castaneum* example from lecture. Researchers were able to use group selection to increase or decrease the population size of flour beetles relative to a control.