

EXCHANGES WITH THE EXTERNAL ENVIRONMENT

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- Every organism is an **open system**, continuously exchanging chemicals and energy with its surroundings to survive.
- An animal's size and shape affect its exchanges with its surrounding environment.
- All living cells must be bathed in a watery solution so that exchange of materials can occur.

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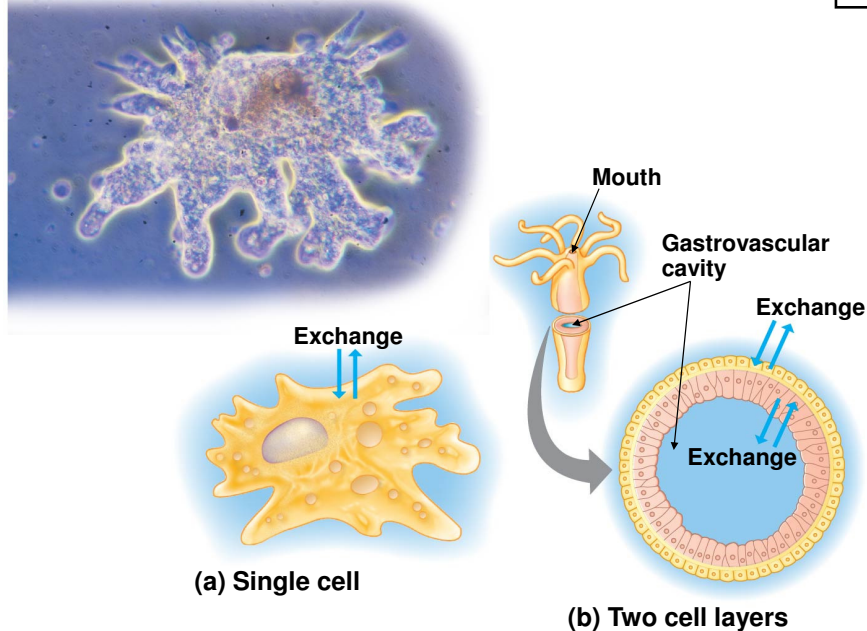
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- The entire surface area of a single-celled amoeba is in contact with its watery environment.
- A hydra has a body wall only two cell layers thick.
- Both layers of cells are bathed in pond water, enabling exchange with the environment.

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Figure 21.9

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- Animals with complex body forms face the same basic problems. Every cell must
 - be bathed in fluid and
 - have access to resources from the outside environment.

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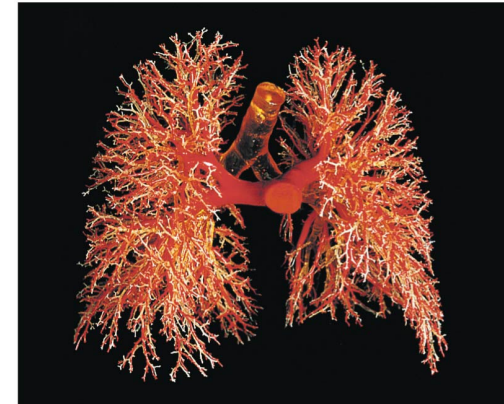
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- Complex animals have evolved extensively folded or branched internal surfaces that maximize surface area for exchange with the immediate environment.
- Lungs
 - have a very large total surface area and
 - exchange oxygen and carbon dioxide with the air you breathe.

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Figure 21.10

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- Animals use three organ systems to exchange materials with the external environment:
 1. digestive,
 2. respiratory, and
 3. urinary.

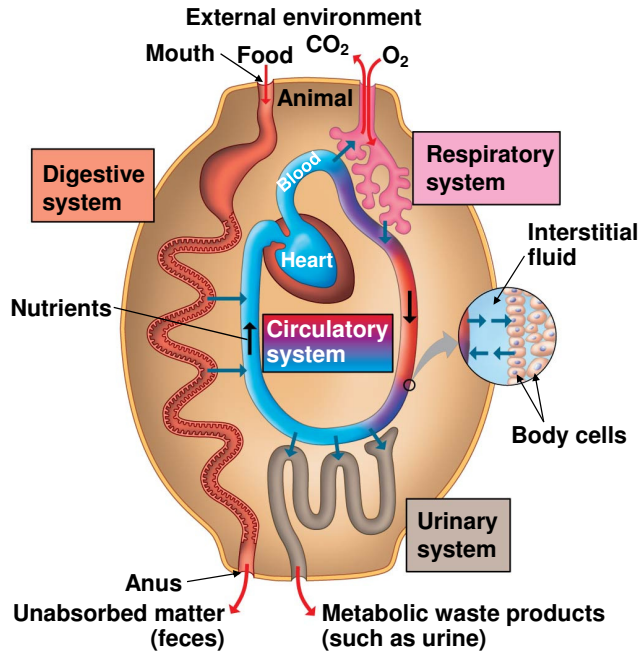
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- The circulatory system
 - connects to nearly every organ system,
 - transports needed materials from the environment to the body's tissues, and
 - carries waste away.

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REGULATING THE INTERNAL ENVIRONMENT

- Animals adjust to a changing environment.

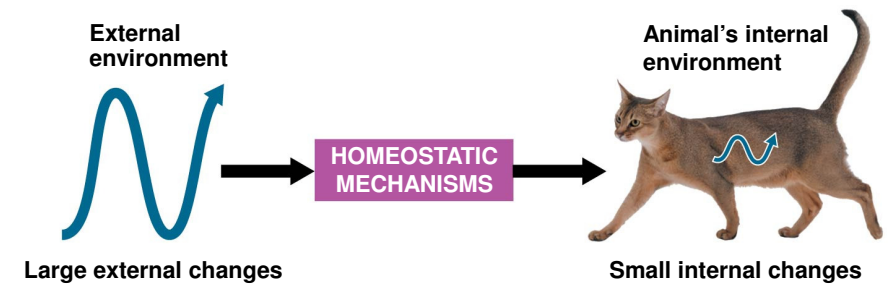
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Homeostasis

- Homeostasis** is the body's ability to stay relatively unchanged even when the world around it changes.
- The internal environment of vertebrates includes the **interstitial fluid** that
 - fills the spaces between cells and
 - exchanges nutrients and wastes with microscopic blood vessels.

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Figure 21.12



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Negative and Positive Feedback

- Most mechanisms of homeostasis depend on a principle called **negative feedback**,
 - in which the results of a process inhibit that same process,
 - such as a thermostat that turns off a heater when room temperature rises to the set point.



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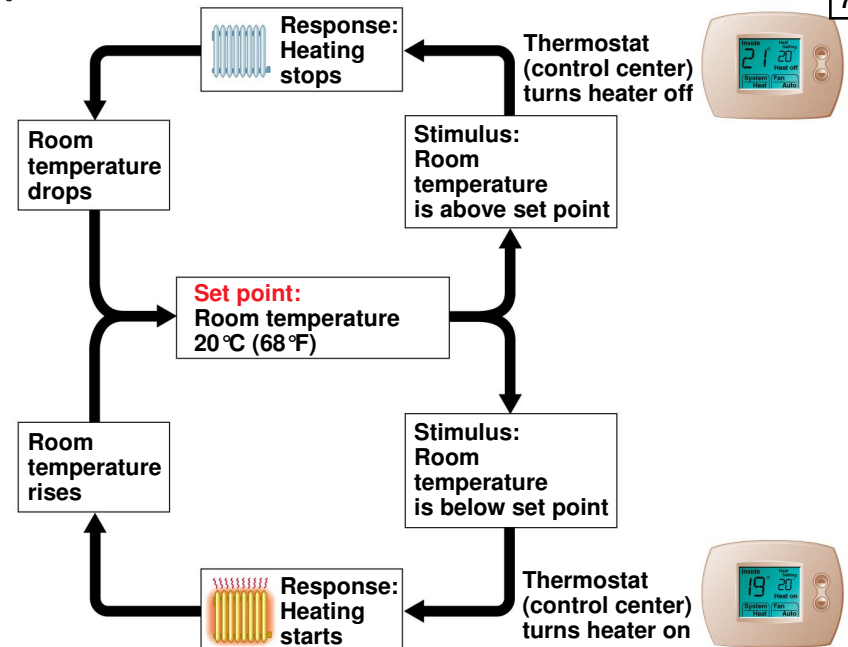
Animation: Negative Feedback
Right click slide / select "Play"



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Animation: Positive Feedback
Right click slide / select "Play"

Figure 21.13



- Less common is **positive feedback**,
 - in which the results of a process intensify that same process,
 - such as uterine contractions during childbirth.