Chapter 4
The Organization of Life
Section 2: Evolution
DAY 1
Evolution by Natural Selection

- English naturalist **Charles Darwin** observed that organisms in a population differ slightly from each other in form, function, and behavior.

- Some of these differences are **hereditary**.

- Darwin proposed that the **environment exerts** a strong influence over which individuals survive to produce offspring, and that some individuals, because of certain traits, are more likely to survive and reproduce than other individuals are.
Evolution by Natural Selection

• **Natural selection** is the process by which individuals that have favorable variations and are better adapted to their environment survive and reproduce more successfully than less well adapted individuals do.

• Darwin proposed that over many generations, natural selection causes the characteristics of **populations to change**.

• **Evolution** is a change in the characteristics of a population from one generation to the next.
Evolution YouTube!

Bill Nye Explains
Nature Selects

- Darwin thought that nature selects for certain traits, such as sharper claws, because organisms with these traits are more likely to survive.

- Over time, the population includes a greater and greater proportion of organisms with the beneficial trait.

- As the populations of a given species change, so does the species.
# Evolution by Natural Evolution

<table>
<thead>
<tr>
<th>Evolution by Natural Selection</th>
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<tbody>
<tr>
<td><strong>1. Organisms produce more offspring than can survive.</strong></td>
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<td><strong>2. The environment is hostile and contains limited resources.</strong></td>
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<td><strong>3. Organisms differ in the traits they have.</strong></td>
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<td><strong>4. Some inherited traits provide organisms with an advantage.</strong></td>
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<tr>
<td><strong>5. Each generation contains proportionately more organisms with advantageous traits.</strong></td>
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Nature Selects

- An example of evolution is a population of deer that became isolated in a cold area.
- Some of the deer had genes for thicker, warmer fur.
- These deer were more likely to survive, and their young with thick fur were more likely to survive to reproduce.
- Adaptation is the process of becoming adapted to an environment.
- It is an anatomical, physiological, or behavioral change that improves a population’s ability to survive.
Adaptations Explained via YouTube!

Adaptation Song
Coevolution

• The process of two species evolving in response to long-term interactions with each other is called **coevolution**.

• An example is the **Hawaiian honeycreeper**, which has a long, curved beak to reach nectar at the base of a flower.

• The flower has structures that ensure that the bird gets some pollen on its head.

• When the bird moves the next flower, some of the pollen will be transferred, helping it to reproduce.
Nature Selects

1. These deer live in a warm climate. Some have thicker fur than others.

2. Some deer become separated from the rest of the group.

3. In the cold mountain climate, deer with thicker fur are more likely to survive.

4. As years pass, each generation has a greater proportion of deer with thick fur. After many generations, most deer have thick fur.
Coevolution

• The honeycreeper’s adaptation is a long, curved beak.
• The plant has two adaptations:
  – The first is the sweet nectar, which attracts the birds.
  – The second is the flower structure that forces pollen onto the bird’s head when the bird sips nectar.
Evolution by Artificial Selection

- **Artificial selection** is the selective breeding of organisms, by humans, for specific desirable characteristics.
- Dogs have been bred for certain characteristics.
- Fruits, grains, and vegetables are also produced by artificial selection.
- Humans save seeds from the largest and sweetest fruits.
- By selecting for these traits, farmers direct the evolution of crop plants to produce larger, sweeter fruit.
Evolution of Resistance

- **Resistance** is the ability of an organism to tolerate a chemical or disease-causing agent.

- An organism may be resistant to a chemical **when it contains a gene that allows it to break down a chemical into harmless substances.**

- Humans promote the evolution of resistant populations by trying to control pests and bacteria with chemicals.
Pesticide Resistance

• A pesticide sprayed on corn to kill grasshoppers, for example, may kill most of the grasshoppers, but those that survive happen to have a gene that protects them from the pesticide.

• These surviving insects pass on this resistant gene to their offspring.

• Each time the corn is sprayed; more grasshoppers that are resistant enter the population.

• Eventually the entire population will be resistant, making the pesticide useless.
Pesticide Resistance

1. Insect pests are sprayed with an insecticide. Only a few resistant insects survive.

2. The survivors pass the trait for insecticide resistance to their offspring.

3. When the same insecticide is used again, more insects survive because more of them are resistant.