Phenotypic Plasticity: different phenotypes from the same genotype in different environments.

Examples: -skin color in humans

-plant size in response to water/nutrient availability

- migratory or non migratory behavior in some insect species.

- and millions of other examples...

Remember: we can't use heritability estimates to say whether differences *between* groups are genetically based. Phenotypic plasticity makes this impossible.

Sexual Selection

Natural Selection can be thought of as being composed of two separate processes.

1.) **Viability Selection:** due to differences in survival.

2.) **Sexual Selection:** due to differences in reproductive ability.

includes: male-male competition for mates,

female choice

Bateman’s Principle

Generally speaking, females produce relatively few gametes with a relatively high cost per gamete. Also, in many cases females reproduce relatively rarely.

On average reproductive success in males is equal to that of females, but there is very little variance in female reproductive success, while there is high variance in male reproductive success. Some males mate many females, while other males don’t mate at all.

The males that are most attractive to females will get the most mates.

Female choice and male-male competition can lead to the evolution of secondary sexual characters in males.

Secondary sexual characters: differences between males and females that are not necessary for reproduction. They either make the male more attractive to females or give the male a competitive edge in male-male competition.

ex.) facial hair in human males

Manes on male lions

The extravagant feathers of male birds of paradise

Antlers on male deer

etc.

Female preference may be completely arbitrary. In cases like this run away selection can lead to the evolution extravagant male ornamentation that doesn’t actually reflect how fit a male is to the environment.

or

Females could be using male ornamentation as a way of judging the fitness of the male. In other word, elaborate male ornamentation (or behavior) could reflect “good genes” in the male.

The Evolution of Behavior

altruism: behavior costly to the individual doing the behavior and beneficial to the recipient.

Question: how could altruistic behaviors ever evolve in a population. Wouldn’t these behaviors be heavily selected against because they are causing a decrease in the fitness of altruistic individuals?

Possible Solutions:

1.) Reciprocal altruism

2.) Kin Selection

Reciprocal Altruism

Requirements

1.) ability to recognize individuals

2.) ability to recognize cheaters and respond accordingly, i.e. it isn't to anyone's benefit to cheat.

3.) stable patterns of behavior

In a population composed of individuals who meet these requirements, reciprocal altruism may be the most stable strategy, i.e. cheaters actually don't win and have lower fitness.

Kin Selection

Altruistic behaviors can evolve in a population if the altruistic individuals only help individuals that are likely to also carry the gene that causes an individual to behave altruistically.

This allows the gene to increase in frequency in a population.

Hamilton's rule: an altruistic trait can increase in frequency if the benefit (*b*) received by the donor's relatives, weighted by their relationship (*r*) to the donor, exceeds the cost (*c*) of the trait to the donor's fitness (Futuyma 2005)

if $c < rb$ then the behavior can evolve.