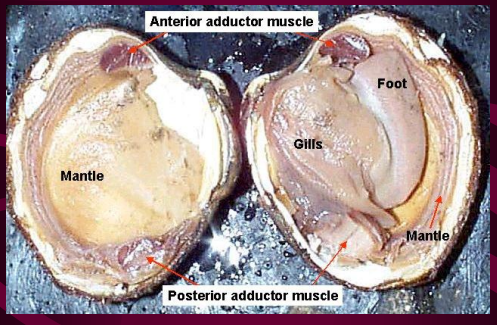
Chapter 35
Mollusks and Annelids

Biology II

Mrs. Michaelsen

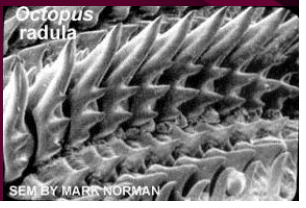
Section 35.1 - Mollusca

I. What is a Mollusk?
- A. Phylum Mollusca
- B. Slugs, snails, oysters, octopus, squid.
- C. Some have shells, some don't.
- D. All have bilateral symmetry, a coelom, two body openings, a muscular foot and mantle.
- E. Mantle: A thin membrane that surrounds the internal organs of the mollusk. Secretes the shell.



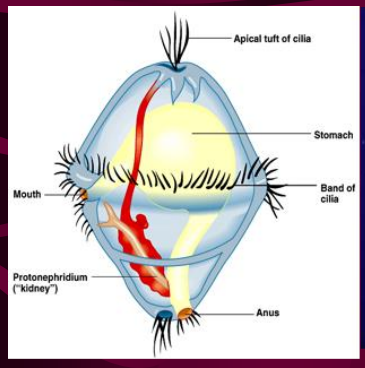
F. How Mollusks Obtain Food

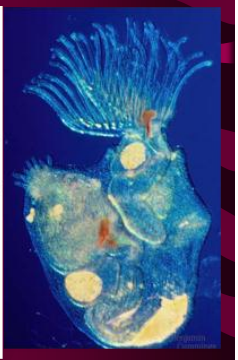
1. Radula: located within the mouth and is a tonguelike organ with rows of teeth.
   - a. Used to drill, scrape, grate or cut food.
   - b. Octopuses and squids use to pull food they have captured into their mouths.
   - c. Bivalves do not have this.



G. Reproduction in Mollusks

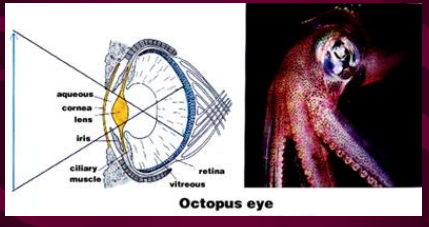
1. Most have separate sexes and reproduce sexually.
2. Eggs and sperm released in water at same time – external fertilization.
3. Many gastropods on land are hermaphrodites.
4. Larvae of all mollusks similar.
   a. Some marine mollusks have free swimming larvae that have cilia – look like a spinning top with tufts of cila: trochophore
   b. Marine snails and bivalves have a stage called *veliger*.





H. Nervous Control in Mollusks

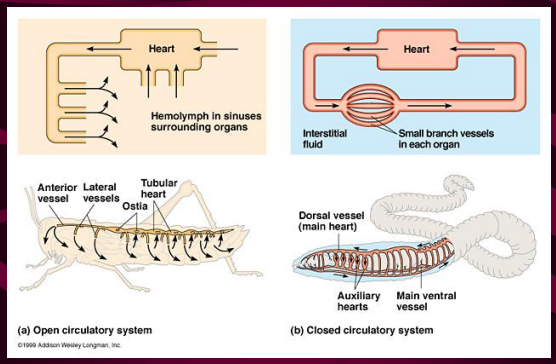
1. Simple system with brain and associated nerves that coordinate movement.
2. Most have paired eyes that range from simple to complex.



Octopus eye

I. Circulation in Mollusks

1. Well-developed and includes three chambered heart.
2. Most have open circulatory system: Blood moves through vessels and into open spaces around body organs.
3. Octopus have a closed circulatory system: Blood moves through body enclosed entirely in blood vessels. Very efficient.



J. Respiration in Mollusks

1. Most have gills: Specialized parts of the mantle that consist of a system of filamentous projections that contain a rich supply of blood for the transport of gases.
2. Land snails and slugs have a primitive lung.

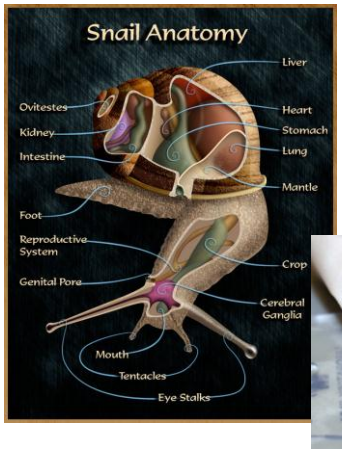
K. Excretion in Mollusks

1. Nephridia: Organs that remove metabolic wastes from the coelom.
2. Wastes are discharged from the mantle cavity and expelled by pumping action of gills.

II. Diversity of Mollusks

A. Class Gastropoda: One-shelled mollusks

1. Stomach footed mollusks.
2. Shelled: snails, abalones, conches, periwinkles, whelks, limpets, cowries, cones.
3. No shell: Slug. Protected by layer of mucus.
   a. Sea slugs use nematocysts into own tissues to protect themselves.
4. Open circulatory: Fluid called hemolymph.
   1. In spaces called hemocoel.



Sea Slugs

B. Class Bivalvia: Two-shelled Mollusks

1. Clams, oysters, scallops.
2. No distinct head or radula: 3 pairs of ganglia.
3. Most use foot for burrowing in the mud or sand, but usually sessile.
4. A ligament connects their shells and strong muscles allow the shell to open and close over their soft bodies.
5. Bivalves are filter feeders.
   a. Have cilia to draw water in through incurrent siphon.
   b. Water moves over gills and food becomes trapped in mucus.
   c. Cilia on gills push food to stomach.
   d. Anything rejected is transported to mantle where it is expelled through excurrent siphon.

Clams

Oyster

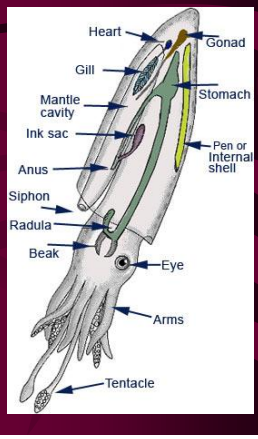
C. Class Cephalopoda: Head-footed Mollusks

1. Octopus, squid, cuttlefish, nautilus.
2. "Head-footed" mollusks.
3. Most complex of mollusks – can learn tasks.
4. Foot is evolved into tentacles with suckers, hooks, or adhesive structures (suction cups).
5. Have siphons to expel water. Can move quickly by jet propulsion.
6. Closed circulatory system.
7. Separate sexes – males transfer packet of sperm to mantle cavity of female.
8. Can also release dark "ink" into water for protection and have chromatophores.

Cuttlefish

D. Squids

1. Ten tentacles
2. Longest two capture prey, rest force prey into mouth
3. Most grow to 1 ft.
4. Giant squid – *Architeuthis* can reach 60 feet.



E. Octopuses

1. Eight tentacles
2. Less likely to use jet propulsion – more likely to crawl on ocean floor and wait in caves.
3. 3.3 ft on average.
4. Giant Pacific octopus can be 30 ft.

F. Chambered Nautilus

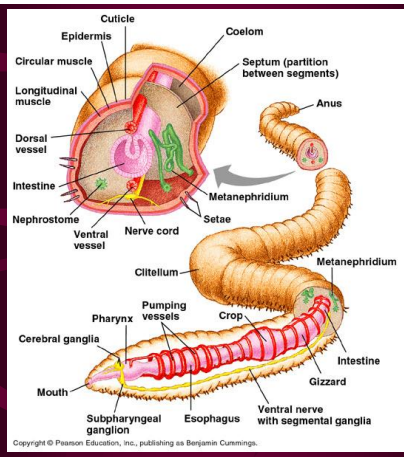
1. Only cephalopod with external shell.
2. Shell coiled with gas filled chambers.
   a. Gas is for buoyancy.

Giant Squid

The squid weighs about 550 pounds (250 kilograms) and was found in two pieces on Seven Mile Beach in Australia. Though her longest tentacles have been lost, estimates based on her remaining arms suggest she would have been around 50 feet—a little larger than the average giant squid, *Architeuthis dux*, found to date. She is not, however, a new species.

Section 27.2 – Segmented Worms

I. What is a Segmented Worm?
- A. Phylum Annelida – 12,000 species.
- B. Earthworms, Leeches, Bristleworms.
- C. Bilaterally symmetrical, have a coelom, and two body openings.
- D. Tube within a tube.
  1. Internal tube – digestive tract (Mouth to anus).
- E. Most have setae: Tiny bristles to anchor bodies.
- F. Segmentation Supports Diversified Functions
  1. Bodies are divided into a series of ringed segments.
  2. Each segment has its own muscles, allowing shortening and lengthening of the body.
  3. Segmentation allows for specialization of body tissues.



G. Nervous System in Segmented Worms
1. Simple, anterior segments used for sensing.
2. Some have eyes with lenses and retinas. Others have a brain in anterior segment with nerve cords and ganglia.

H. Circulation and Respiration
1. Closed circulatory system.
2. Can exchange gases directly through skin – need moist environment.

I. Digestion and Excretion
1. Complete internal digestive tract.
2. Gizzard: Sac with muscular walls and hard particles that grind soil before passing into intestine and out anus.
3. Two nephridia in each segment to collect wastes.

J. Reproduction in Segmented Worms

1. Most are hermaphrodites.
2. Each worm exchanges sperm during mating.
3. Each worm forms capsule for eggs and sperm and when the eggs are fertilized the capsule slips off the worm into the soil.
4. In 2-3 weeks young worms emerge from the eggs.
5. Leeches also reproduce this way.
6. Bristleworms have separate sexes and reproduce sexually.
   a. Usually the eggs and sperm are released into water and fertilized.

Earthworm cocoon

II. Diversity of Segmented Worms

A. Three classes: Oligochaeta (earthworms), Polychaeta (bristleworms), Hirudinea (leeches).

B. <u>Earthworms (Class Oligochaeta)</u>

1. Most well known.
2. Anterior and posterior section – no distinct head.
3. Only a few setae on each segment.
4. Eat their way through soil – aerates.
5. Casting fertilize soil.

http://www.commonsensecare.com/prodimages/wormsatwork.jpg

Giant Gippsland Earthworm

thegreencommunity.org/ giant_worms.html

C. Bristleworms & Their Relatives (Class Polychaeta)

1. Primarily marine.
2. Bristleworms, lug worms, plumed worms, sea mice, fan worms.
3. Have many setae on each segment.
4. Each body segment has parapodia for swimming or crawling and also used in gas exchange.
5. A polychaete has a head with well-developed sense organs, including eyes.

Lugworm

Sea Fan

Plume Worm

Sea Mice

D. Leeches (Class Hirudinea)

1. Flattened bodies and no setae.
2. Most are parasites that suck blood or body fluids.
3. Bite is not painful – saliva contains anesthetic.
4. Other chemicals prevent blood from clotting.
5. Once fed it will drop off and may not eat for a year.

III. Origins of Mollusks and Segmented Worms

A. Mollusks lived in great numbers 500 million years ago.
B. Mollusks found in early paleozoic deposits.
C. Nautilus has changed very little.
D. Annelids probably evolved in the sea as early as 620 million years ago.