Phylum Annelida

1. Schizopelmatous, bilaterally symmetrical, segmented worms.
2. Development typically protostomous; segments arise by blastemic growth.
3. Digestive tract complete, usually with a single pharynx.
4. With a closed circulatory system; respiratory system extends to all segments.
5. Nervous system well-developed, with dorsal cerebral ganglia, circumesophageal connectives, and ventral ganglionic nerve cords.
6. Most possess metanephridia or less commonly, protonephridia.
7. With a heart, segmentally arranged excretory system.
8. Head comprised of preoral cephalic prominence and postcecal cephalic prominence.
9. Cleistoneous or hemihermaphroditic; many have a characteristic broodcase (less commonly, both in some groups).

Nifty Annelid Advances

1. Segmentation — *metamerism*.
   a. Body is divided into longitudinal segments separated by septa.
Annelid Body Regions

2. Anterior piece - fused to form
   a. Prostomium   b. Peristomium

Annelids: Anterior

Annelids: Anterior
Annelid Body Regions

- c. Middle pieces - trunk

- d. Posterior most piece - *pygidium*
  Not truly a segment, growth takes place just anterior to it.

Segment Components

- 1. Circular and longitudinal muscle
Segment Components

2. Coelomic fluid

Segment Components

3. Peritoneum lines each segment; mesenteries hold gut, viscera in place.

2 Kinds of Appendages

1. Parapodia
   a. each segment has projections
   1. flaplike - used for respiration, locomotion
2 Kinds of Appendages

2. setae - anchoring, protection
   a. lots of taxonomic variation in these structures
Coordinated Movement

3. May have originated with burrowing.
   a. Alternating contraction and expansion of segments allows coordinated ramming through substrate.

Coordinated Movement

4. Contraction of separate segments
   a. Permits greater flexibility
   b. More powerful, controlled locomotion

Coordinated Movement

5. Setae are used to grab onto the substrate.
   Are used in combination with segmental contraction.
Coordinated Movement

6. Leeches use a slightly different method.
a. Suckers allow rapid movement over uneven surfaces.

Figure 13.13 - locomotion in a leech, moving left to right, using the anterior and posterior suckers to progress in "inch worm" fashion.

Circulatory System

1. Closed, equipped with pumping structures, vessels and capillaries.
2. Blood contains respiratory pigments
   a. pigments bind O2 and increase the amount of oxygen that can be carried.

Other Pigments

Electron micrography of the chlorocruorin of the marine polychaete Sabel la spallanzanii (Gmelin, 1791).
**How Blood Pigments Work**

1. Assist in loading and unloading O2 to tissues.
   a. At high tension (in respiratory structures) O2 loads.
   b. At low tension (at tissues) O2 unloads.
   c. Mixtures of pigments handle highly variable loads.

---

**Respiratory Pigments**

1. Assist in loading and unloading O2 to tissues.
   a. At high tension (in respiratory structures) O2 loads.
   b. At low tension (at tissues) O2 unloads.
   c. Mixtures of pigments handle highly variable loads.

---

**O2 Dissociation Curves**

*Figure 16-13 Oxygen dissociation curve of human hemoglobin. The loading tension is the pO2 at which the respiratory pigment is 95 per cent saturated with oxygen. The unloading tension is the pO2 at which the respiratory pigment has reached 50 per cent delivery of oxygen.*
Figure 18-15 Oxygen dissociation curves for hemoglobin. The effects of changes in pH and $\text{PCO}_2$ are shown. This is the Bohr effect.
Blood Corpuscles

a. Allow the concentration of pigments to be elevated.
b. Their shape increases surface area of O2 uptake.

Respiratory Structures

1. parapodia

2. gills or radioles-