

Circulation and Gas Exchange III

Circulatory System keywords

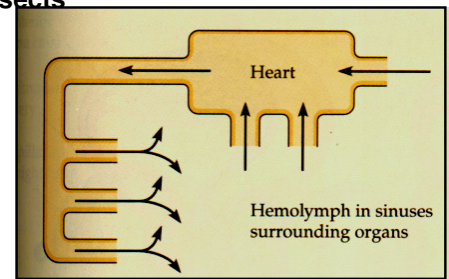
- Open vs. closed circulatory systems
- Hemolymph vs. blood
- Artery, capillary, vein
- 2-, 3-, 4- chambered heart
- Pathway of circulation
- Atrium
- ventricle

Circulatory Systems

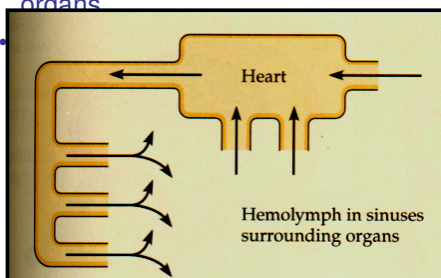
- **Two types: open and closed**
- **Used to transport oxygen to cells and waste carbon dioxide away.**
- **Also transport of other substances such as hormones, glucose, nitrogenous wastes**

Open circulatory system

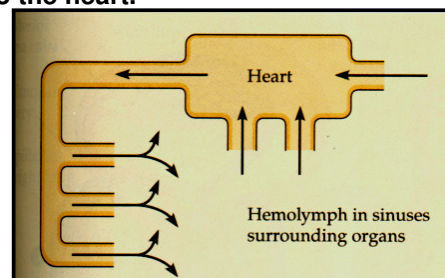
- **Found in invertebrates such as clams and insects**



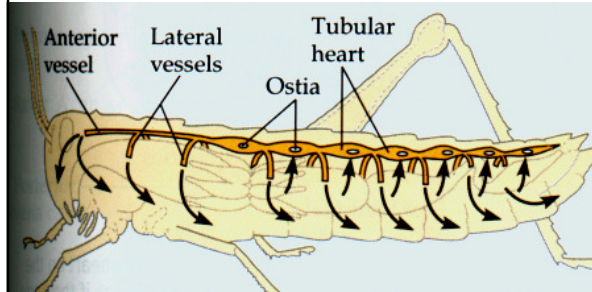
- Heart pumps fluid to through vessels out to body into spaces called sinuses.
- Fluid in sinuses bathes cells and organs.



- **Hemolymph collecting in sinuses can be drawn back into the heart.**
- **Body movements can aid circulation by squeezing sinuses and pushing blood back into the heart.**

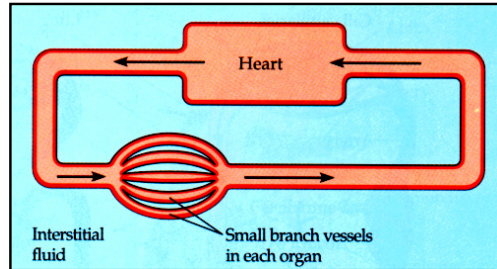


Example of open circulation

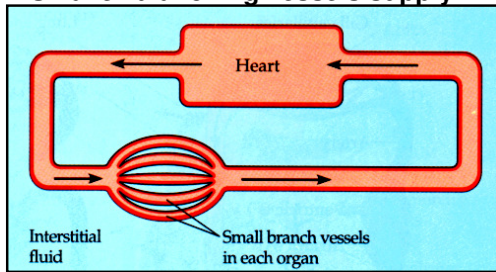


Closed circulatory system

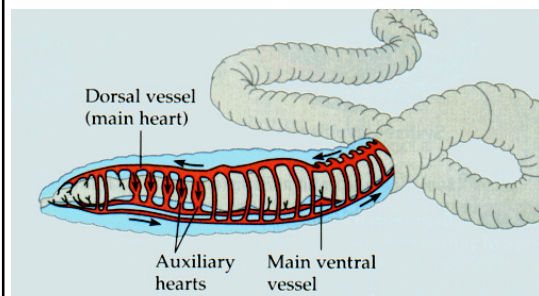
- Found in earthworms (annelids), squids & octopus (cephalopods), vertebrates



- Fluid (called blood) stays in the vessels
- Smaller branching vessels supply

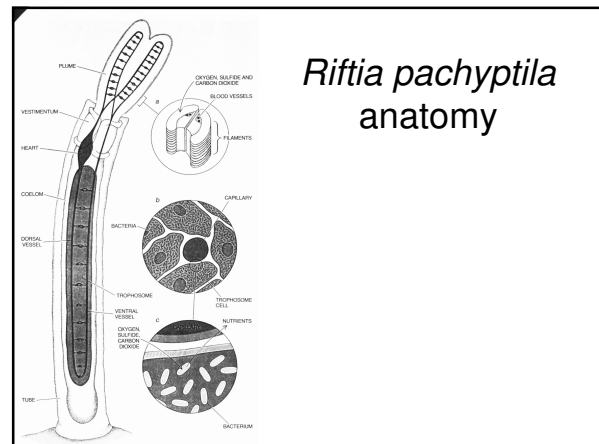


Example of closed circulatory system: Earthworm

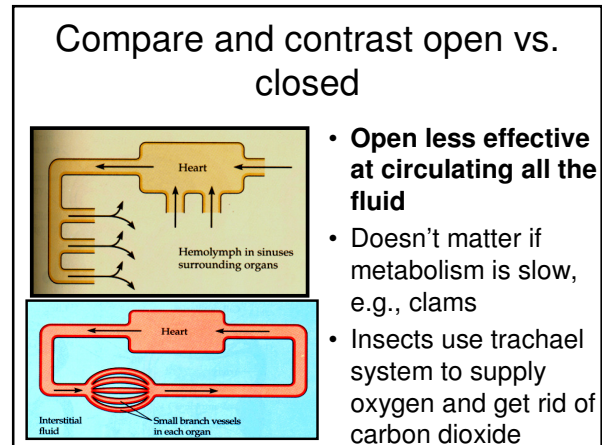
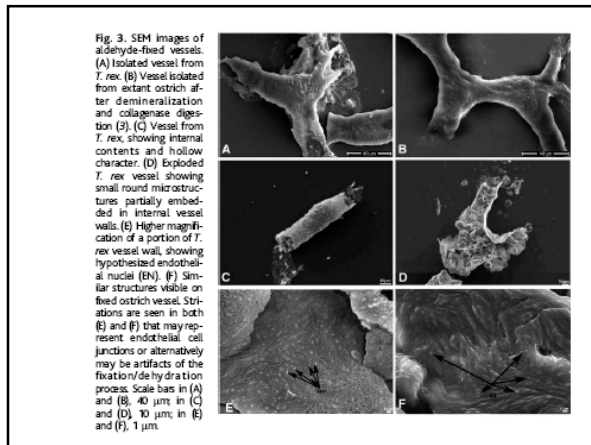
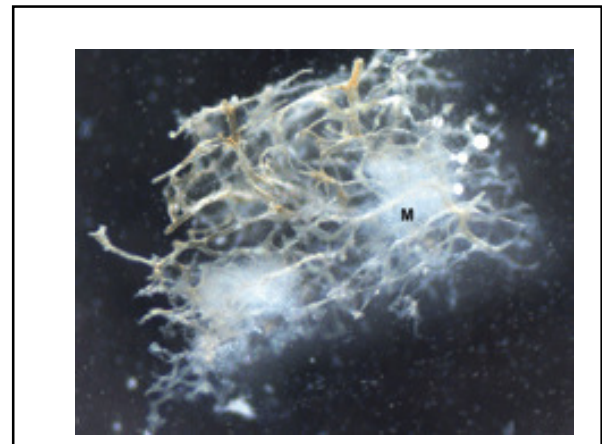
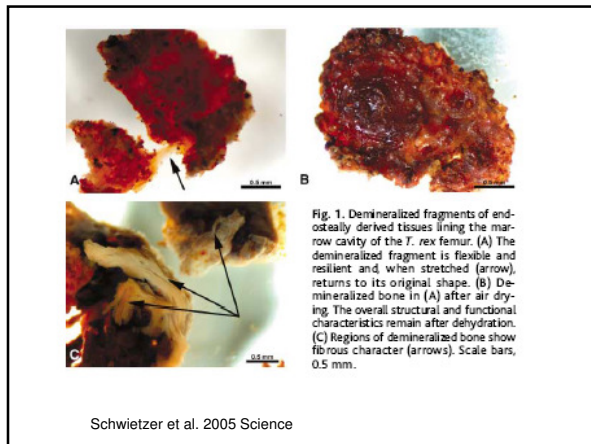


(b) Closed circulatory system

The annelid worm *Riftia pachyptila*

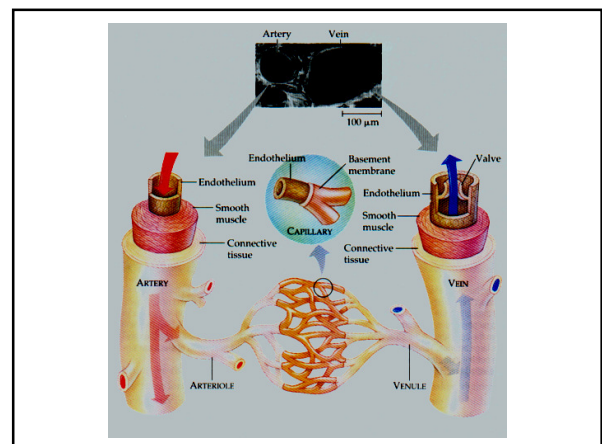


Riftia pachyptila anatomy



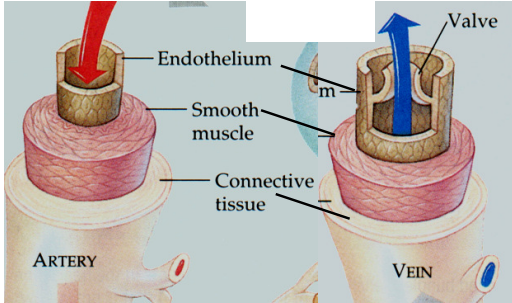
Closer look at closed circulatory system

- Also called cardiovascular system: heart, blood vessels, blood
- Three main types of blood vessels
 - Arteries, capillaries, veins



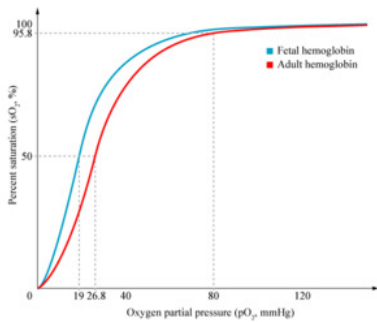
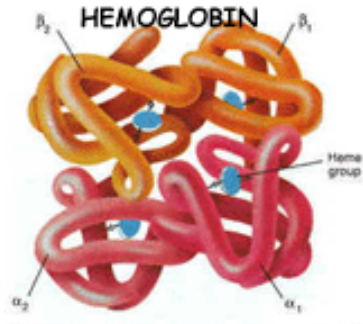
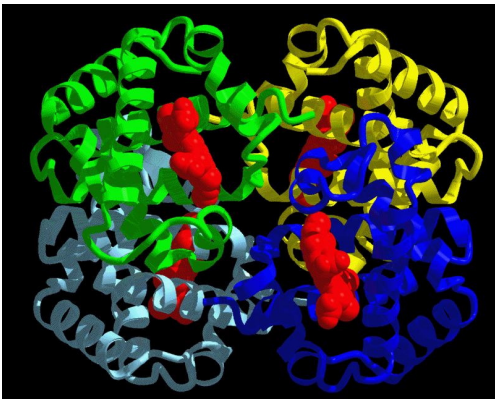
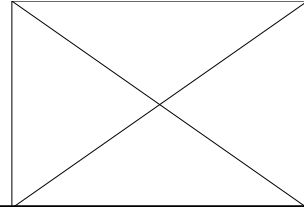
Blood vessels some major points

- Arteries are thicker walled, veins have valves



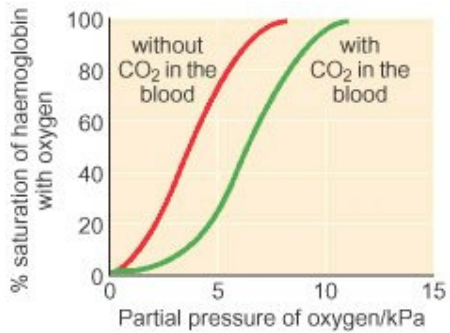
Blood vessels some major points

- Arteries transport blood AWAY from heart, veins TOWARDS heart
 - Doesn't necessarily correlate with oxygenated vs. deoxygenated blood



Fetal hemoglobin important points

- Oxygen binding curve shows how hemoglobin binds increasing amounts of oxygen as oxygen concentration increases
- Fetal hemoglobin binds oxygen more strongly than mother hemoglobin so that the fetus can get oxygen from mother's bloodstream



Hemoglobin bohr shift

- Important points:
- Hemoglobin binds less tightly to oxygen when CO₂ is high. This is the condition found in respiring tissues like muscles.

The vertebrate circulatory system- types of hearts

- Two chamber - fish
- Three chamber - amphibians
- Four chamber - mammals, crocodiles

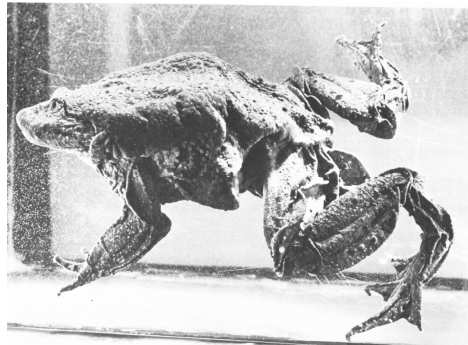
First a few things about amphibian respiration

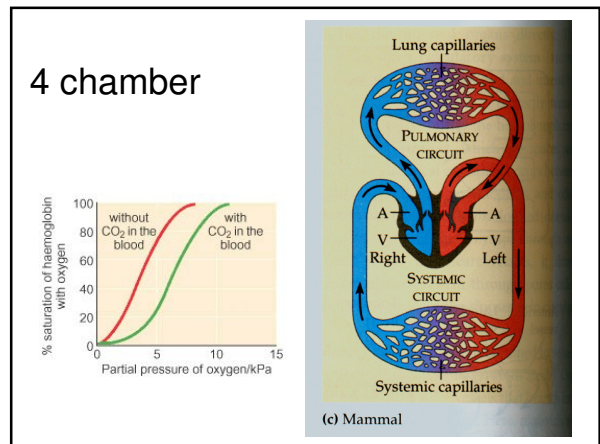
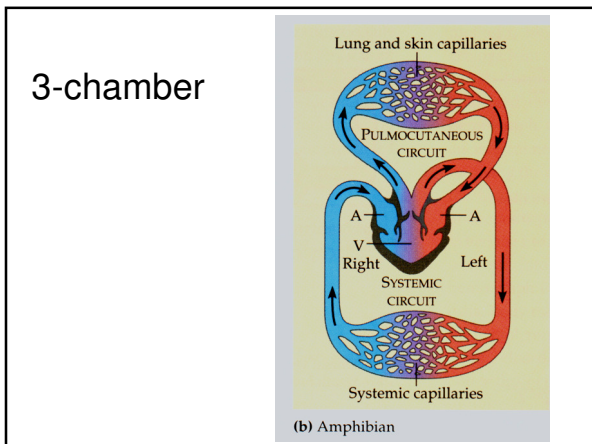
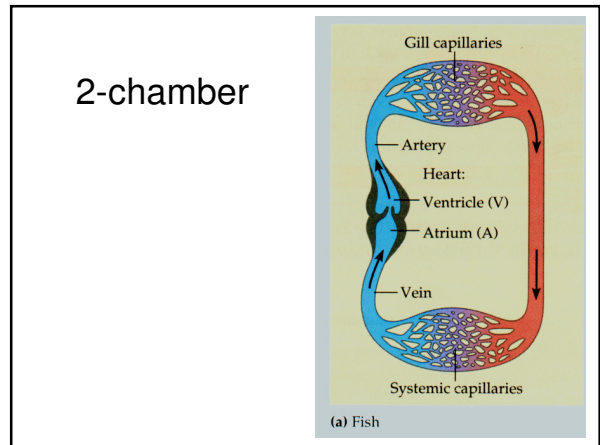
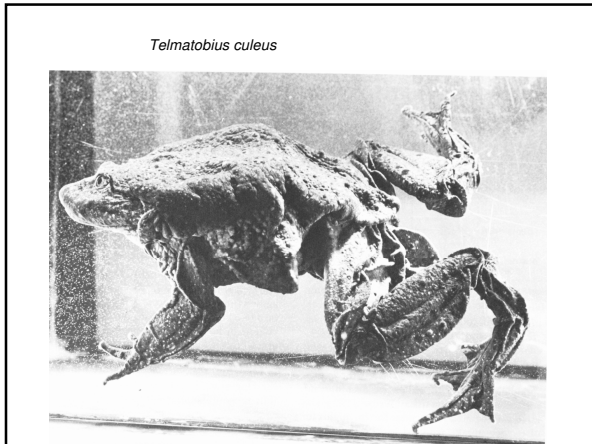
- Involves both lung and surface respiration

Gas exchange structures

- Surface only (very small organisms ≤ 1 mm)
- Gastrovascular cavity (hydra, jellyfish, also flatworms)
- Gills, tracheal systems, lungs
- Mixture of the above

Some divers breathe through their skin
 Lake Titicaca frog <http://www.youtube.com/watch?v=j06d2Cj0lcI>





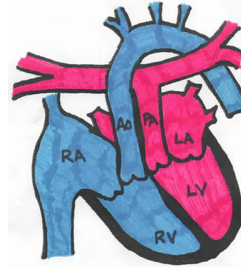
Summary

- Respiratory surfaces and types of circulatory systems reflect the lifestyle and size of the organism
- Investigated last type of respiratory surface, the lung.
- Different types of circulatory systems
- Next time: Nutrition

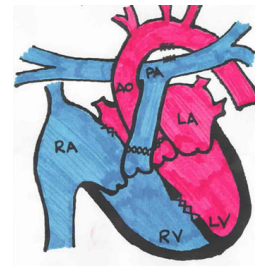
Transposition of the great blood vessels

http://www.driscollchildrens.org/DCHWEB/AboutDriscoll/content/cardiopathy_arterial_switch_procedure.asp

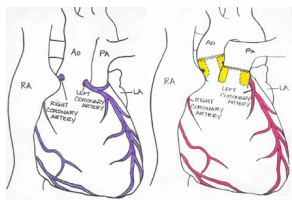
Walk on Water: Inside an Elite Pediatric Surgical Unit: by Michael Ruhlman



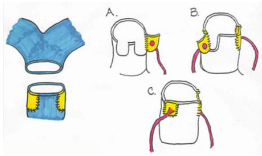
defective



repaired



Reattachment of coronary arteries requires incredible skill



Willo the dinosaur with a 4 chambered heart



Willo belongs to the Ornithischian, or "bird-hipped" line of dinosaurs. It is a *Thescelosaurus*, a plant-eater with teeth like salad tongs, ideal for browsing vegetation in its riparian forest habitat. *Thescelosaurus* lived during the late Cretaceous, and ranged from Wyoming and the Dakotas northward into Alberta, Canada. The species is uncertain, but believed to be *T. neglectus*. It was about 13 feet (4 meters) long and about 665 pounds (300 kg) in the flesh. Its gender is unknown

<http://www.dinoheart.org/fastfacts/index.html>



<http://www.dinoheart.org/insideout/index.html>