Invertebrates

Invertebrates are animals that have no backbone.

There are six kinds of invertebrates.

You have already learned about three kinds.

Sponges

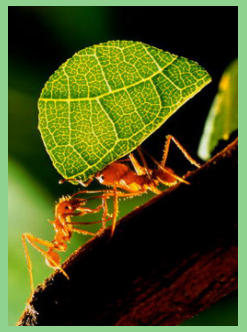
Worms

Cnidarians

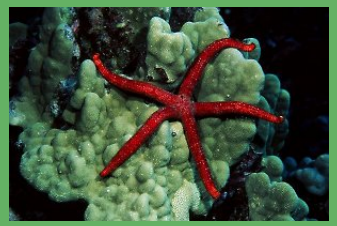
Now, let's learn three more!

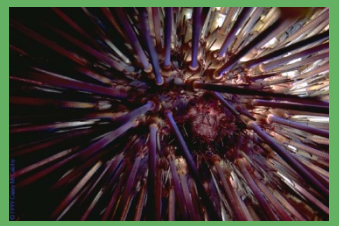
1. Sponges
2. Cnidarians
3. Worms - Annelids
4. Mollusks


5. Arthropods

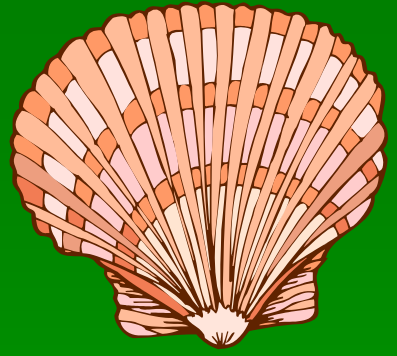

6. Echinoderms





Mollusks

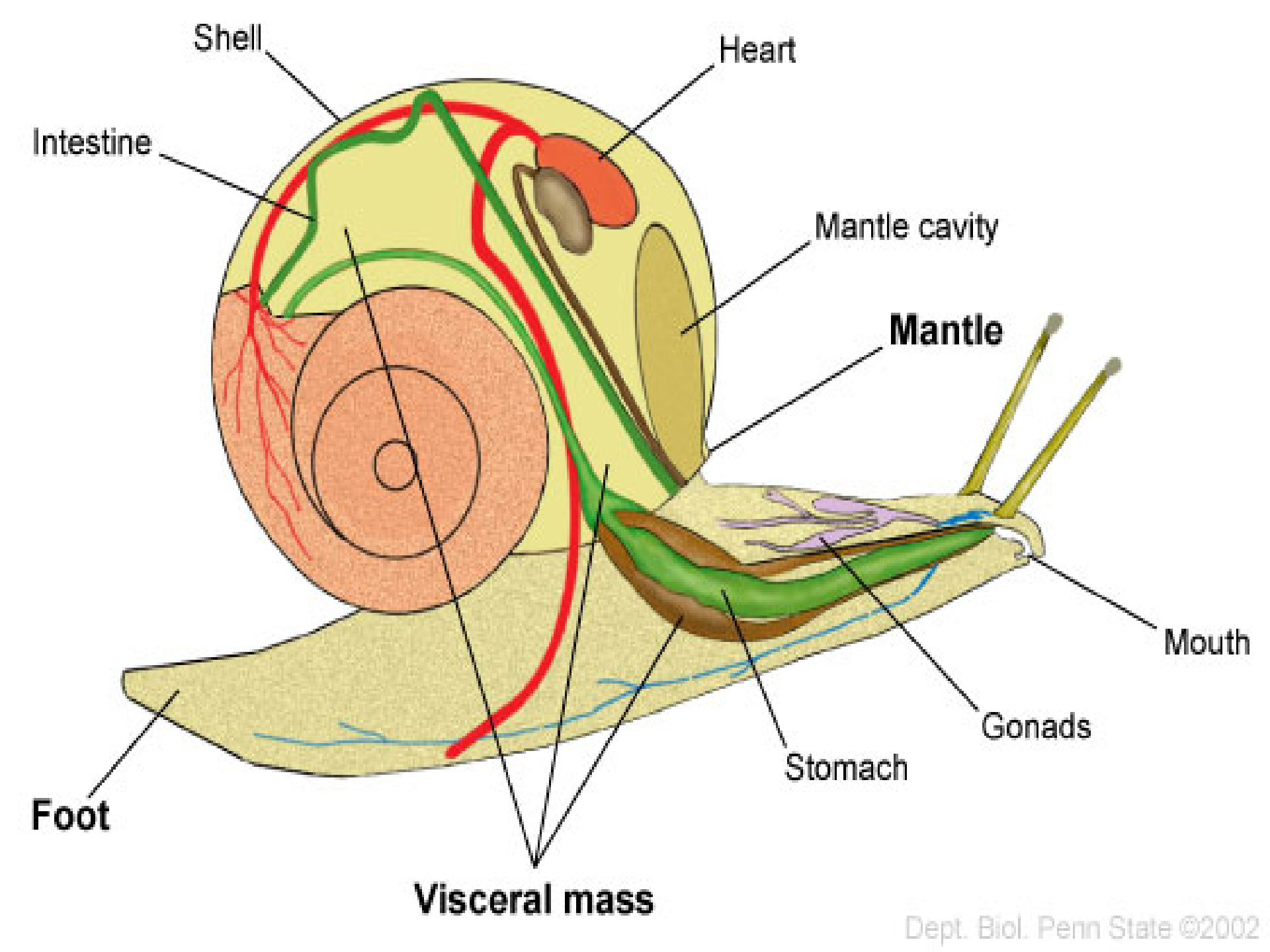
Mollusks



- Huge phylum, wide variety of shapes/sizes
  - ~85,000 different species
- Soft-bodied invertebrates
- Have bilateral symmetry
- Usually have one or two shells with organs in a fluid filled cavity
- Most live in water
- Fossils are 500+ million years old

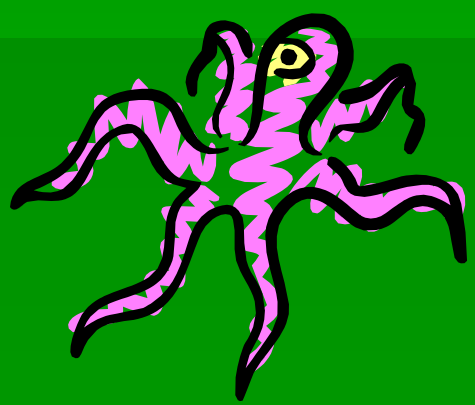
Mollusks' Body Plan

- Have a well developed head with a mouth and some sensory organs
- Underside is a muscular foot
  - Moves by making rhythmic contractions

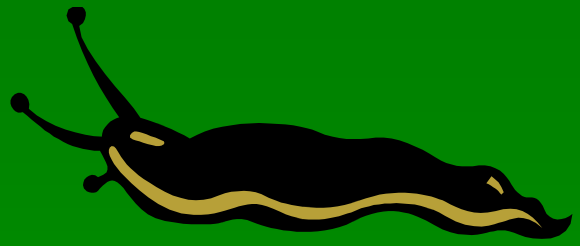

Shell
Heart
Intestine
Mantle cavity
Mantle
Mouth
Gonads
Stomach
Foot
Visceral mass
Dept. Biol. Penn State ©2002

Classification of Mollusks

- Classified into three common groups based on shell presence, type and foot type
  - Gastropods
  - Bivalves
  - Cephalopods

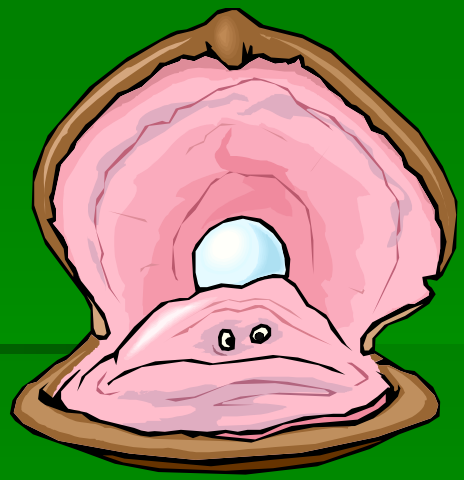


Gastropods



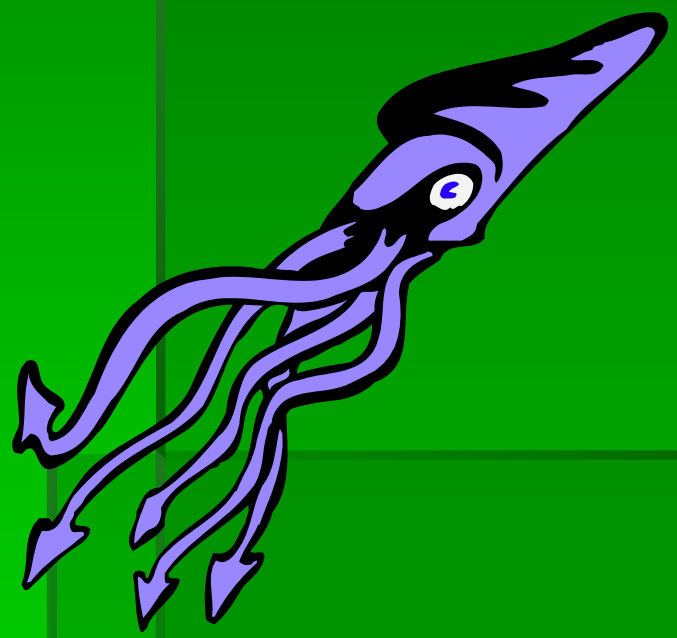
- Largest group of mollusks
- Usually have a single shell
- Use a radula (a tongue-like organ with rows of teeth) to get food
- Have foot glands that secrete a layer of mucus for sliding
- Includes snails, conchs, and garden slugs

Bivalves



- Have a hinged, two-part shell
- To open or close their shell they either contract or relax their muscles
- Includes clams, oysters, and scallops
- Well adapted for water
  - Clams can burrow in sand
  - Mussels attach themselves to a solid surface
  - Scallops escape predators by rapidly opening and closing their shell

Cephalopods



- Most specialized and complex mollusks.
- Include squid, octopuses, and chambered nautiluses.
- Have a well developed head and many tentacles for capturing prey.
- Closed circulatory system
  - Moves blood through the body in a series of closed vessels like humans.
- Use jet propulsion to move at speeds of 6 m/s.

Arthropods

Arthropods

An arthropod is an invertebrate with an exoskeleton, a segmented body, and jointed legs.

There are four main kinds of arthropods.

1. Crustaceans
2. Spiders & Scorpions
   Ticks & Mites
3. Centipedes & Millipedes
4. Insects

Arthropods

There are more than 1 million kinds of arthropods on Earth.

There are three characteristics that all arthropods have.

1. exoskeleton
2. segmented body
3. jointed legs

All arthropods have an exoskeleton.

An exoskeleton is a hard, outer covering.

Some arthropods grow too big for their exoskeletons.

These arthropods will **molt.**

Molting is to leave an exoskeleton and grow a new one.

Crustacean

A **crustacean** is an arthropod that has a hard, exoskeleton, two pairs of antennae, and a mouth for crunching and grinding.

Crustaceans are ...

Crabs Lobsters Barnacles Shrimp




Crustaceans

Crustaceans can re-grow certain parts of their body.

A stone crab can re-grow its claws.

Most crustaceans live in water and get oxygen from the water through gills.

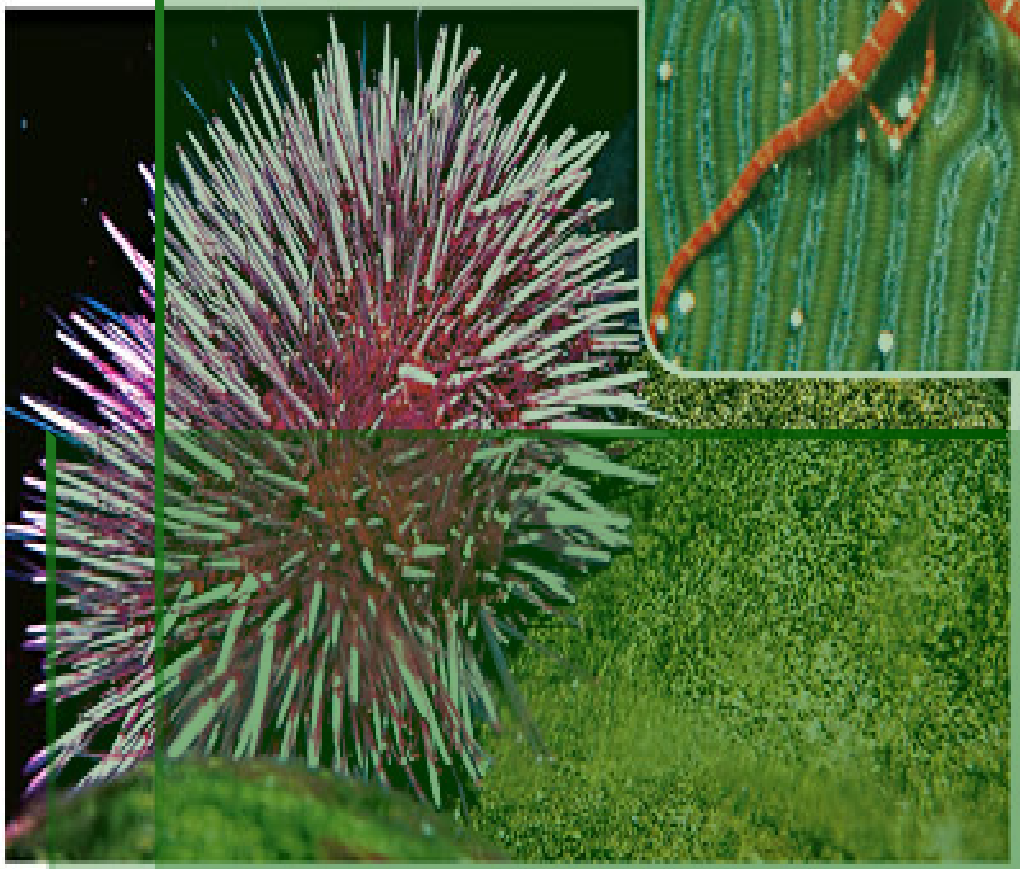
Gills are special respiratory organs that help some animals breathe and get oxygen from the water.

Echinoderms

Brittle star

Sea cucumber

Sea urchin



2-3: Echinoderms

* Echinoderms are starfish, sea lilies, feather stars, sea urchins, sea cucumbers, and sand dollars.

* Echinoderm means spiny skin. All echinoderms have spiny skin.

Echinoderms

- There are __five__ characteristics of echinoderms.

- All echinoderms have:
  - Spiny skin
  - An internal skeleton
  - A five part body
  - A water vascular system
  - Tube feet

Characteristics of Echinoderms

* All echinoderms have spiny skin. Some of them have small hair-like spines, like the starfish.

* Some echinoderms have long spines, like the sea urchin.

Characteristics of Echinoderms

* The internal skeleton of an echinoderm is made of bony plates that are bumpy or spiny.

* An echinoderm's water vascular system is a system of tubes that carry food and oxygen and remove wastes.

* The water vascular system also helps an echinoderm move.

Characteristics of Echinoderms

tube feet

* Echinoderms have tube feet.

* An echinoderm's tube feet are used for moving and for getting food.

Starfish

* Starfish are also called sea stars.

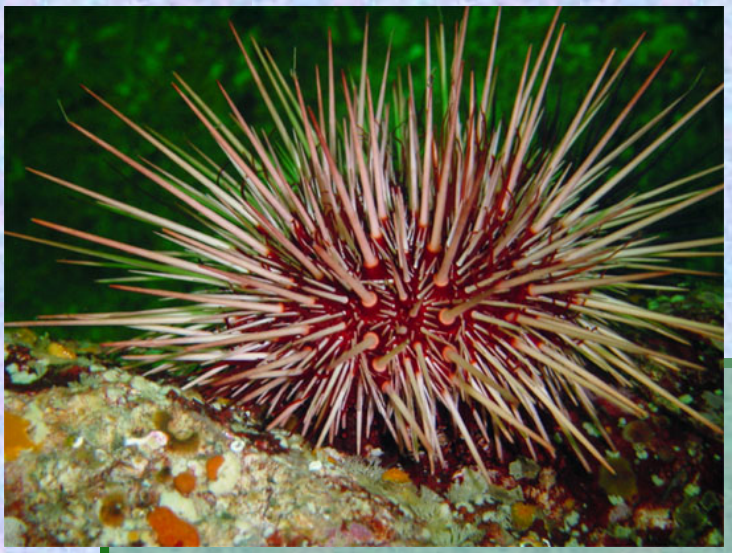
* Starfish have five or more arms connected to a central body.

* On the bottom of the arms are hundreds of tube feet that look like suction cups.

Starfish

* A starfish is able to re-grow its arms.

* A starfish uses its tube feet to move and to open its food.



Sea Urchins

* Sea urchins have longer and sharper spines that they use to protect themselves.

* Some sea urchins have poisonous spines.

Sea Urchins

* Sea urchins have a mouth hidden under its body.

* A sea urchin uses its five teeth to eat sea plants.

* A sea urchin is not very active. Sometimes, it does move slowly using its tube feet. When not moving it uses its feet to stick to the ocean floor.

Sea cucumbers

Sand dollars

Sea lily

A Review

Arthropods

Crustaceans

Spiders & Scorpions
Ticks & Mites

Centipedes & Millipedes

Insects

Echinoderms

Starfish

Sea Urchins

Sand dollars

Sea lilies

Sea cucumbers

Mollusks' Body Plan

- Mantle
  - Thin layer of tissue that covers the body organs
- Mantle cavity (between soft body and mantle)
  - Contains the gills that are used to breathe by exchanging oxygen and carbon dioxide in the water
- Open Circulatory System
  - Most mollusk have this
  - Moves blood through vessels and into open spaces around body organs

More Characteristics of Arthropods

Arthropods have segmented bodies.

Arthropods have jointed legs.

Arthropods have a heart to pump blood through their bodies.

Arthropods reproduce sexually.

Four Kinds of Arthropods