33.1B: Body Plans

Animal body plans can have varying degrees of symmetry and can be described as asymmetrical, bilateral, or radial.

Learning Objectives

• Describe the body plan of an animal

Key Points

• Some animals have a body with no pattern or symmetry, making them asymmetrical.
• Animals (mostly aquatic) with an up-and-down orientation have a radial symmetry in which there is no definite right or left side, but any longitudinal plane cut produces equal halves.
• Animals, either aquatic or terrestrial, that have a high level of mobility usually have a body plan that is bilaterally symmetric.
• Terms such as anterior (front), posterior (rear), dorsal (toward the back), and ventral (toward the stomach) are used to describe the position of parts of the body in relation to other parts.

Key Terms

• asymmetrical: having disproportionate arrangement of parts; exhibiting no pattern
• bilateral symmetry: having equal arrangement of parts (symmetry) about a vertical plane running from head to tail
• radial symmetry: a form of symmetry wherein identical parts are arranged in a circular fashion around a central axis
Body Plans

Animal body plans follow set patterns related to symmetry. They can be asymmetrical, radial, or bilateral in form. Asymmetrical animals are those with no pattern or symmetry, such as a sponge. Radial symmetry describes an animal with an up-and-down orientation: any plane cut along its longitudinal axis through the organism produces equal halves, but not a definite right or left side. This plan is found mostly in aquatic animals, especially organisms that attach themselves to a base, such as a rock or a boat, and extract their food from the surrounding water as it flows around the organism. Bilateral symmetry is found in both land-based and aquatic animals; it enables a high level of mobility. Bilateral symmetry is illustrated in a goat. The goat also has an upper and lower component to it, but a plane cut from front to back separates the animal into definite right and left sides.

Figure 1: Body symmetry: Animals exhibit different types of body symmetry. The sponge is asymmetrical, the sea anemone has radial symmetry, and the goat has bilateral symmetry.

In order to describe structures in the body of an animal it is necessary to have a system for describing the position of parts of the body in relation to other parts. For example, it may be necessary to describe the position of the liver in relation to the diaphragm or the heart in relation to the lungs. The most common terms used when describing positions in the body are anterior (front), posterior (rear), dorsal (toward the back), and ventral (toward the stomach). Note that the terms superior and inferior are usually not used to describe animals. They are only used to describe the position of structures in the human body (and possibly apes) where the upright posture means some structures are above or superior to others.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorsal</td>
<td>Near the back of the animal than</td>
<td>The backbone is dorsal to the belly.</td>
</tr>
<tr>
<td>Ventral</td>
<td>Near the belly of the animal than</td>
<td>The breastbone is ventral to the heart.</td>
</tr>
<tr>
<td>Cephalic</td>
<td>Near the head than</td>
<td>The brain is cephalic to the stomach.</td>
</tr>
<tr>
<td>Proximal</td>
<td>Closest to the body part (usually used for structures on limbs)</td>
<td>The shoulder is proximal to the elbow.</td>
</tr>
<tr>
<td>Distal</td>
<td>Further from the body part (usually used for structures on limbs)</td>
<td>The ankle is distal to the knee.</td>
</tr>
<tr>
<td>Medial</td>
<td>Near the midline than</td>
<td>The bladder is medial to the legs.</td>
</tr>
<tr>
<td>Lateral</td>
<td>Further from the midline than</td>
<td>The ribs are lateral to the lungs.</td>
</tr>
<tr>
<td>Rostral</td>
<td>Towards the muzzle</td>
<td>There are more gray hairs in the rostral part of the head.</td>
</tr>
<tr>
<td>Palmar</td>
<td>The &quot;walking&quot; surface of the front paw</td>
<td>There is a small cut on the left palmar surface.</td>
</tr>
</tbody>
</table>

Figure 1: Directional terms: The table illustrates common directional terms that are used to describe the position of body parts in relation to other body parts.