Ch 26 & 27 What Is an Animal?

Animals are multicellular, eukaryotic heterotrophs whose cells lack cell walls.

Animals have the following types of tissues:

epithelial

muscular

connective

nervous

Epithelial tissues cover body surfaces.

Muscle tissue cells contain proteins that enable them to contract, moving parts of animals' bodies.

Connective tissues support an animal's body and connect its parts.

Nervous tissue contains nerve cells, which carry information throughout the body.

Invertebrates make up 95% of all animal species.

Invertebrates do not have a backbone, or vertebral column.

They include sea stars, worms, jellyfishes, and insects.

The other 5% of animals are vertebrates.

Vertebrates have a backbone.

Vertebrates include fishes, amphibians, reptiles, birds, and mammals.

What Animals Do to Survive

- **Animals carry out the following essential functions:**

feeding
respiration
circulation
excretion
response
movement
reproduction

Many body functions help animals maintain homeostasis, or a relatively stable internal environment.

Homeostasis is often maintained by internal feedback mechanisms called feedback loops.

Most feedback loops involve **feedback inhibition**, in which the product or result of a process stops or limits the process.

Animals can also form symbiotic relationships, in which two species live in close association with each other.

Respiration

- Whether they live in water or on land, all animals respire—they take in oxygen and give off carbon dioxide.

Circulation

- Animals transport oxygen, nutrient molecules, and waste products among all their cells through either simple diffusion or some kind of circulatory system.

All animals must achieve the following tasks to be considered alive:

Excretion

Respond to environment

Movement

Reproduction

Complex animals tend to have:

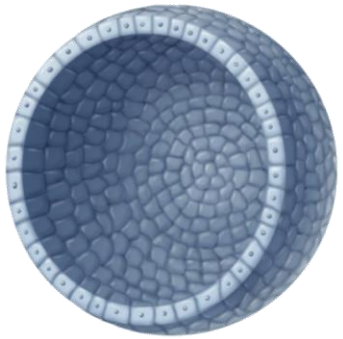
High levels of cell specialization and Internal body organization

Bilateral body symmetry

Front end or head with sense organs

Body cavity

The zygote undergoes a series of divisions to form a **blastula**, a hollow ball of cells.

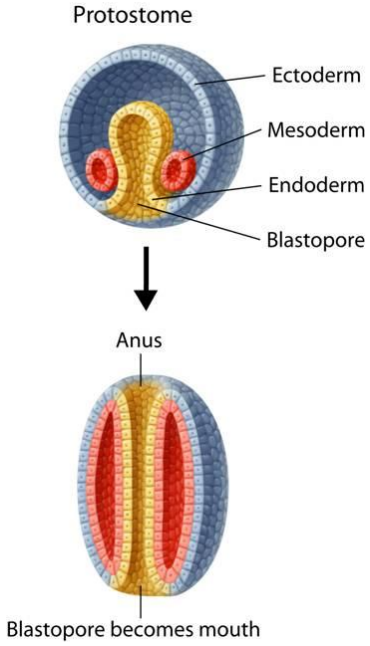


Blastula
(cross section)

The blastula folds in on itself, forming a single opening called a blastopore.
The blastopore leads into a central tube that runs the length of the developing embryo. This tube becomes the digestive tract and is formed in one of two ways.

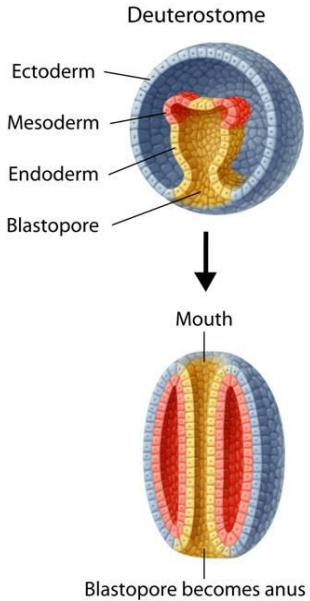
A **protostome** is an animal whose mouth is formed from the blastopore.

Most invertebrate animals are protostomes.



A **deuterostome** is an animal whose anus is formed from the blastopore.

The **anus** is the opening through which wastes leave the digestive tract.

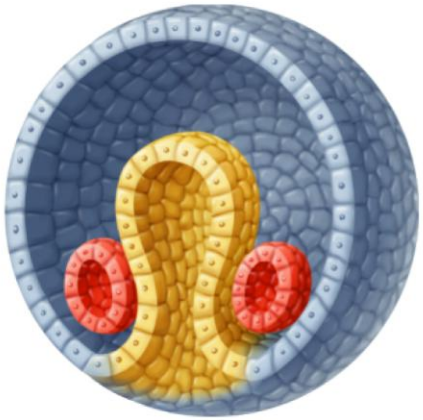


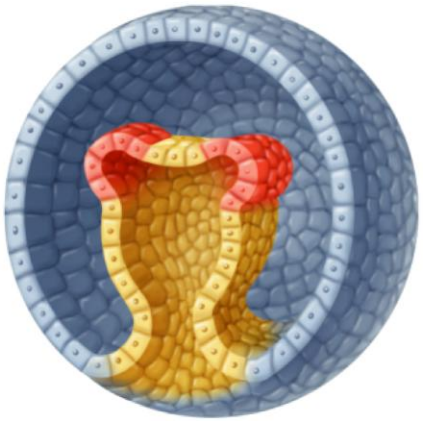
During development, the 3 layers called germ layers.

Endoderm, or innermost germ layer, develop into the linings of the digestive tract and much of the respiratory system.

The cells of the **mesoderm**, or middle layer, develop into muscles and much of the circulatory, reproductive, and excretory organ systems.

The **ectoderm**, or outermost layer, develops into the sense organs, nerves, and the outer layer of the skin.





Body Symmetry

Except for sponges, every animal exhibits some body symmetry in its structure.

In radial symmetry, any number of imaginary planes can be drawn through the center, each dividing the body into equal halves.

In animals with bilateral symmetry, only one imaginary plane can divide the body into two equal halves—left and right.

Cephalization

Animals with bilateral symmetry exhibit **cephalization,** which is the concentration of sense organs and nerve cells at the front end of the body.

Phylum: Porifera

What Is a Sponge?

Sponges are in the phylum Porifera which means “pore-bearers.”

Sponges live their entire adult life attached to a single spot.

Sponges are classified as animals because they are:

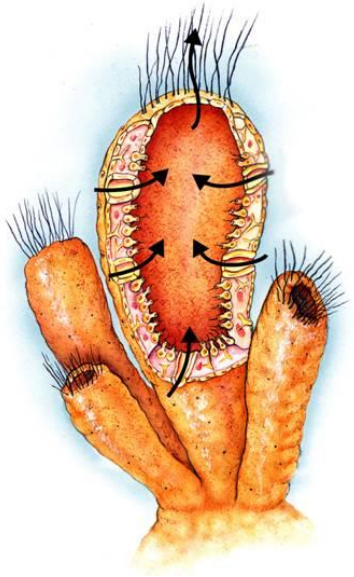
multicellular

heterotrophic

have no cell walls

contain a few specialized cells

Form and Function in Sponges



Sponges do not have a mouth or gut, and they have no tissues or organ systems.

The body of a sponge forms a wall around a large central cavity through which water is circulated continually.

Sponges are asymmetrical; they have no front or back ends, no left or right sides.

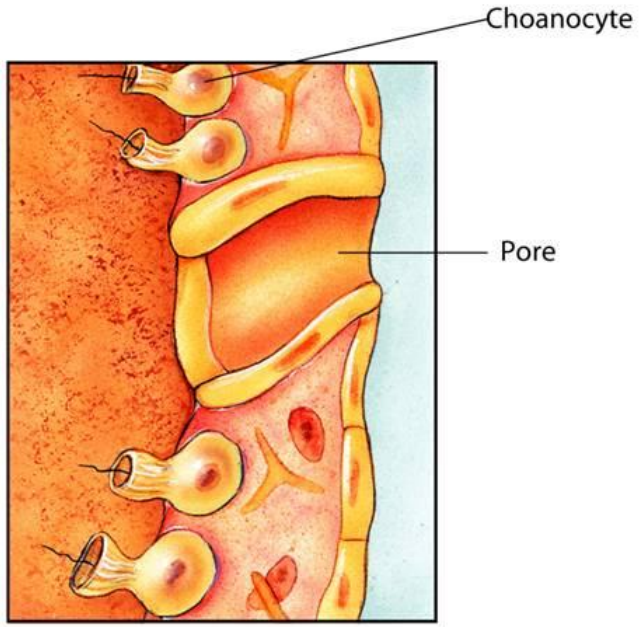
The body of a sponge forms a wall around a large central cavity through which water is circulated continually.

Water enters through pores located in the body wall and leaves through the osculum, a large hole at the top of the sponge.

Choanocytes are specialized cells that use flagella to move a steady current of water through the sponge.

Feeding

Sponges are filter feeders.
As water moves through the sponge, food particles are trapped and engulfed by choanocytes and are then digested or passed on to archaeocytes, who complete the digestive process and transport digested food throughout the sponge.



Respiration, Circulation, and Excretion

Sponges rely on movement of water through their bodies to carry out body functions.

Oxygen dissolved in the water diffuses into the surrounding cells.

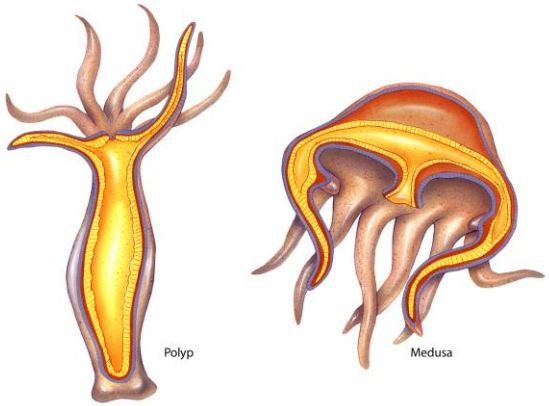
Carbon dioxide and other wastes, such as ammonia, diffuse into the water and are carried away.

Reproduction

Sponges can reproduce sexually or asexually.

In most sponge species, a single sponge forms both eggs and sperm by meiosis are internally fertilized or can reproduce asexually by budding or by producing gemmules.

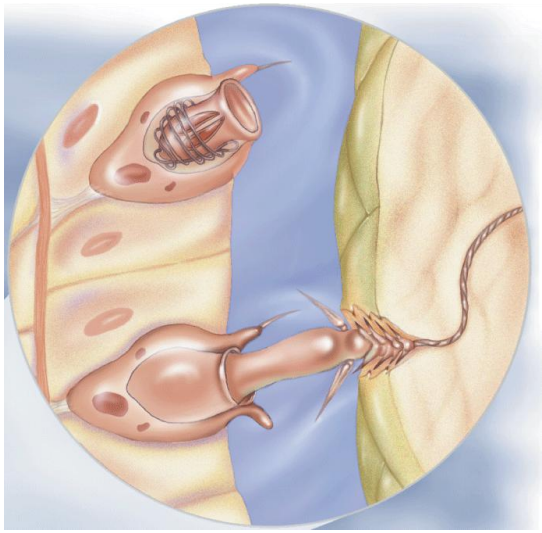
Phylum: Cnidaria



What Is a Cnidarian?

Cnidarians are soft-bodied, carnivorous animals that have stinging tentacles arranged in circles around their mouths. They are the simplest animals to have body symmetry and specialized tissues.

Cnidarians get their name from the cnidocytes, or stinging cells, located along their tentacles. Cnidarians use cnidocytes for defense and to capture prey.



Within each cnidocyte is a nematocyst

– a poison-filled, stinging structure that contains a tightly coiled dart.

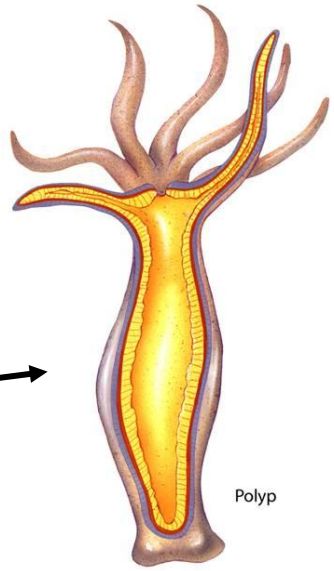
Form and Function in Cnidarians

Cnidarians are radially symmetrical. They have a central mouth surrounded by numerous tentacles that extend outward from the body.

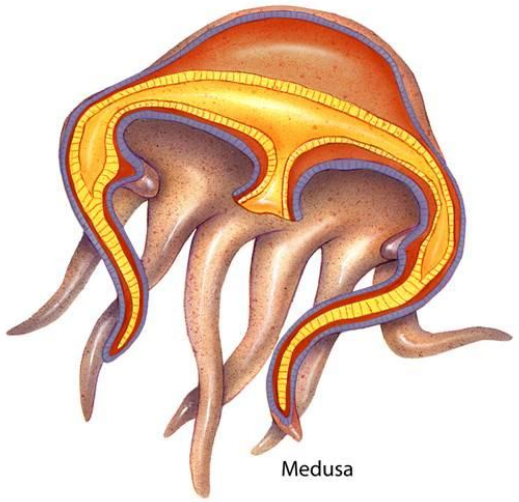
Cnidarians typically have a life cycle that includes two different-looking stages: a polyp and a medusa.

A polyp is a cylindrical body with armlike tentacles. In a polyp, the mouth points upward.

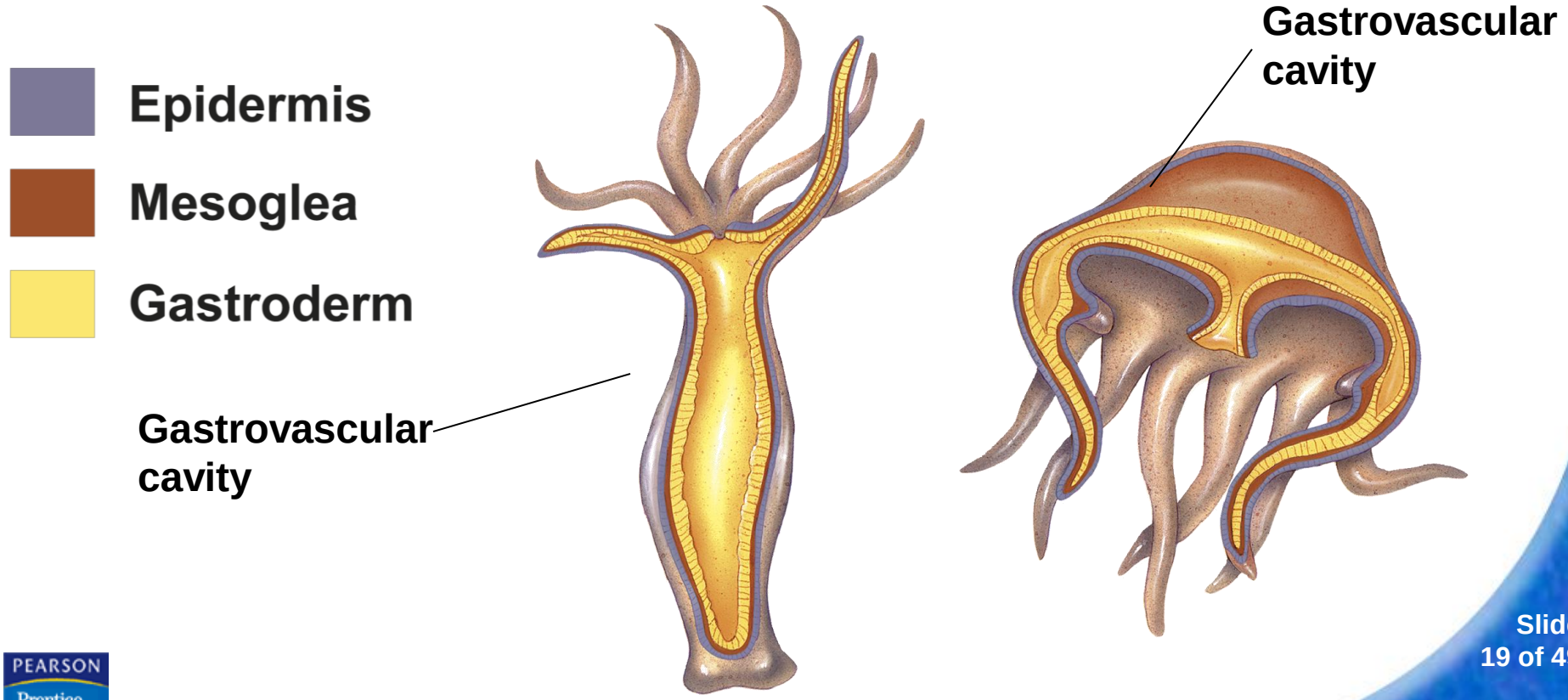
Polyps are usually sessile.



A medusa has a motile, bell-shaped bo
with the mouth on the bottom.



Cnidarian polyps and medusas each have a body wall that surrounds an internal space called a gastrovascular cavity.



The gastroderm is the inner lining of the gastrovascular cavity, where digestion takes place.

The epidermis is the outer layer of cells.

The mesoglea is a layer that lies between the epidermis and gastroderm.

Feeding

A cnidarian pulls its food through its mouth and into its **gastrovascular cavity,** a digestive chamber with one opening.

Food enters and wastes leave the body through that same opening.

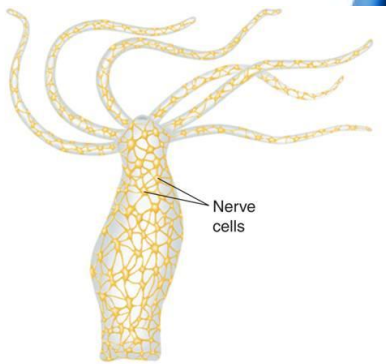
Respiration, Circulation, and Excretion

Following digestion, nutrients are usually transported throughout the body by diffusion.

Cnidarians respire and eliminate the wastes of cellular metabolism by diffusion through their body walls.

Response

Both polyps and medusas have a **nerve net,** a loosely organized network of nerve cells.



Cnidarians also have statocysts, which are groups of sensory cells that help determine the direction of gravity.

Ocelli are eyespots made of cells that detect light.

Reproduction

Most cnidarians reproduce both sexually and asexually.

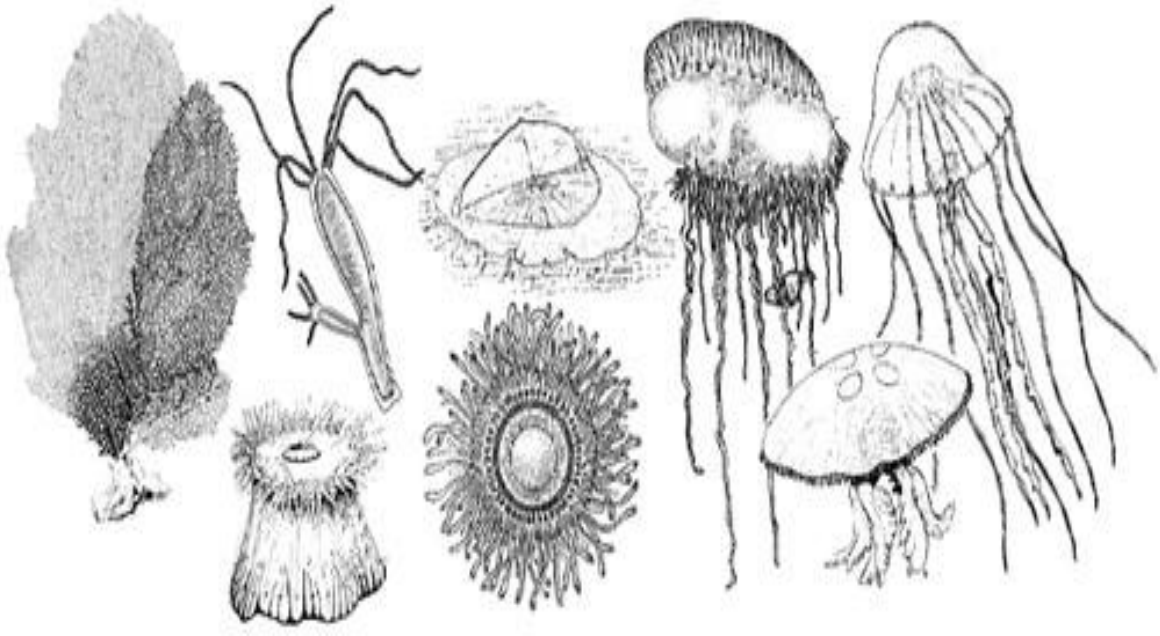
Polyps can reproduce asexually by budding.

In most cnidarians, sexual reproduction takes place with external fertilization. **External fertilization** takes place outside the female's body.

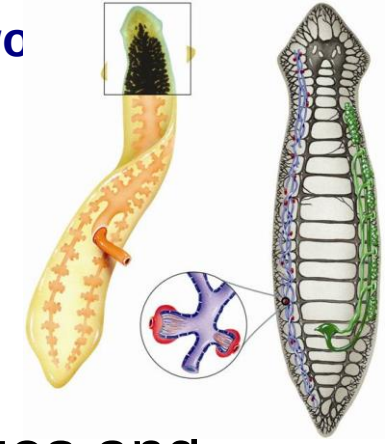
Groups of Cnidarians

Cnidarians include:

- jellyfishes
- hydras and their relatives
- sea anemones and corals



Phylum: Platyhelminthes



What Is a Flatworm?

Flatworms are soft, flattened worms that have tissues and internal organ systems.

They are the simplest animals to have three embryonic germ layers, bilateral symmetry, and cephalization.

Flatworms are acoelomates, which means they have no coelom - a fluid-filled body cavity that is lined with tissue derived from mesoderm.

The digestive cavity is the only body cavity in a flatworm.

Flatworms have bilateral symmetry.

Form and Function in Flatworms

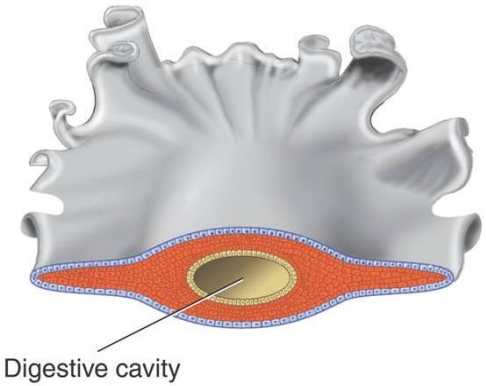
Flatworms are thin and most of their cells are close to the external environment.

All flatworms rely on diffusion for respiration, excretion, and circulation.

Free-living flatworms have organ systems for digestion, excretion, response, and reproduction.

Parasitic species are typically simpler in structure than free-living flatworms.

3 Germ Layers →



Feeding

Flatworms have a digestive cavity with a single opening through which both food and wastes pass.

Near the mouth is a muscular tube called a **pharynx**.

Flatworms extend the pharynx out of the mouth. The pharynx then pumps food into the digestive cavity.

Most parasitic worms do not need a complex digestive system.

They obtain nutrients from foods that have already been digested by their host.

Respiration, Circulation, and Excretion

Flatworms do not need a circulatory system to transport materials.

Flatworms rely on diffusion to

- transport oxygen and nutrients to their internal tissues, and
- to remove carbon dioxide and other wastes from their bodies.

Flatworms have no gills or respiratory organs, heart, blood vessels, or blood.

Some flatworms have flame cells which are specialized cells that remove excess water from the body.

Flame cells may filter and remove metabolic wastes.

Response

In free-living flatworms, a head encloses **ganglia**, or groups of nerve cells, that control the nervous system.

Two long nerve cords run from the ganglia along both sides of the body.

Many free-living flatworms have eyespots.

Eyespots are groups of cells that can detect changes in light.

Most flatworms have specialized cells that detect external stimuli.

The nervous systems of free-living flatworms allow them to gather information from their environment.

Reproduction

Most free-living flatworms are hermaphrodites that reproduce sexually.

A **hermaphrodite** is an individual that has both male and female reproductive organs.

Two worms join in a pair and deliver sperm to each other.

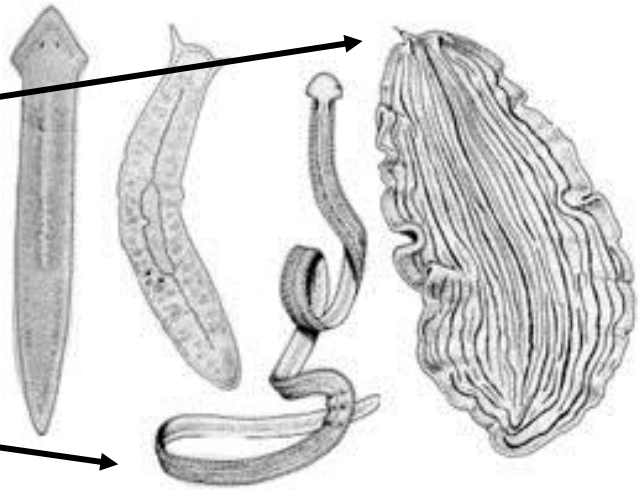
Asexual reproduction takes place by fission, in which an organism splits in two, where each half grows new parts to become a complete organism.

Parasitic flatworms often have complex life cycles that involve both sexual and asexual reproduction.

Groups of Flatworms

The three main groups of flatworms are

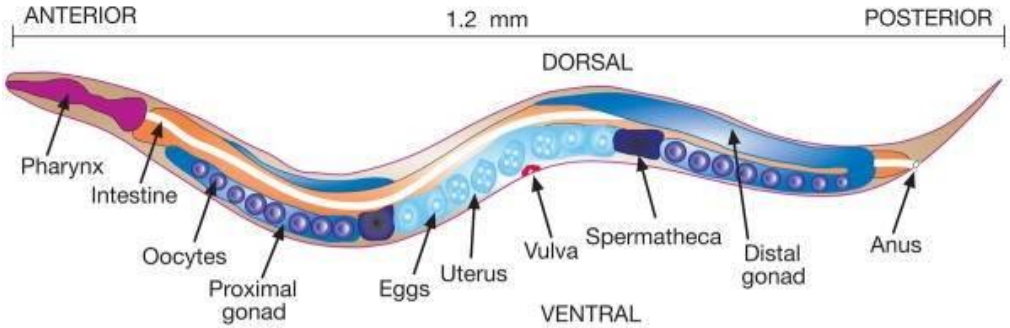
- turbellarians
- flukes
- tapeworms



Most turbellarians are free-living.

Most other flatworm species are parasites.

Phylum: Nematoda



What Is a Roundworm?

Most species of roundworms are free-living, inhabiting soil, salt flats, aquatic sediments, and water, from polar regions to the tropics.

Others are parasitic and live in hosts.

Roundworms are unsegmented worms that have pseudocoeloms and digestive systems with two openings—a mouth and an anus.

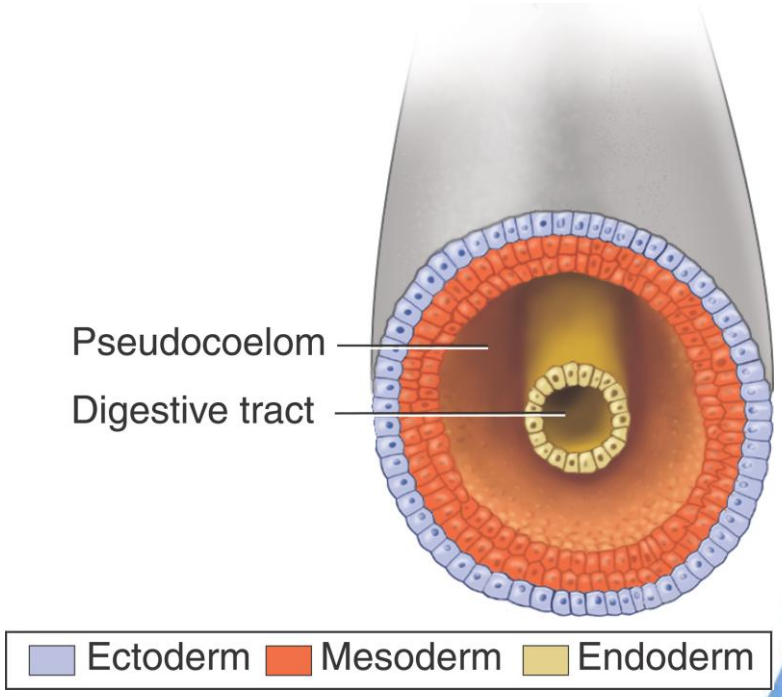
Roundworms have a body cavity between the endoderm and mesoderm tissues.

This cavity is partially lined with tissue derived from the mesoderm and is called a pseudocoelom, **meaning, "false coelom."**

Roundworms have a digestive tract with two openings.

Food moves in one direction through the digestive tract of roundworms.

Any food that is not digested leaves the body through the anus.



Form and Function in Roundworms

Roundworms have specialized tissues and organ systems that carry out essential physiological functions.

Feeding

Many free-living roundworms use grasping mouthparts and spines to catch and eat other small animals.

Respiration, Circulation, and Excretion

Roundworms exchange gases and excrete metabolic waste through their body walls.

They depend on diffusion to carry nutrients and waste through their bodies.

Response

Roundworms have simple nervous systems, consisting of several ganglia.

Several nerves extend from ganglia in the head and run the length of the body.

Reproduction

Roundworms reproduce sexually.

Most species have separate sexes.

Roundworms reproduce using internal fertilization.

Parasitic roundworms often have life cycles that involve two or three different hosts or several organs within a single host.