

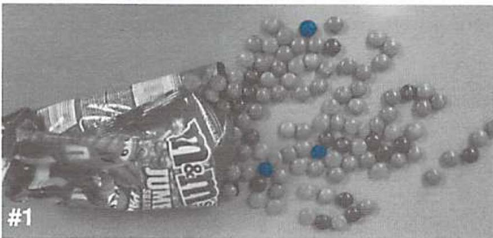
Key Idea: Evolution by **natural selection** describes how organisms that are better adapted to their environment survive to produce a greater number of offspring.

Evolution

Evolution is the change in inherited characteristics in a population over generations. Evolution is the consequence of interaction between four factors: (1) The potential for populations to increase in numbers, (2) Genetic variation as a result of mutation and sexual reproduction, (3) competition for resources, and (4) individuals with better survival and reproduction pass on their traits.

Natural selection is the term for the mechanism by which better adapted organisms survive to produce a greater number of viable offspring. This has the effect of increasing their proportion in the population so that they become more common. This is the basis of Darwin's theory of evolution by natural selection.

We can demonstrate the basic principles of evolution using the analogy of a 'population' of M&M's candy.



In a bag of M&M's, there are many colors, which represents the variation in a population. As you and a friend eat through the bag of candy, you both leave the blue ones, which you both dislike, and return them to bag.



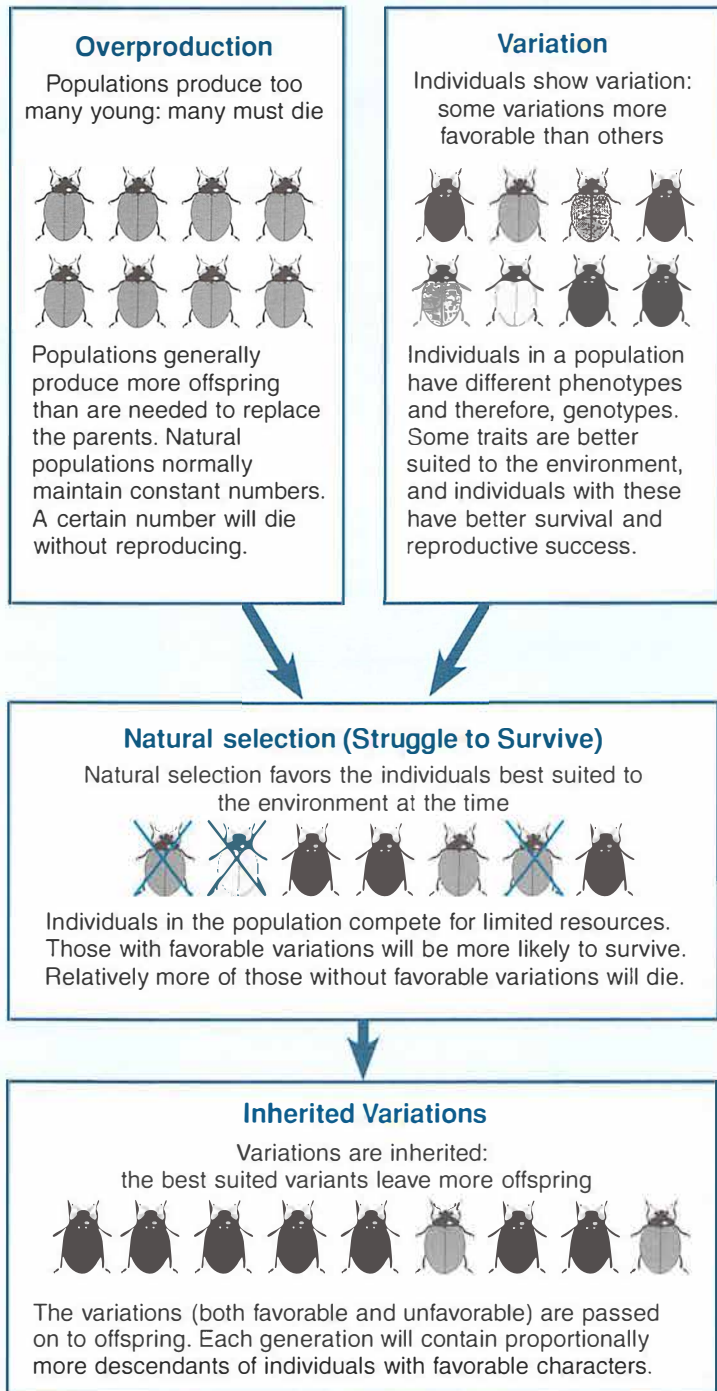
The blue candy becomes more common...



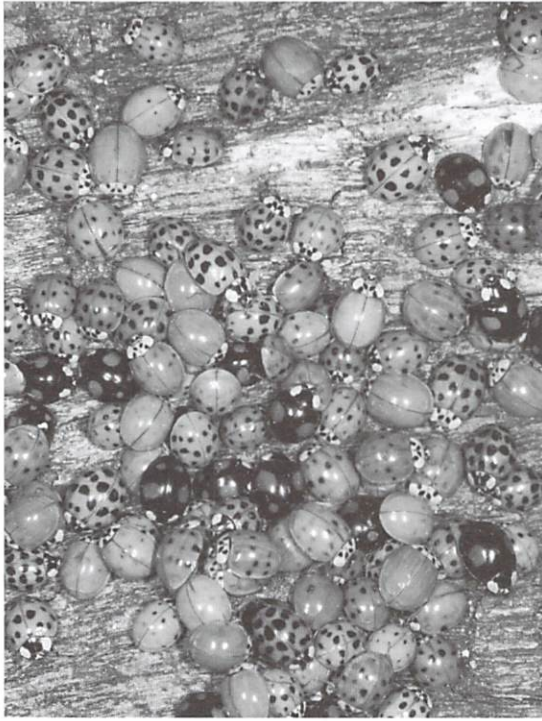
Eventually, you are left with a bag of blue M&M's. Your selective preference for the other colors changed the make-up of the M&M's population. This is the basic principle of selection that drives evolution in natural populations.

Darwin's theory of evolution by natural selection

Darwin's theory of evolution by natural selection is outlined below. It is widely accepted by the scientific community today and is one of founding principles of modern science.

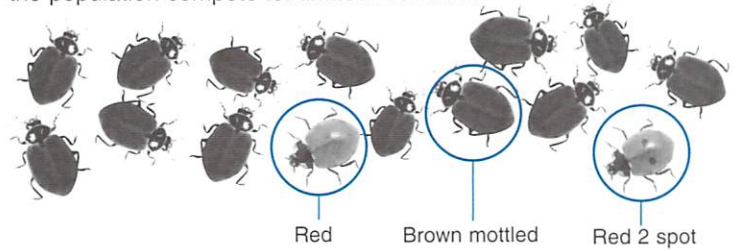


Variation, selection, and population change

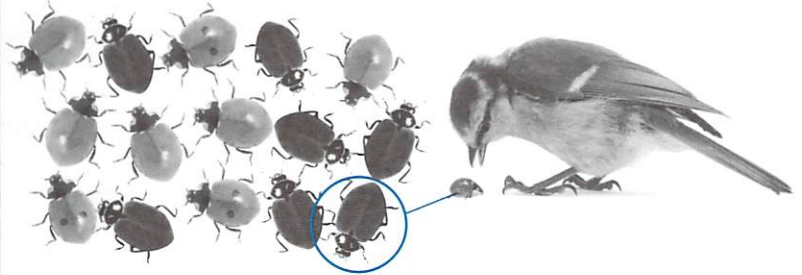


Natural populations, like the ladybug population above, show genetic variation. This is a result of **mutation** (which creates new alleles) and sexual reproduction (which produces new combinations of alleles). Some variants are more suited to the environment of the time than others. These variants will leave more offspring, as described for the hypothetical population (right).

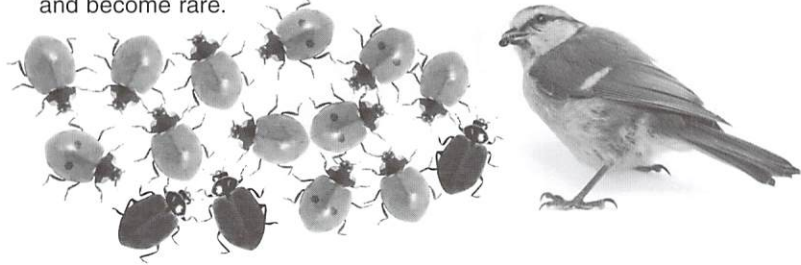
1. Variation through mutation and sexual reproduction:
 In a population of brown beetles, mutations independently produce red coloration and 2 spot marking on the wings. The individuals in the population compete for limited resources.



2. Selective predation:
 Brown mottled beetles are eaten by birds but red ones are avoided.



3. Change in the genetics of the population:
 Red beetles have better survival and fitness and become more numerous with each generation. Brown beetles have poor fitness and become rare.



1. What produces the genetic variation in populations? _____

2. (a) Define evolution: _____

(b) Identify the four factors that interact to bring about evolution in populations: _____

3. Using your answer 2(b) as a basis, explain how the genetic make-up of a population can change over time:
