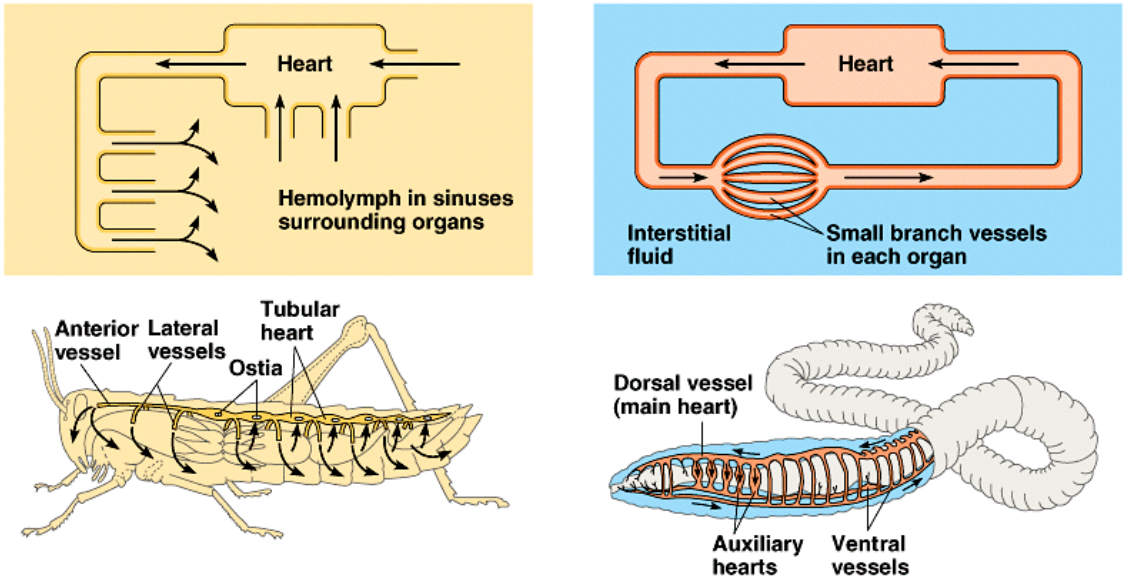
Diagrams of Vascular Systems

Open versus Closed Ciruclatory Systems:



(Figure 42.2 from Campbell 6th ed.)

Advantage of Double Circulatory System over Single Circulatory System

One advantage of a circulatory system such as that in fish is that blood going to most of the body has already been oxygenated in the gills. A disadvantage is that the narrow gill capillaries offer considerable resistance to the passage of blood, so that blood leaving the gills is at a much lower pressure than when it entered. Thus, no matter how hard the heart pumps, the blood traveling in a fish's dorsal aorta is at a relatively low pressure, since it has had to pass through the capillaries in the gills. This slows the rate of delivery of oxygen to the cells and limits the metabolic rate that fish can attain. In higher vertebrates, this problem is overcome by returning the blood to the heart as soon as it has passed through the respiratory organs (lungs instead of gills). During the second passage through the heart, the pressure is raised again before the blood goes out to the capillary beds in the rest of the body.

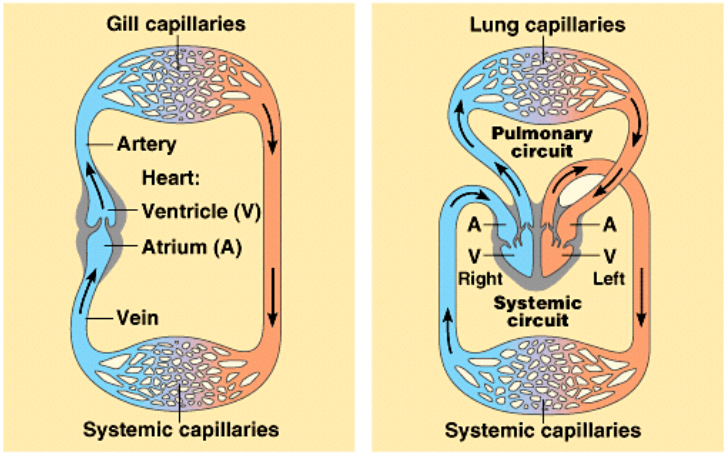
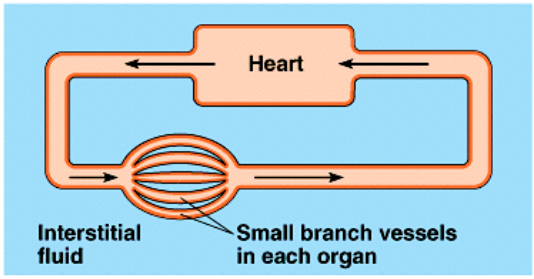


Figure 42.3 from Campbell 6th ed.

The single circulation of fish (left) . Blood passes through the heart once during each circuit of the body; pressure in the dorsal aorta is low since the slender gill capillaries offer much resistance to the blood as it passes through, picking up oxygen. **In mammals (and birds) (right)** , the blood must pass through the heart twice before it returns to the same point. Blood returning to the heart from the lungs is pumped at high pressure to the systemic (body) circulation.



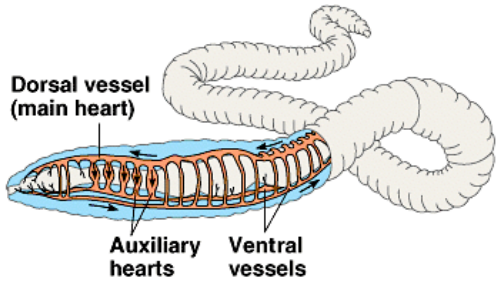


Figure 42.2 from Campbell 6th ed.

Arrangement of the major blood vessels in several segments of an **earthworm**. The blood of an earthworm flows in a definite, one-way circuit.

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