11.2 Natural Selection in Populations

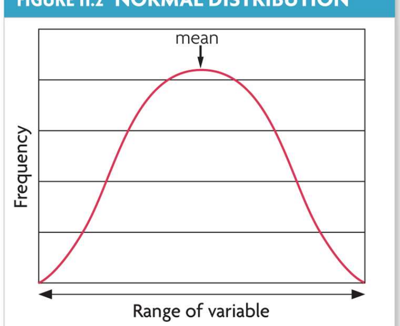
KEY CONCEPT

Populations, not individuals, evolve.

11.2 Natural Selection in Populations

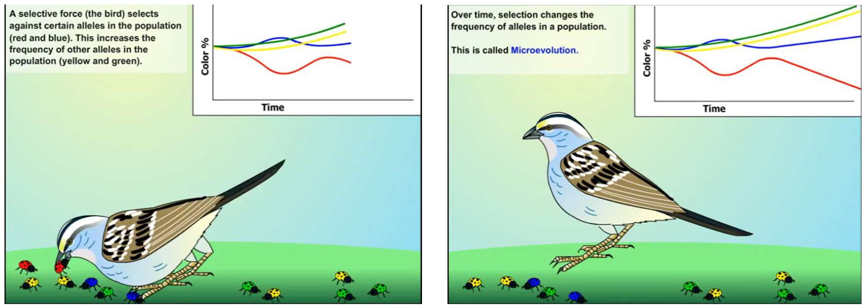
- **Natural selection acts on distributions of traits.**
  - A **normal distribution** graphs as a bell-shaped curve.
    - highest frequency near mean value
    - frequencies decrease toward each extreme value
  - Traits not undergoing natural selection have a normal distribution.

FIGURE 11.2 NORMAL DISTRIBUTION



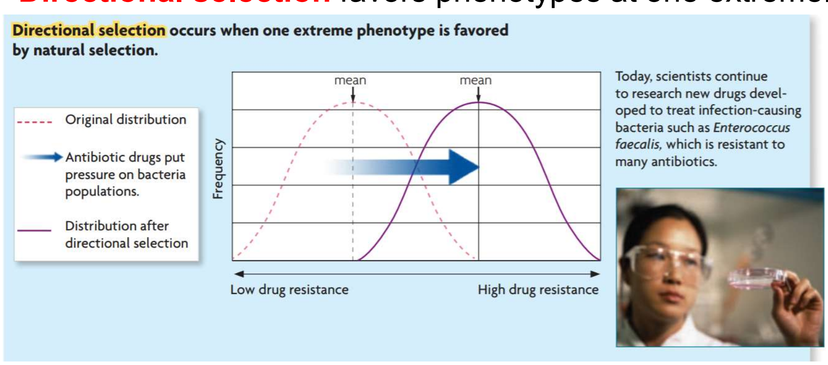
11.2 Natural Selection in Populations

- **Natural selection can change the distribution of a trait in one of three ways.**
  - **Microevolution** is evolution within a population.
    - – the observable change in the allele frequencies of a population over time; can result from natural selection



11.2 Natural Selection in Populations

- Natural selection can take one of three paths.
  - – **Directional selection** favors phenotypes at one extreme.



The rise of drug-resistant bacteria provides a classic example of this type of selection.
Before antibiotics were developed in the 1940s, a trait for varying levels of drug resistance existed among bacteria.
At the time, there was no advantage to having drug resistance. But once antibiotics came into use, the resistant bacteria had a great advantage.

The early success of antibiotics in controlling infectious diseases led to overuse of these drugs. This overuse favored even more resistant phenotypes.
New drugs were then developed to fight the resistant bacteria. This resulted in the evolution of "superbugs" that are highly resistant to many drugs.
Today, over 200 types of bacteria show some degree of antibiotic resistance.

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- Natural selection can take one of three paths.
  - **Stabilizing selection** favors the intermediate phenotype.

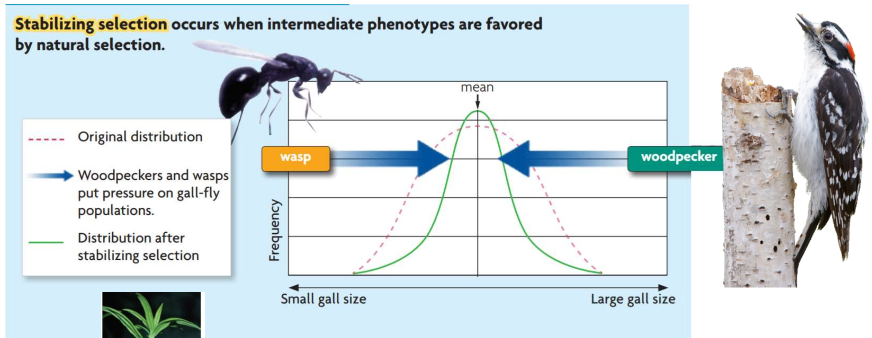

FIGURE 2.3 The gall fly and the goldenrod plant have a parasitic relationship. The fly benefits by receiving shelter and food during its larval stage, while the goldenrod is harmed, growing more slowly than a gall-free goldenrod.

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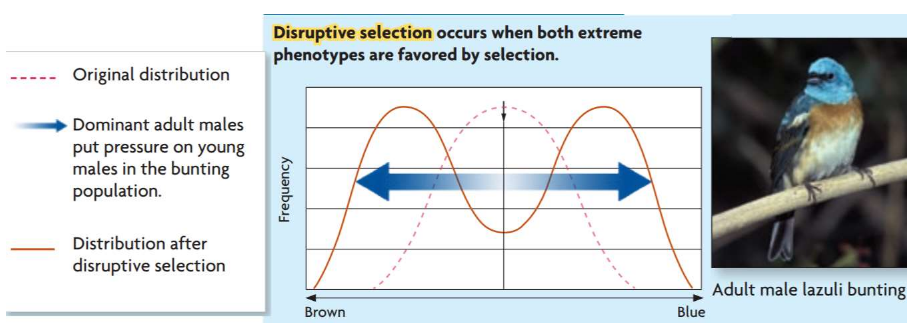
- Natural selection can take one of three paths.
  - **Disruptive selection** favors both extreme phenotypes.



Research suggests that dominant adult males are aggressive toward young buntings that they see as a threat, including bright blue and bluish brown males. The dullest brown birds can therefore win a mate because the adult males leave them alone. Meanwhile, the bright blue birds attract mates simply because of their color.

Both extreme phenotypes are favored in this situation, while intermediate forms are selected against. The bluish brown males are not as well adapted to compete for mates because they are too blue to be left alone by adult males, but not blue enough to win a mate based on color alone. By favoring both extreme phenotypes, disruptive selection can lead to the formation of new species.