Domain Eukarya
Kingdom Animalia

PHYLUM ANNELIDA

SEGMENTED WORMS

The Phylum **Annelida**, annelids, are **segmented worms**. They live in marine and fresh water and in moist terrestrial habitats; some are parasitic. They are **bilaterally symmetrical**, have a true **coelom** (the body cavity that surrounds and contains the digestive tract and other organs), and a **segmented body** with **bristles**. The cellular layer that lines both sides of the coelom is called peritoneum. The digestive system begins at the **mouth** at one end and runs to the **anus** at the other. The body consists of the three basic tissue layers; the nervous system has a brain; the blood vessels are closed tubes. Many kinds have gills for respiration, but some, like the earthworm, have no specialized respiratory structures. There are no hard parts, and the segmented worms are said to have a **hydrostatic skeletal support**.

Class **Oligochaeta**

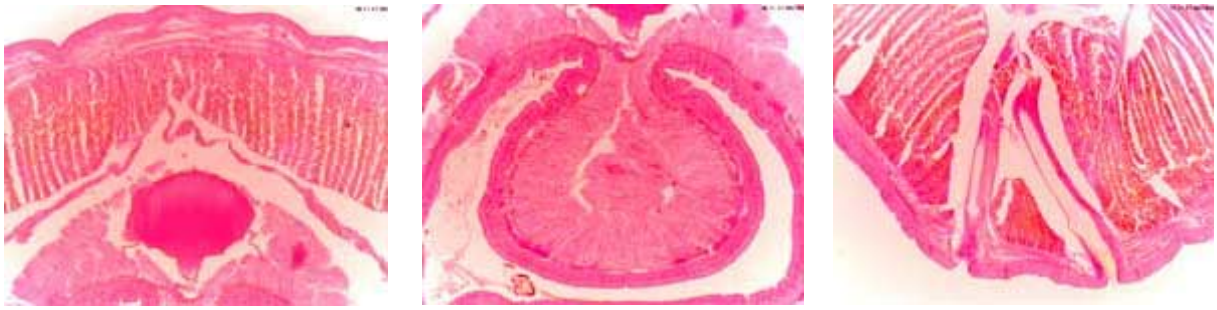
The name refers to the few (oligo-) bristles (-chaeta) along the body of these earthworms and fresh water worms. Examine the earthworm genus ***Lumbricus***. The **dorsal** or top **side** is slightly darker than the **ventral side**. Earthworms burrow through soil and eat decomposing plant and other organic material. The mouth end is pointed and conical, and the tail end is dorsoventrally flat. The anus is a vertical slit in the last segment. As you run your fingers along the sides of the living worm, you can feel the rasp of the **setae** (singular seta) or bristles. Tiny excretory pores from the nephridia can be found on the lateral or ventral surfaces of all segments except those at the ends. The earthworm has both ovaries and testes. The openings of the oviducts can be seen on the sides of segment 14 and those of the sperm ducts, which have swollen edges on segment 15. The enlarged ring that begins at segment 31 or 32 and ends at 37 is called the **clitellum**. It is glandular and secretes a slimy mucus around two copulating individuals.

Dissection: Place a preserved earthworm dorsal side up in a dissecting pan. Anchor the anterior end with a pin through the tip, stretch the worm slightly, and put a second pin through the posterior end. Use a razor blade to make a longitudinal, mid-dorsal incision through the skin; don't cut deeply. With forceps open the incision and cut the internal septa. Pin the skin back on both sides so the internal organs are exposed to view.

The brain is at the anteriormost end. The digestive system begins at the mouth, continues through a pharynx and tubular esophagus to the bulb-like crop and tough-walled gizzard behind it; the intestine extends from the gizzard posteriorly to the anus at the tip of the worm. The space in each segment around the digestive system is part of the coelom. Five pairs of dark colored blood vessels "aortic hearts" surround the esophagus and connect the ventral and dorsal blood vessels, the dorsal vessel is contractile and pumps the blood anteriorly. The reproductive organs are also prominent; the large whitish seminal vesicles contain the

testes and have ducts to the pores in segment 15; anteroventral to them are the small, bulb-like **seminal receptacles**, a part of the female reproductive system.

Two microscope slides of the worm illustrate important features in cross section. The intestine is clearly separated by the coelom from the body wall. A swollen ridge hangs down from the dorsal side of the intestine; it is called the typhlosole, and it increases the surface area for absorption of nutrient molecules from the digested food. Find the dorsal blood vessel, ventral blood vessel, ventral nerve cord, and immediately below it the subneural blood vessel. The body wall has two layers of muscle. The inner longitudinal layer is thick; cells run anteroposteriorly, and when they contract, each segment becomes shorter and fatter (the fluid inside each segment cannot be compressed and must occupy the same volume). The cells of the outer circular layer run around the body; when they contract the body narrows and the segments lengthen. This action is just the opposite of the longitudinal layer. Together they produce the kind of rippling motion characteristic of your own intestine (it likewise has two muscular layers) that is called peristalsis. Pairs of setae or short bristles can be seen in the muscular body wall in some parts of the section.



In order for a worm to move forward through the ground, it contracts the longitudinal muscle layer in the posterior part and sticks the setae into the soil; this end of the worm becomes fatter and serves as an anchor to push against. The circular muscle layer in the anterior part of the worm contracts to thin and extend the front end of the worm; the setae in this portion are retracted.

From C. Darwin, 1881, The Formation of Vegetable Mould through the Action of Worms. As quoted on pp. 39-40 in M. Appelhof, et al., 1993, Worms Eat our Garbage. Kalamazoo, Flower Press.

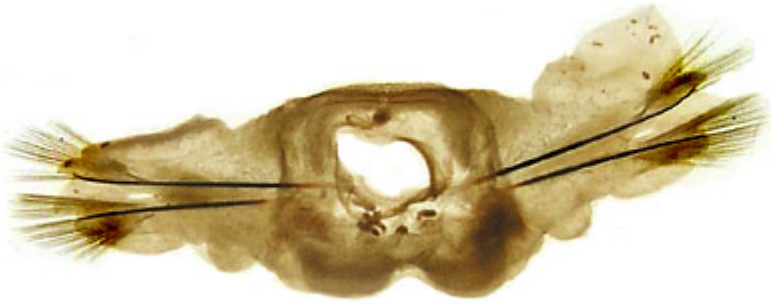
> “Earthworms must be considered as terrestrial animals...During the summer when the ground is dry, they penetrate to a considerable depth and cease to work, as they do during the winter when the ground is frozen.
>
> “Worms are nocturnal in their habits, and at night may be seen crawling about in large numbers, but usually with their tails still inserted in their burrows. By the expansion of this part of their bodies, and with the help of the short...bristles, with which their bodies ar armed, they hold so fast that they can seldom be dragged out of the ground without being torn to pieces. During the day, they remain in their burrows, except at the pairing season, when those which inhabit adjoining burrows expose the greater part of their bodies for an hour or two in the early morning.

> "Worms do not possess any sense of hearing. They took not the least notice of the shrill notes from a metal whistle, which was repeatedly sounded near them; nor did they of the deepest and loudest tones of a bassoon.
>
> "They were indifferent to shouts, if care was taken that the breath did not strike them. When placed on a table close to the keys of a piano, which was played as loudly as possible, they remained perfectly quiet."

Class **Polychaeta**

Polychaetas (many bristles) live in the marine environment and are very common in the shallow, intertidal zone. Many are carnivores and prey on a variety of invertebrates. ***Nereis*** has pinching **jaws** with a horny covering at the mouth; short sensory **palps** are present immediately behind these, and **tentacles** arise on segments immediately behind. Lateral appendages (on the sides) are called **parapodia**. These are used for **locomotion**--to row the worm through the water and to excavate a burrow--and for **gas exchange**--they serve as gills.

Examine the thick microscope slide (no high power) that is a cross section of *Nereis*. Bunches of black **setae** arise in the body wall and extend beyond the ends of the parapodia.



Class **Hirudinea**

The name simply means **leech**. Leeches live in both marine and fresh water and in damp terrestrial habitats. The body is segmented, but this is not clearly visible on the outside. A **sucker** at each end is used for locomotion on a surface; swimming is achieved by contractions of the body wall musculature. Leeches lack setae and parapodia. Some are predators, others are parasites. Those that feed on blood have sharp jaws and secrete an anticoagulant that prevents clotting of the blood. Medicinal leeches are a fresh water variety that is still in use.

Last updated 22 September 2007 (JHW); 22 April 2025 Grace Avecilla