Variation of Traits Within a Population

- Population biologists study many different traits in populations, such as size and color.

Variation of Traits Within a Population, continued

- Causes of Variation
  - Traits vary and can be mapped along a bell curve, which shows that most individuals have average traits, whereas a few individuals have extreme traits.
  - Variations in genotype arise by mutation, recombination, and the random pairing of gametes.
Chapter 16

The Gene Pool

• The total genetic information available in a population is called the **gene pool**.

Section 1 Genetic Equilibrium

The Gene Pool, continued

• **Allele frequency** is determined by dividing the total number of a certain allele by the total number of alleles of all types in the population.

Chapter 16

Objectives

• List five conditions under which evolution may take place.
• Explain how migration can affect the genetics of populations.
• Explain how genetic drift can affect populations of different sizes.
• Contrast the effects of stabilizing selection, directional selection, and disruptive selection on populations over time.
• Identify examples of nonrandom mating.
Chapter 16

Section 2 Disruption of Genetic Equilibrium

Mutation

- Evolution may take place when populations are subject to genetic mutations, gene flow, genetic drift, nonrandom mating, or natural selection.

- Mutations are changes in the DNA.

Gene Flow

- Emigration and immigration cause gene flow between populations and can thus affect gene frequencies.

Genetic Drift

- Genetic drift is a change in allele frequencies due to random events.

- Genetic drift operates most strongly in small populations.

Nonrandom Mating

- Mating is nonrandom whenever individuals may choose partners.
Nonrandom Mating, continued

- Sexual Selection
  - Sexual selection occurs when certain traits increase an individual's success at mating.
  - Sexual selection explains the development of traits that improve reproductive success but that may harm the individual.

Natural Selection

- Natural selection can influence evolution in one of three general patterns.

Natural Selection, continued

- Stabilizing Selection
  - Stabilizing selection favors the formation of average traits.

Natural Selection, continued

- Disruptive Selection
  - Disruptive selection favors extreme traits rather than average traits.
Chapter 16 Section 2 Disruption of Genetic Equilibrium

Natural Selection, continued

- Directional Selection
  - Directional selection favors the formation of more-extreme traits.

Chapter 16 Section 2 Disruption of Genetic Equilibrium

Two Kinds of Selection

Chapter 16 Section 3 Formation of Species

Objectives

- Relate the biological species concept to the modern definition of species.
- Explain how the isolation of populations can lead to speciation.
- Compare two kinds of isolation and the pattern of speciation associated with each.
- Contrast the model of punctuated equilibrium with the model of gradual change.

Chapter 16 Section 3 Formation of Species

The Concept of Species

- According to the biological species concept, a species is a population of organisms that can successfully interbreed but cannot breed with other groups.
Chapter 16

Isolation and Speciation

• Geographic Isolation
  – Geographic isolation results from the separation of population subgroups by geographic barriers.

Isolation and Speciation, continued

• Allopatric Speciation
  – Geographic isolation may lead to allopatric speciation.

Isolation and Speciation, continued

• Reproductive Isolation
  – Reproductive isolation results from the separation of population subgroups by barriers to successful breeding.

Isolation and Speciation, continued

• Sympatric Speciation
  – Reproductive isolation within the same geographic area is known as sympatric speciation.
Chapter 16

Rates of Speciation

• In the gradual model of speciation (gradualism), species undergo small changes at a constant rate.

• Under punctuated equilibrium, new species arise abruptly, differ greatly from their ancestors, and then change little over long periods.