

# Animal Kingdom

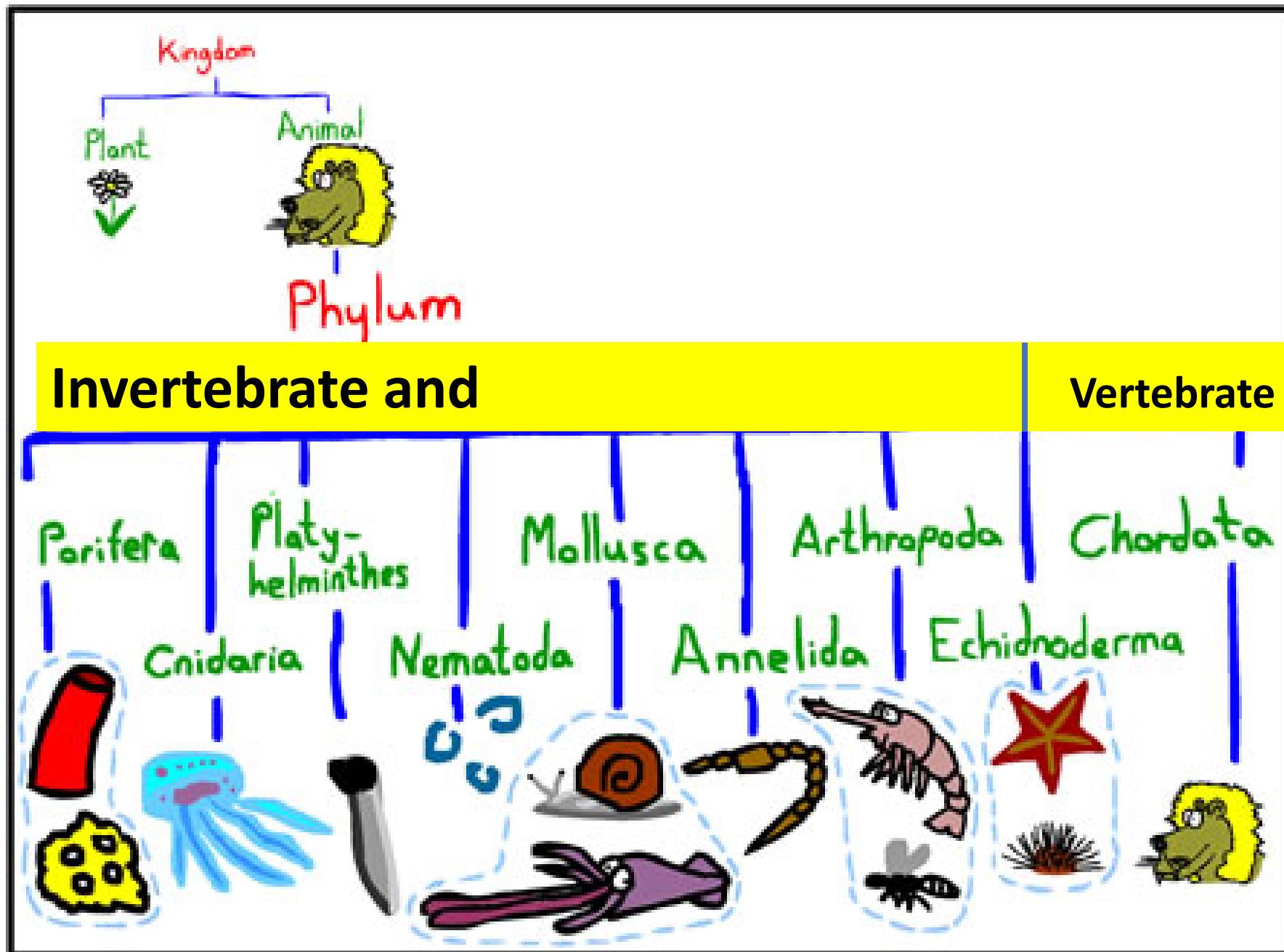
# Kingdom

Plant



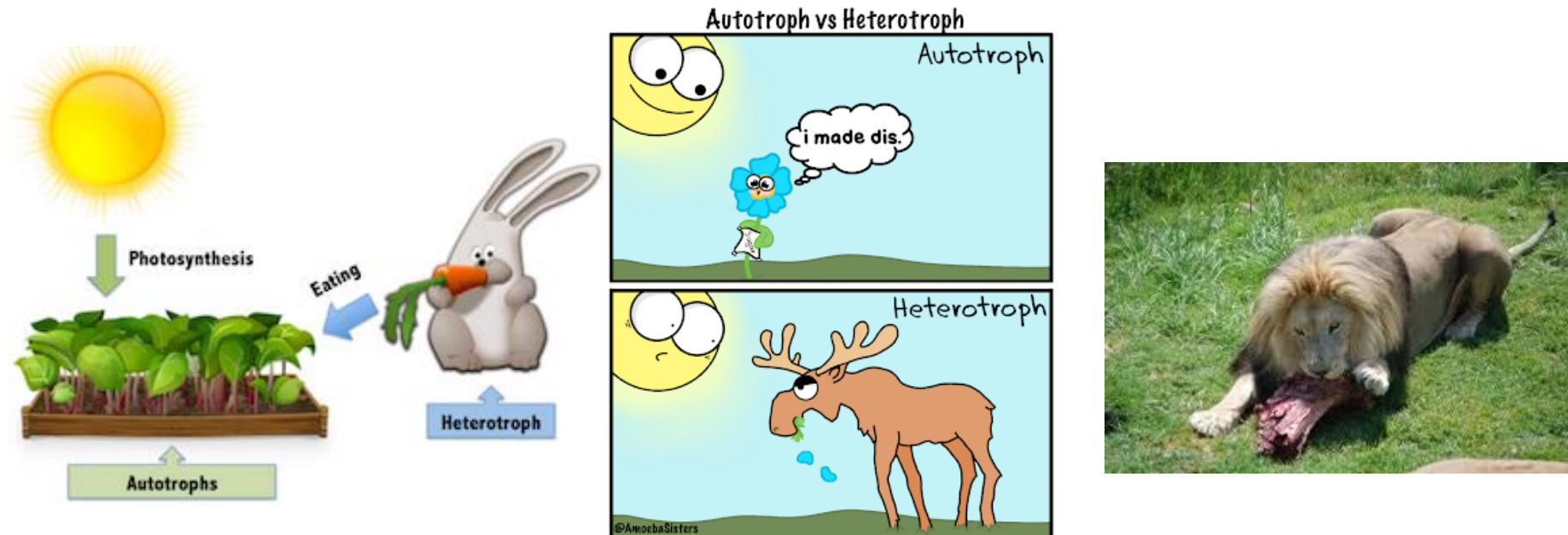
Animal





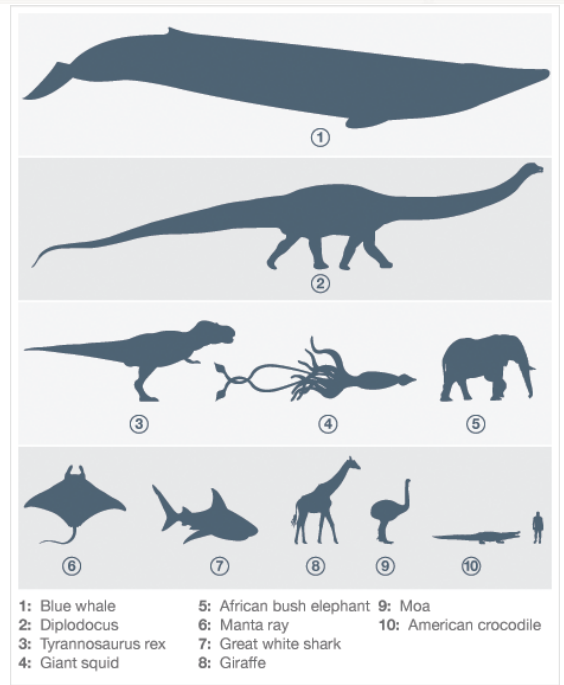
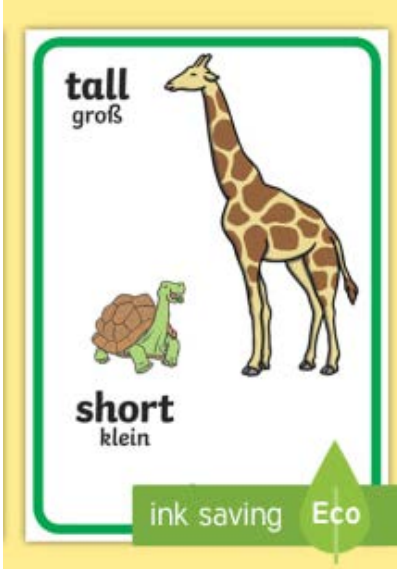
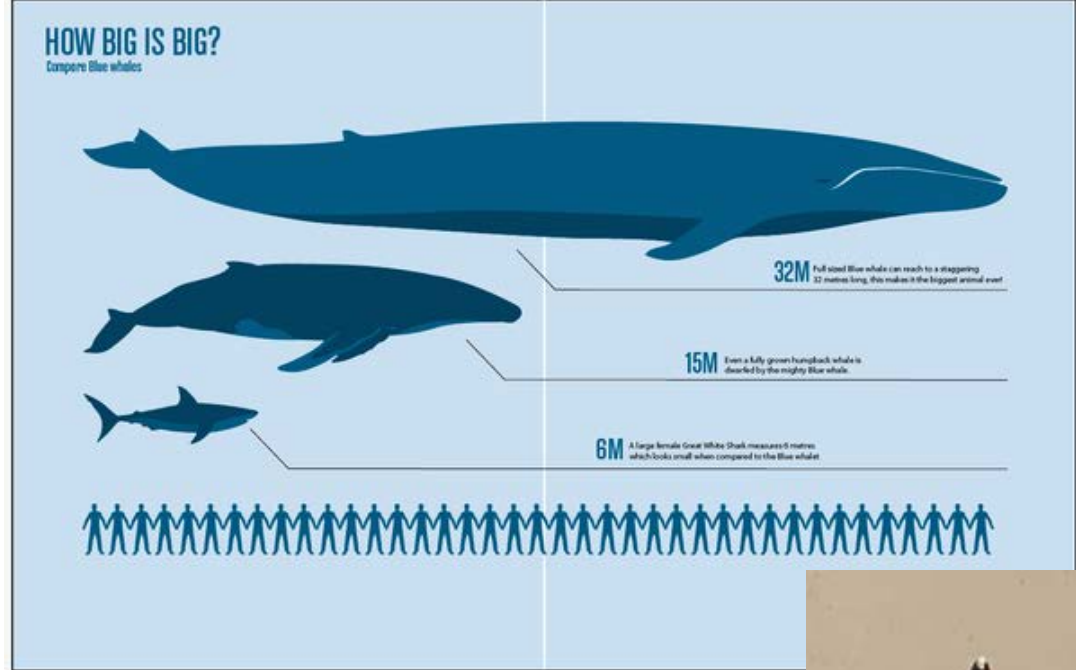
# Some General Features of Animals

- Multicellular Heterotrophs : Animals are the eaters or consumers of the earth. They are **heterotrophs** and depend directly or indirectly on plants, photosynthetic protists (algae), or autotrophic bacteria for nourishment.



# Diverse in Form

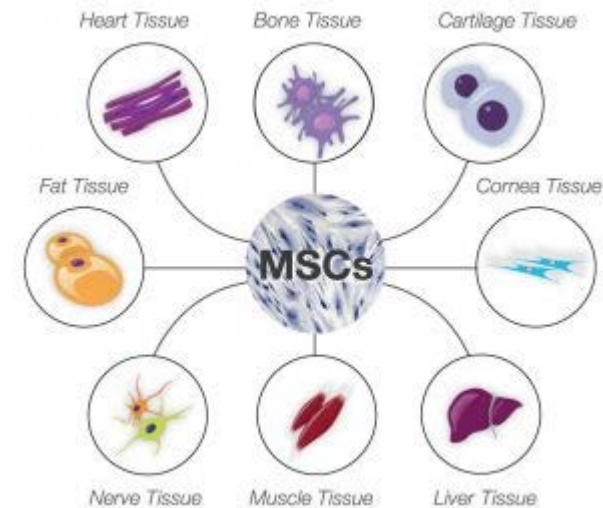
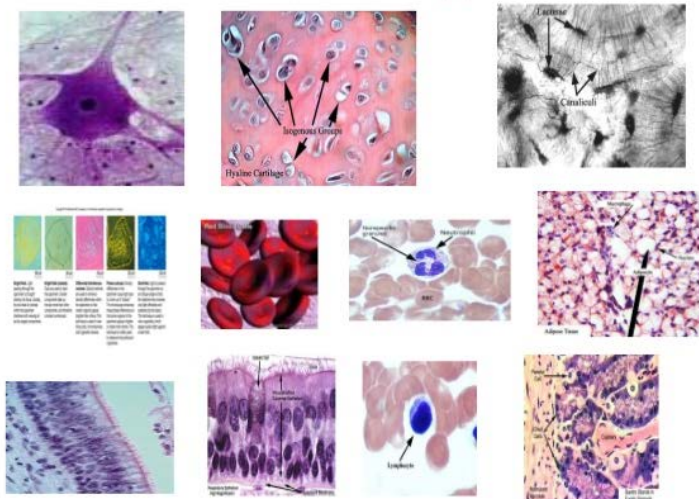
- **Almost all animals (99%) are invertebrates, lacking a backbone.**
- **Vertebrate = have backbone**
- **diverse in form, ranging in size from ones too small to see with the naked eye to enormous whales and giant squids.**
- **35 phyla found in sea,**
- **Lesser found in fresh water and land**



# No Cell Walls

- Lack rigid cell walls and are usually quite flexible.
- The cells of all animals but sponges are organized into structural and functional units called tissues

## Animal Cell Types





# Active Movement.

- directly related to the flexibility of their cells and the evolution of nerve and muscle tissues.
- Flying is a unique movement found in animal
- Bird,bat, insect can fly



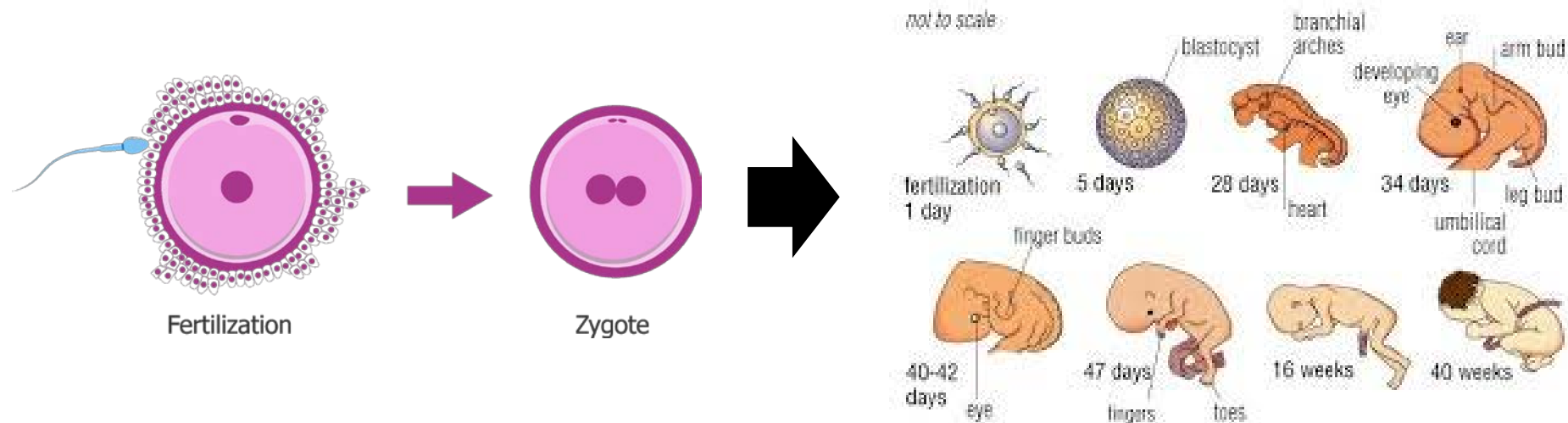


Can you classify  
type of movement  
of  
animals  
in the picture

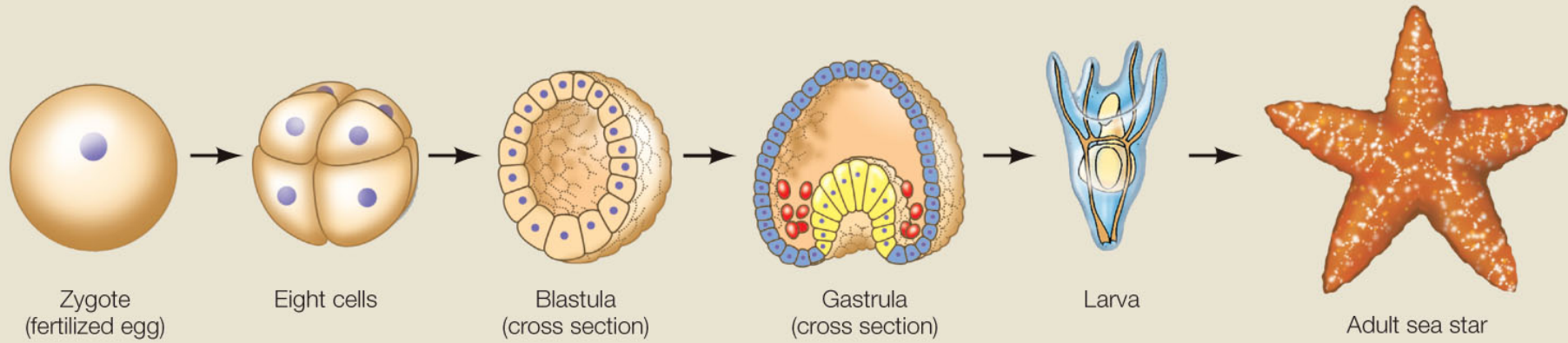


# Sexual Reproduction

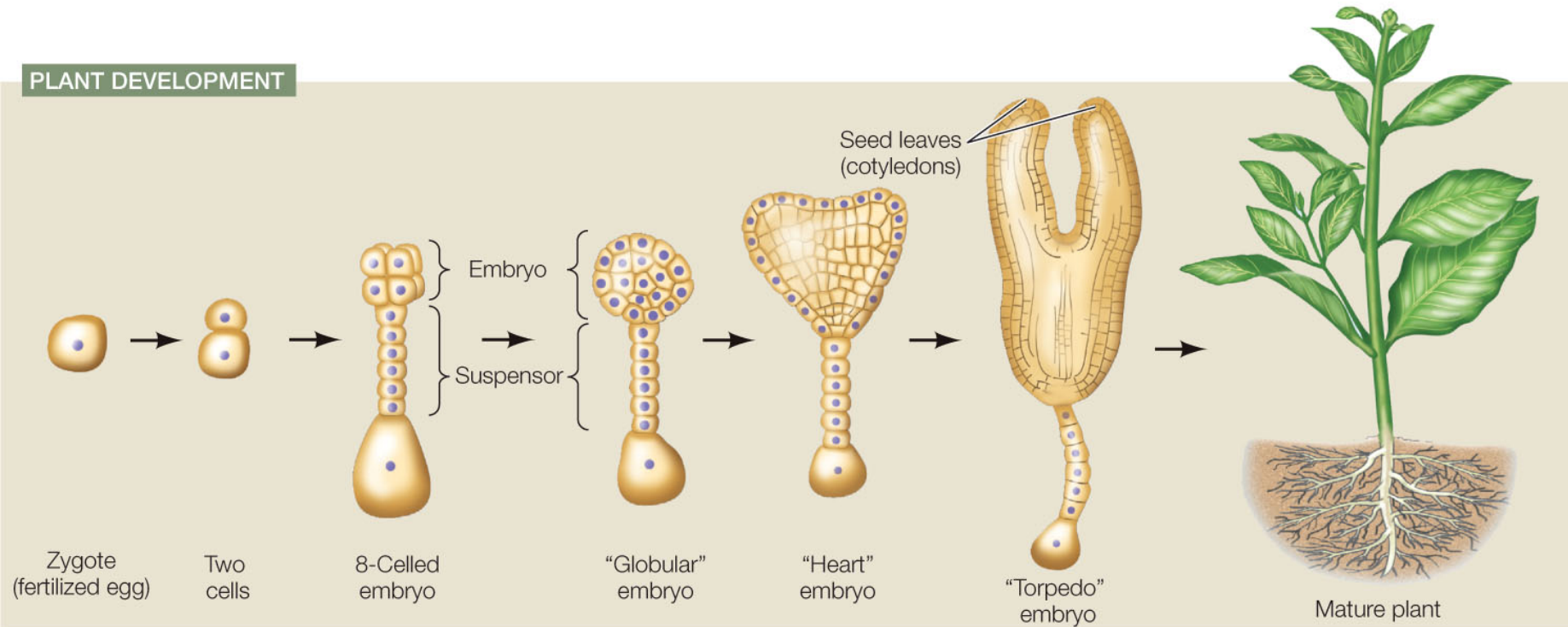
- Most animals reproduce sexually. Animal eggs, which are nonmotile, are much larger than the small, usually flagellated sperm.
- Meiosis and create haploid and fuse together to form **zygote** to Embryonic Development.



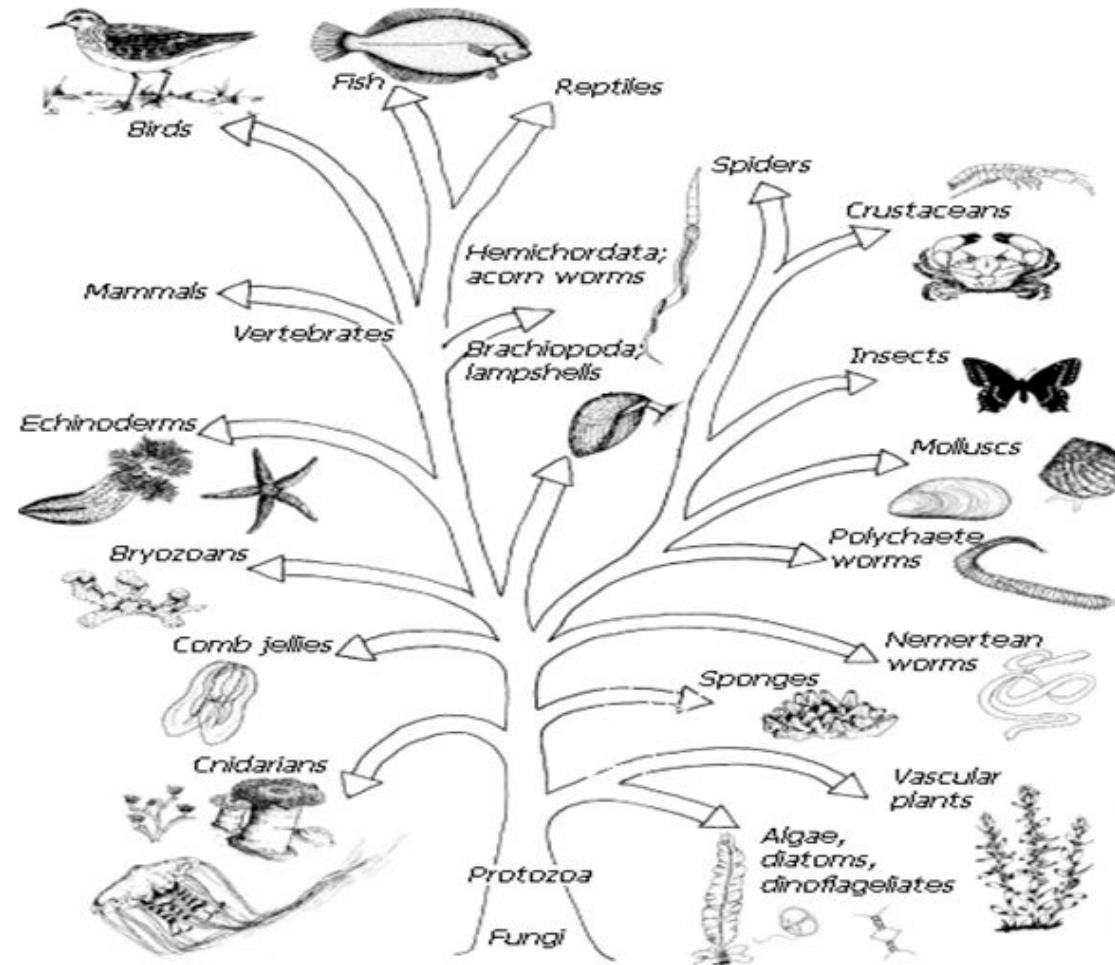
## ANIMAL DEVELOPMENT



## PLANT DEVELOPMENT



# Animal Classification



# How to classify

- **Parazoa**—animals that for the most part lack a definite symmetry and possess neither tissues nor organs, mostly comprised of the sponges, phylum Porifera
- **Eumetazoa**—animals that have a definite shape and symmetry and, in most cases, tissues organized into organs and organ systems. Although very different in structure, both types evolved from a common ancestral form

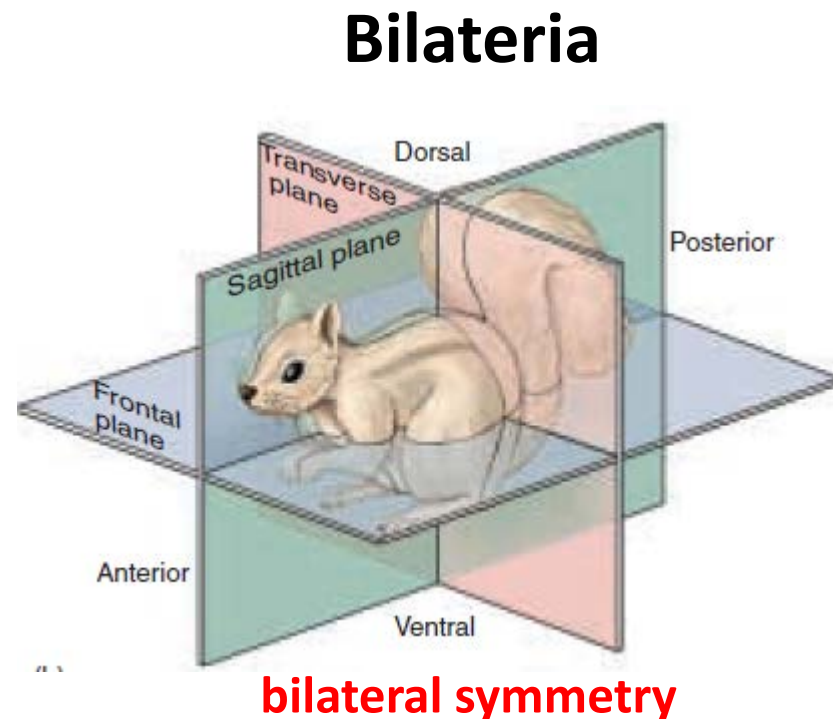
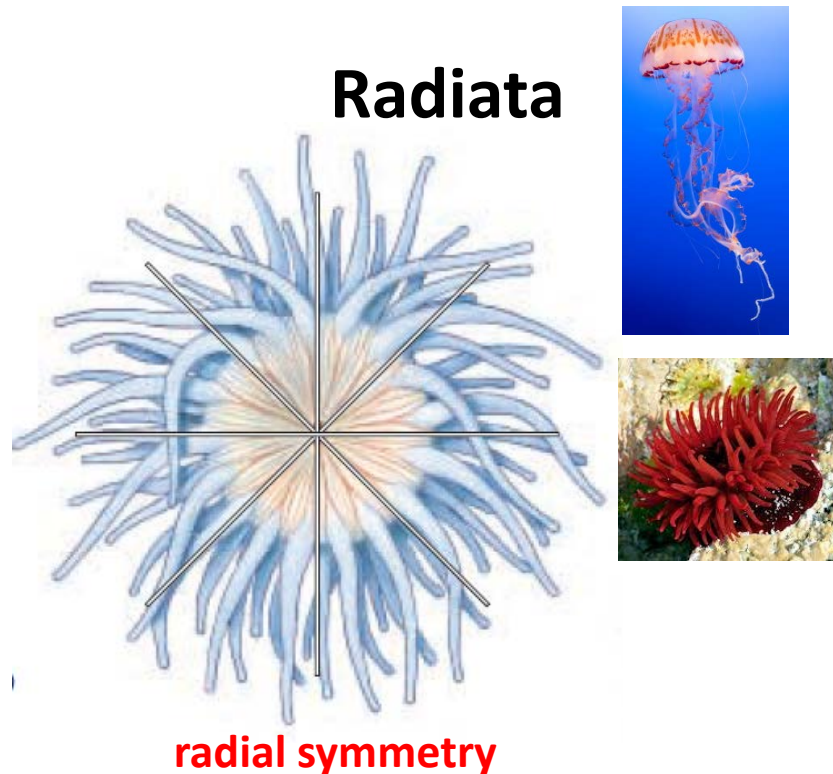
# Five Key Transitions in Body Plan

- **Evolution of Tissues**
- The **simplest animals**, the Parazoa, lack both defined tissues and organs. Characterized by the sponges, these animals exist as aggregates of cells with minimal intercellular coordination.
- Eumetazoa, have distinct tissues with highly specialized cells. The evolution of tissues is the first key transition in the animal body plan.



# Evolution of Bilateral Symmetry

- Sponges lack any definite symmetry, growing asymmetrically as irregular masses.
- Another animals possess definite shape and symmetry





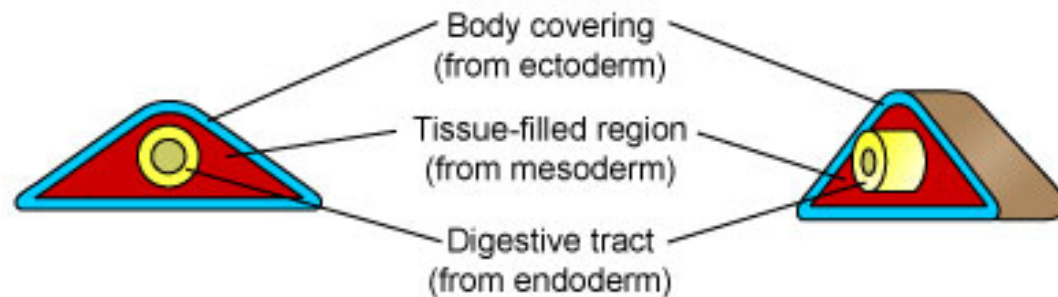
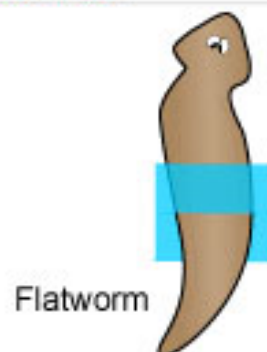
# Evolution of a Body Cavity

- **The evolution of efficient organ systems within the animal body was not possible until a body cavity evolved for supporting organs, distributing materials, and fostering complex developmental interactions.**
- **Large body cavity = better digestive system**
- **internal body cavity = better reproductive system**

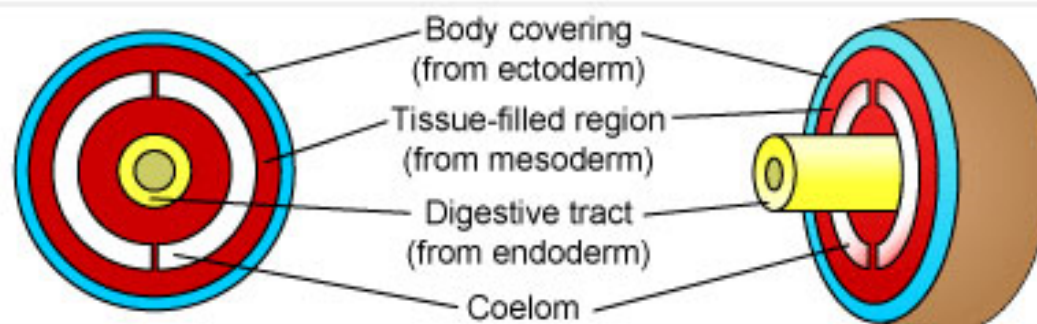
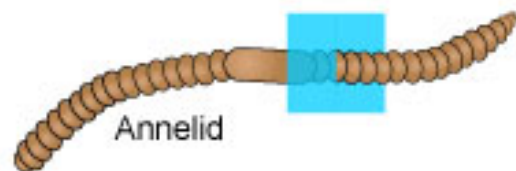
# Kinds of Body Cavities

- **Acoelomates : have no body cavity**
- **Pseudocoelomates have a body cavity called the pseudocoel located between the mesoderm and endoderm.**
- **Coelom : fluid-filled body cavity develops not between endoderm and meso-derm,**

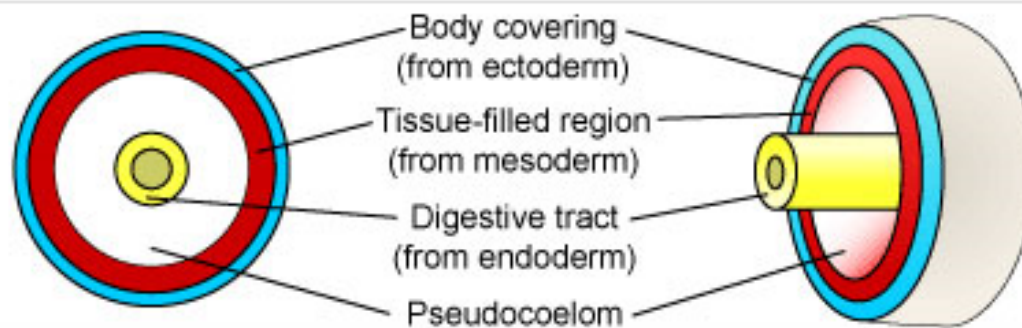
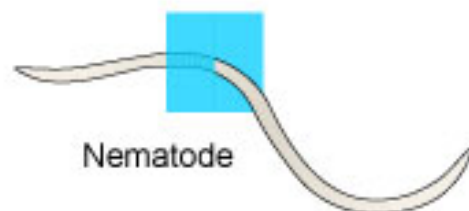
## Acoelomate



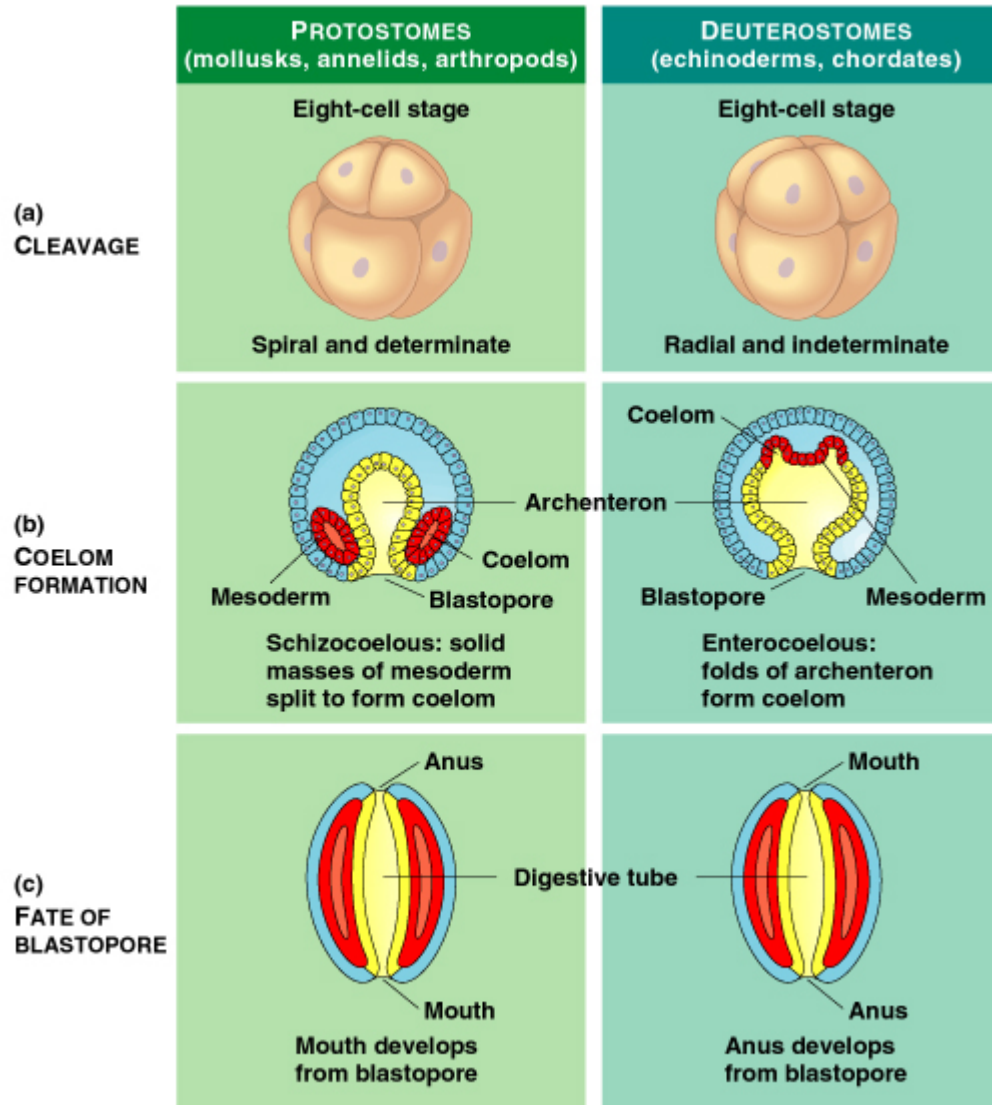
## Coelomate



## Pseudocoelomate



# The Evolution of Protostome and Deuterostome Development

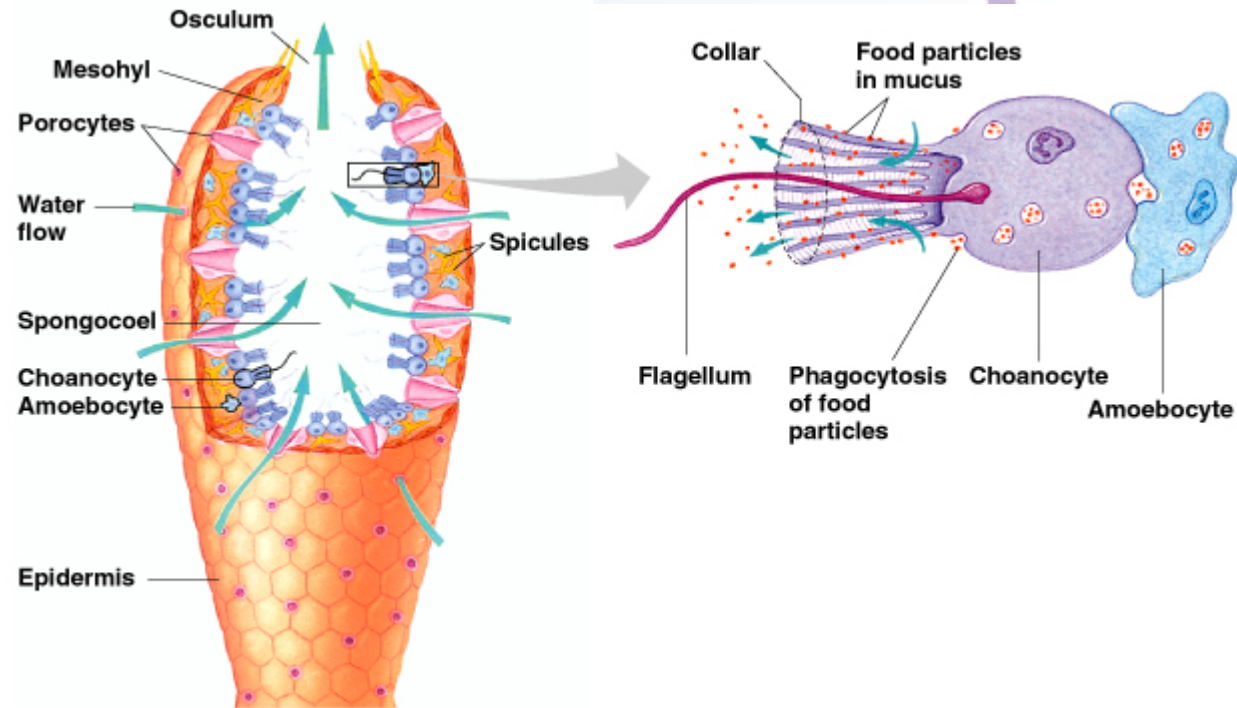
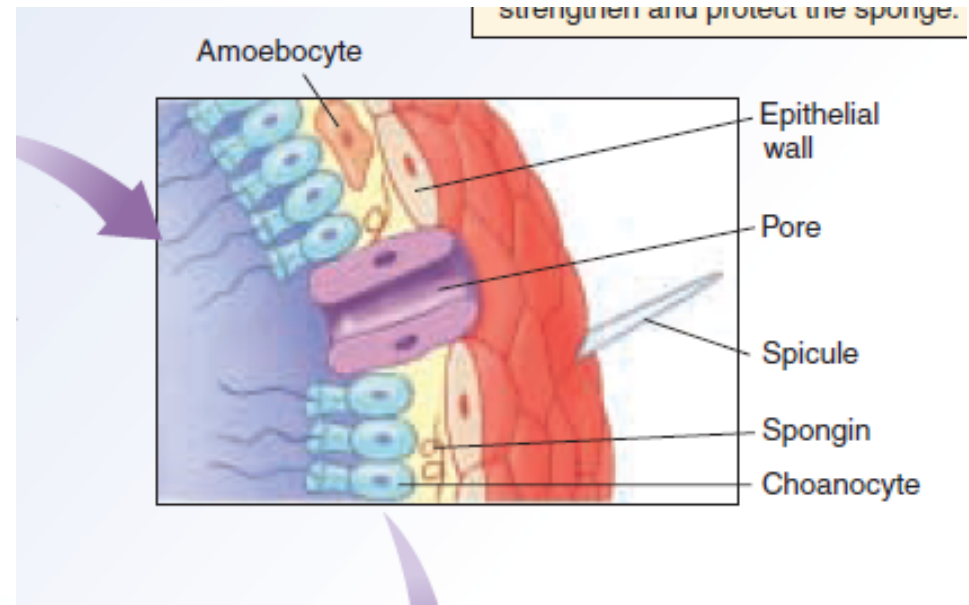


# The Evolution of Segmentation

- The segmented animals are “assembled” from a succession of identical segments.
- these segments become most obvious in the mesoderm but later are reflected in the ectoderm and endoderm
- In annelid, segmented body can help to regenerate
- Segmented body advance in locomotion

# The parazoa : Porifera

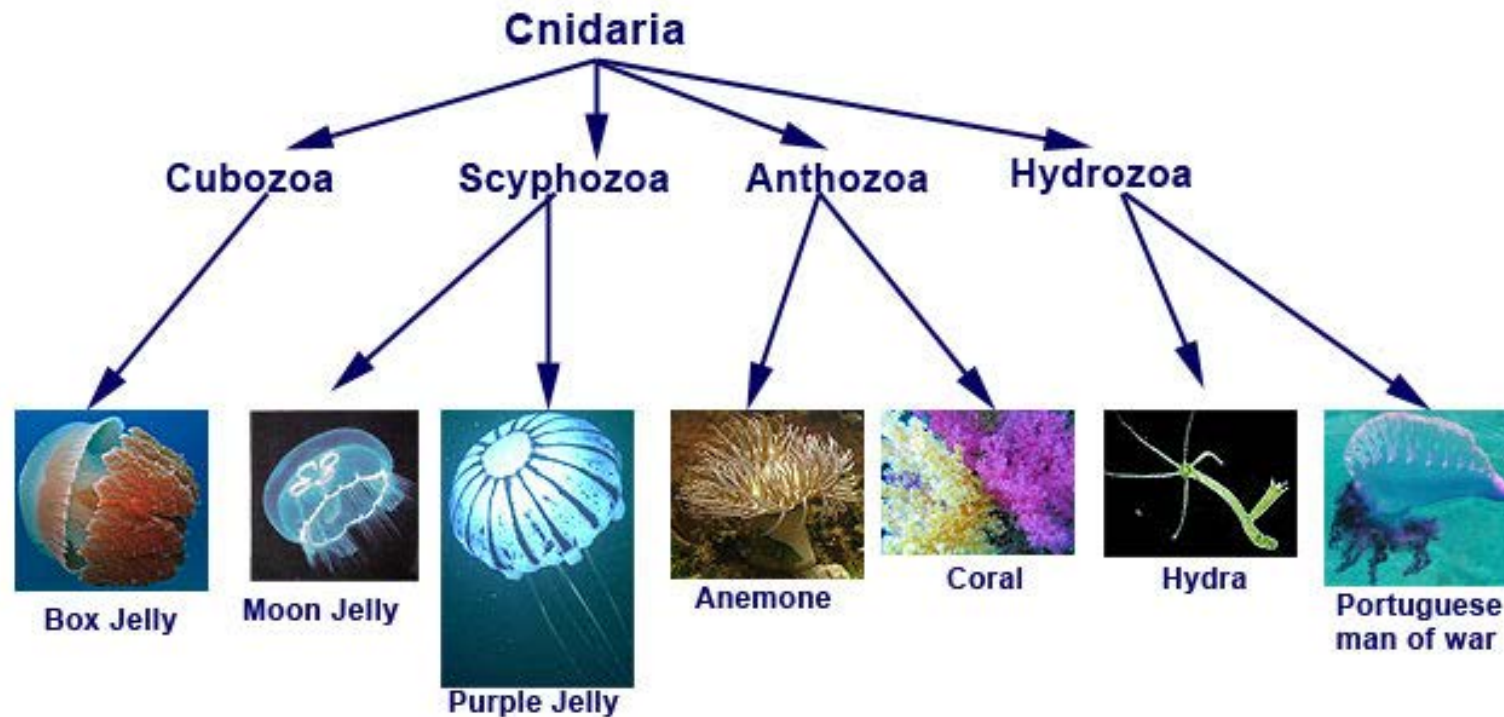
- These are sponges, just like the bath sponges. There are many shapes and sizes of sponge, one of my favorites is the basket sponge, they're brown and grow like a huge laundry basket.
- Sponges live on reefs in warm and cold water, they have many holes in them through which water passes and they filter out nutrients. When they are gathered, cleaned, cut and dried they become natural bath sponges (although now we also make artificial sponge from plastic).
- Sponges were a big harvest from Florida, The Caribbean and the Greek islands, fishermen would use hooks on long poles or dive using traditional copper diving helmets to hunt for the sponges.





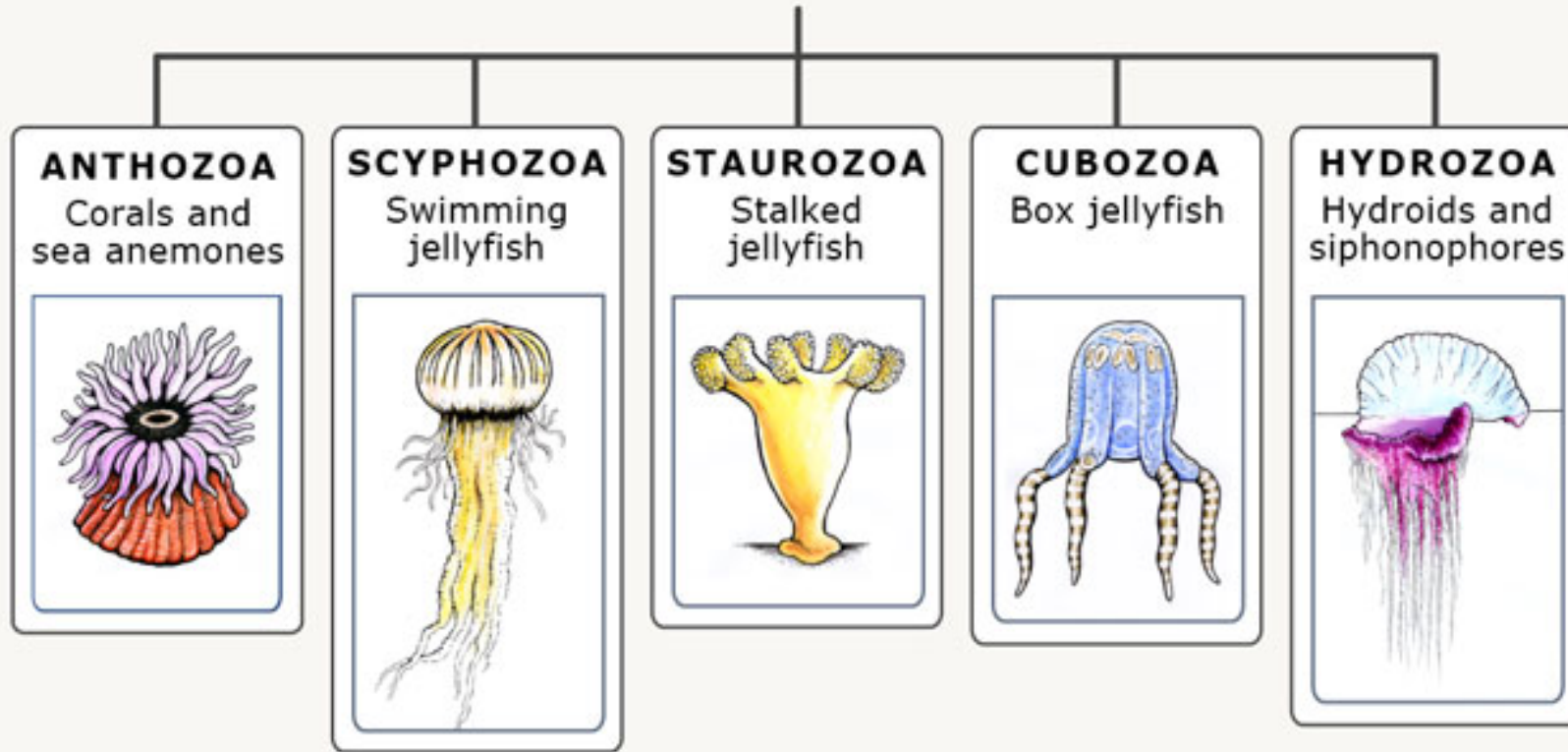
# Cnidaria

- These are creatures that include jellyfish and corals, the actual jelly like animal that is the living part of coral. A piece of coral is a colony of these "polyps" living together.



# CNIDARIA

'Nettle animals'



## PHYLUM CNIDARIA: Tissues and radial symmetry

Hydra and other jellyfish are radially symmetrical, with parts arranged around a central axis like petals of a daisy.

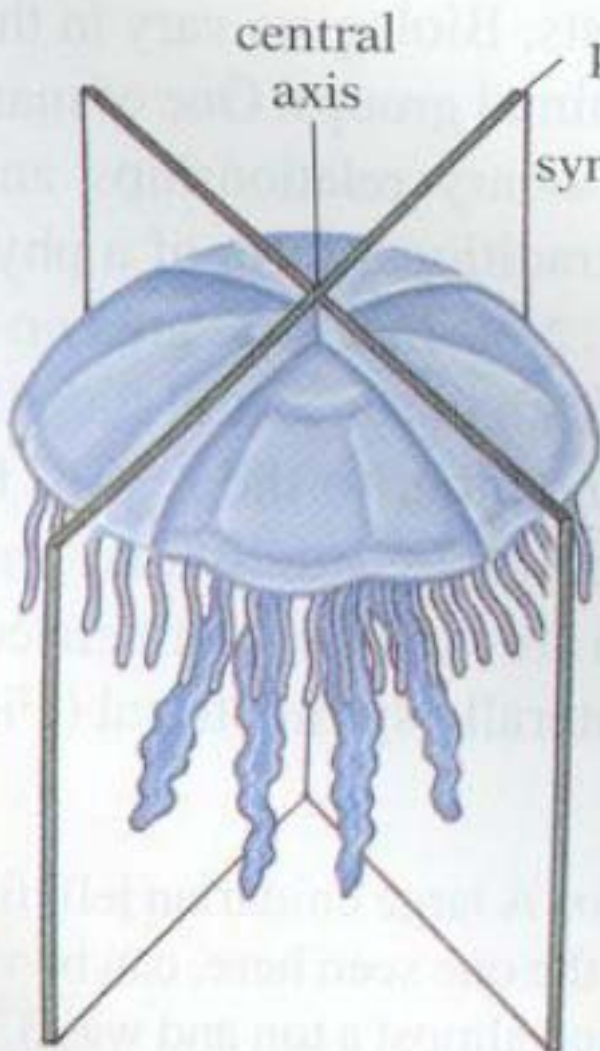
Prey and Predator

Hydra and jellyfish are carnivores that capture their prey with tentacles that ring their mouth.

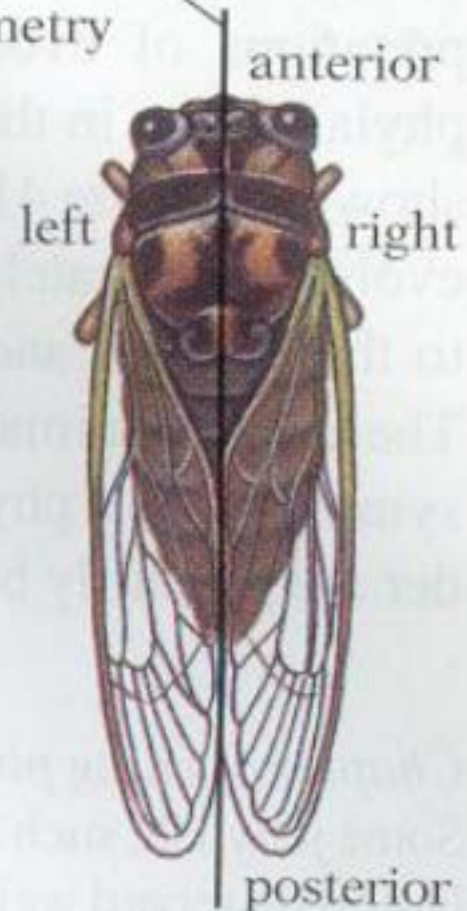
the cells of cnidarians are organized into tissues. A major innovation of hydra and jellyfish is extracellular digestion of food—that is, digestion within a gut cavity.



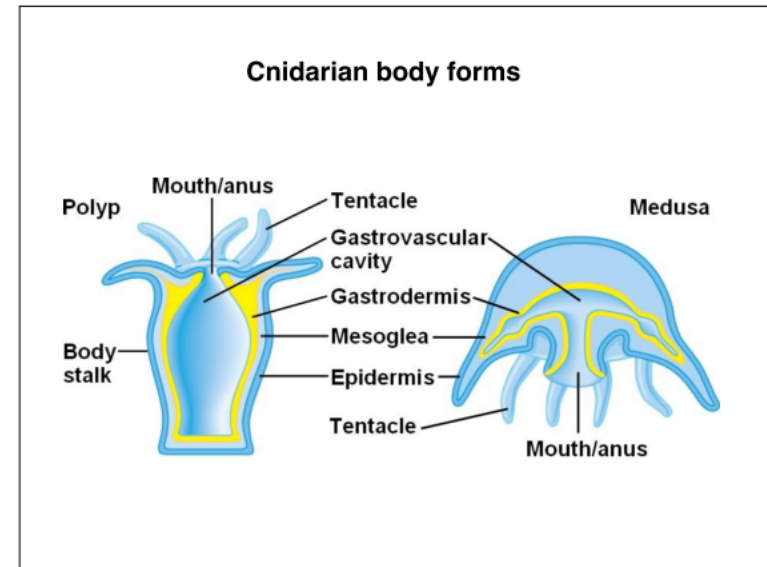
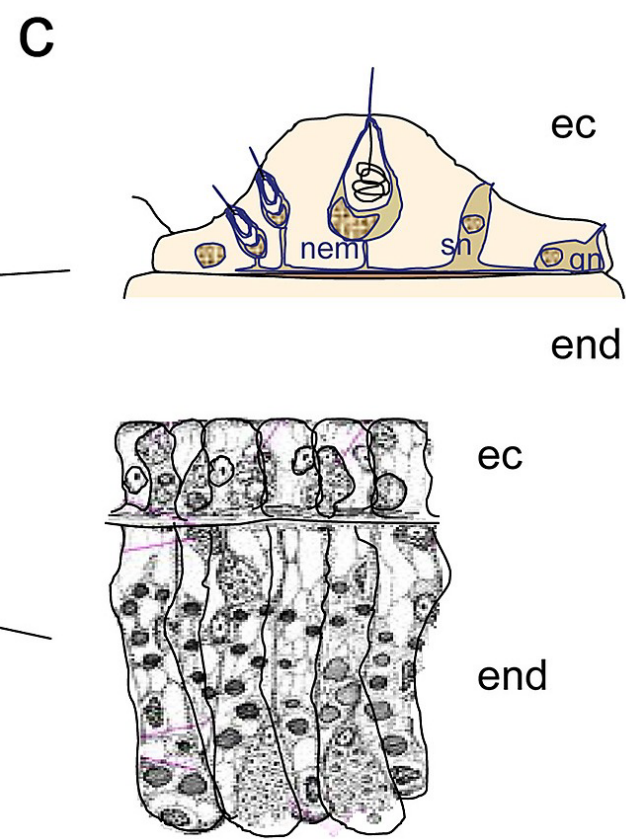
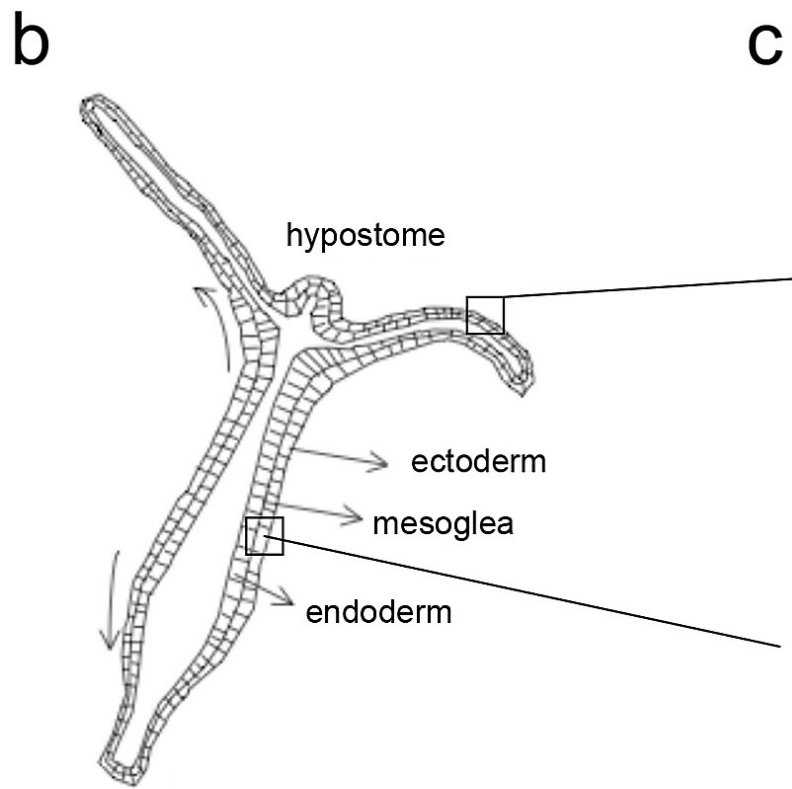
NONE



RADIAL



BILATERAL





# Eumetazoa: The Bilateral Acoelomates

- bilateral symmetry
- Simplest bilaterians are the acoelomates; they lack any internal cavity other than the digestive tract.

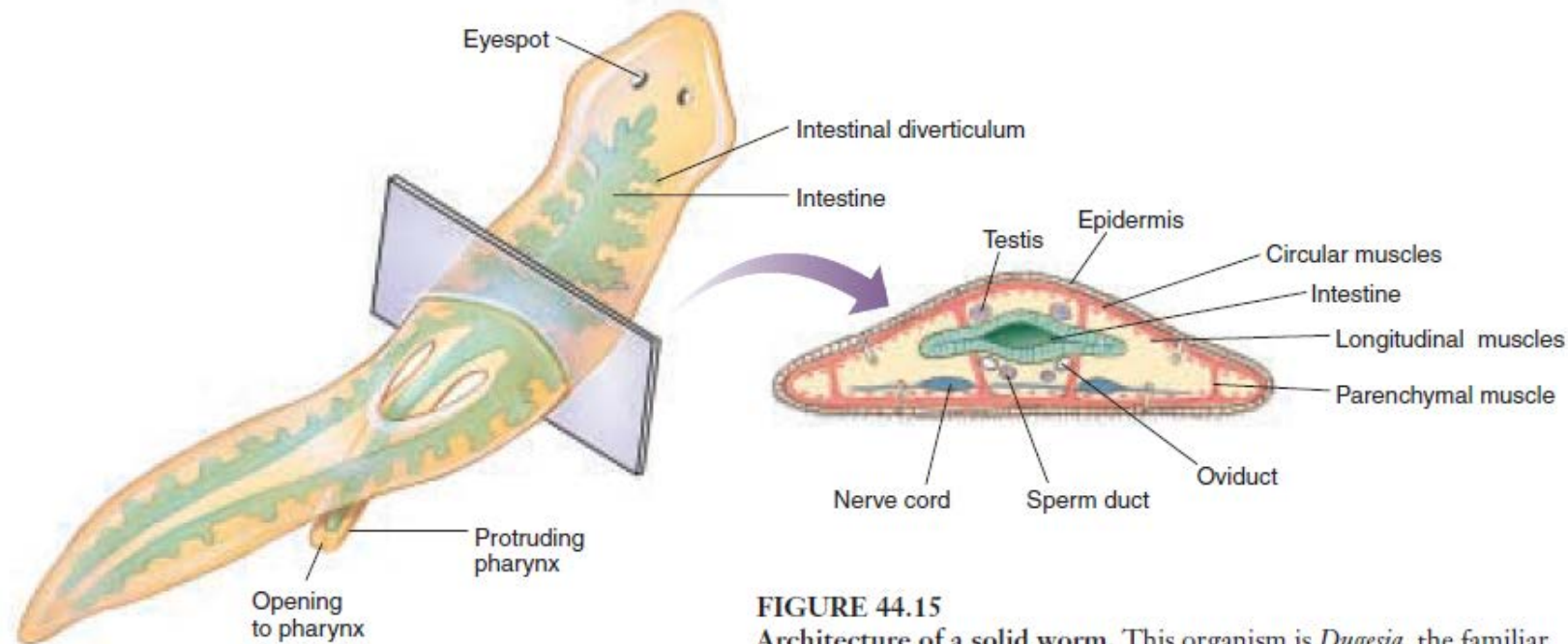


FIGURE 44.15

Architecture of a solid worm. This organism is *Dugesia*, the familiar freshwater “planaria” of many biology laboratories.

# Platyhelminthes

- relatively simple [bilaterian](#), [unsegmented](#), soft-bodied [invertebrates](#). Unlike other bilaterians, they are [acoelomates](#) (having no [body cavity](#)), and have no specialized [circulatory](#) and [respiratory organs](#), which restricts them to having flattened shapes that allow [oxygen](#) and nutrients to pass through their bodies by [diffusion](#). The digestive cavity has only one opening for both ingestion (intake of nutrients) and egestion (removal of undigested wastes); as a result, the food cannot be processed continuously.



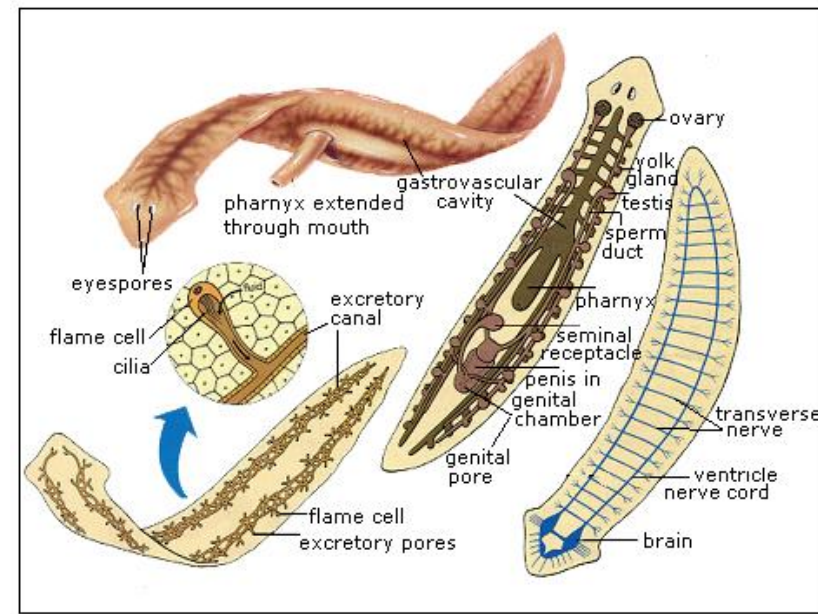
# GROUPS OF FLATWORMS

- 1. Class Turbellarians = free-living flatworms  
Fresh or marine water  
Example: Planarians (cross-eyed)
- **Planarian**(also known as Dugesia)--lives in freshwater  
--mostly a scavenger, also feeds on protists  
--hermaphrodites  
--they can regenerate (regrow parts), Reproduction by  
FISSION

# Planaria

- Brain (ganglia) - planarian can process information about their environment

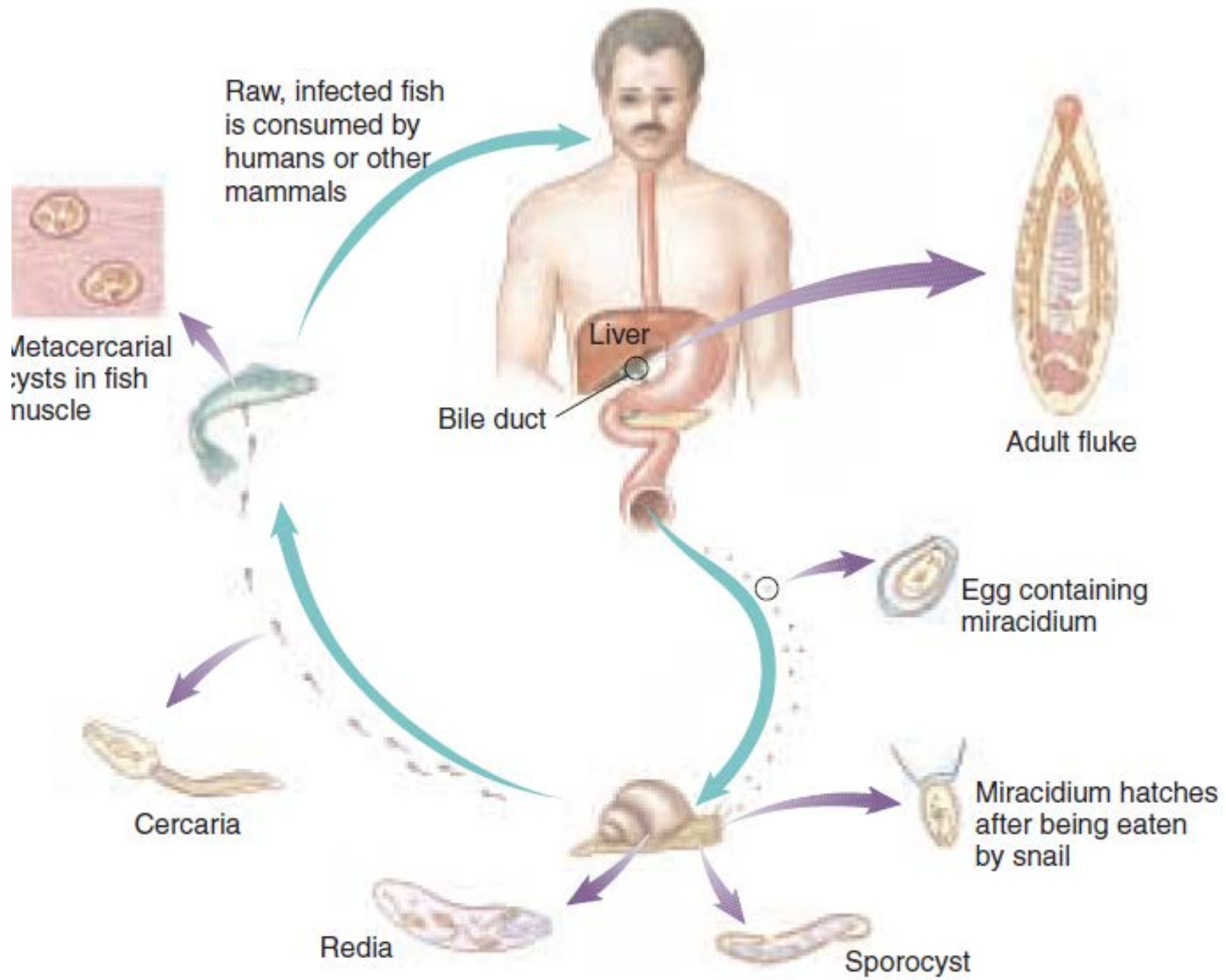
Pharynx - used for suckling food in (the mouth is at the end of the pharynx)



- Eyespot - simple eye, can detect light
- Flame cells - located along the lateral edges, used for excretion
- Intestine - digestion (does not have an anus)

# GROUPS OF FLATWORMS

- 2. **Class Trematoda** = parasitic flatworms  
a.k.a "**flukes**" live in mouth, skin, or gills of host
- Primary host = the host in which a parasite reproduces sexually  
Intermediate host = the host in which asexual reproduction occurs
- *Schistosoma mansoni* - multiple host:  
Primary host = human  
Intermediate host = snail
- Causes Schistosomiasis -in humans; decays lungs liver, spleen, or intestines. Tropical areas with poor sanitation/sewage



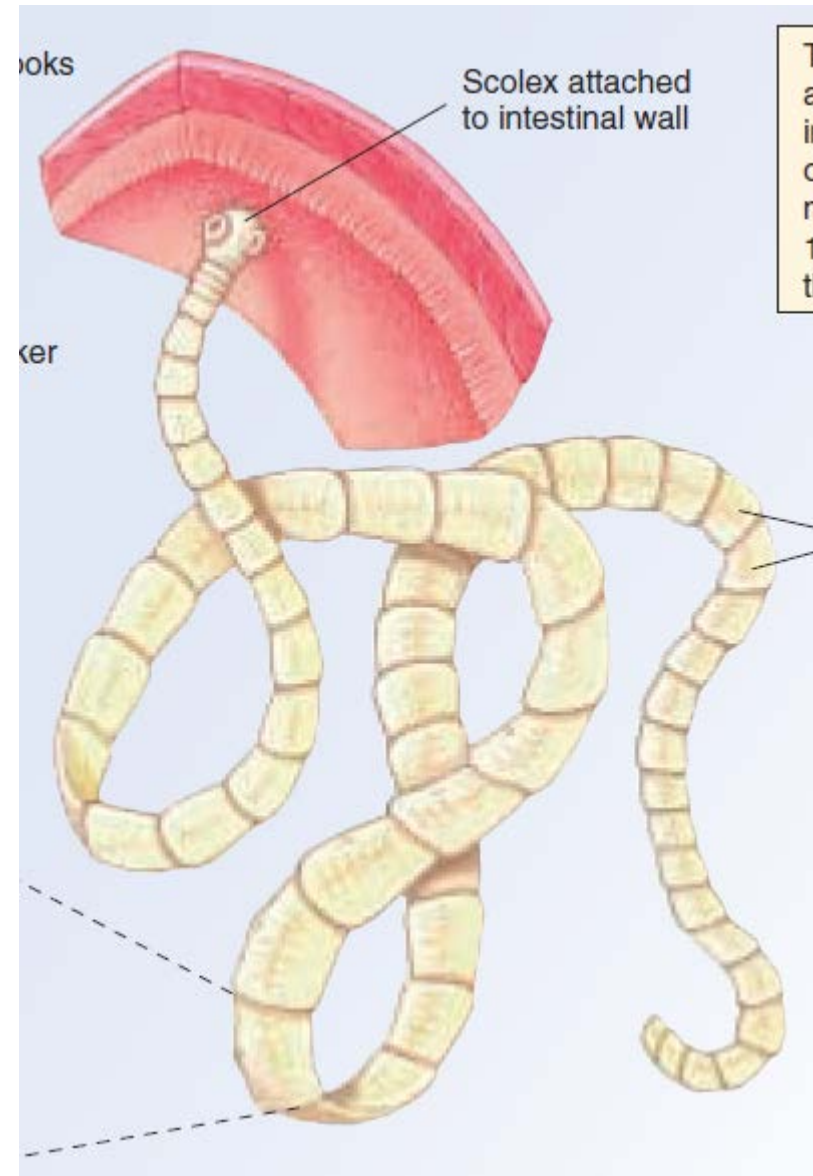
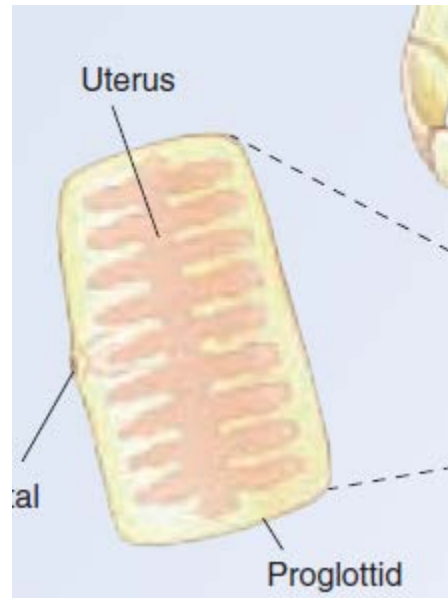
# GROUPS OF FLATWORMS



- **3. Class Cestoda** =tapeworms  
Long, flat, parasitic  
Live in intestines colex = a structure that contains suckers and/or hooks  
**Proglottids** = body segments of the tapeworm
- Each mature proglottid is a hermaphrodite  
Testes produce sperm, fertilize the eggs to produce a zygote  
Zygotes are passed out through the **feces**.
- A dormant, protective cyst is formed in the intermediate cyst.
- This is why you should never eat incompletely cooked meat.

# PHYLUM PLATYHELMINTHES:

## Bilateral symmetry



# Phylum Nemertea: The Ribbon Worms

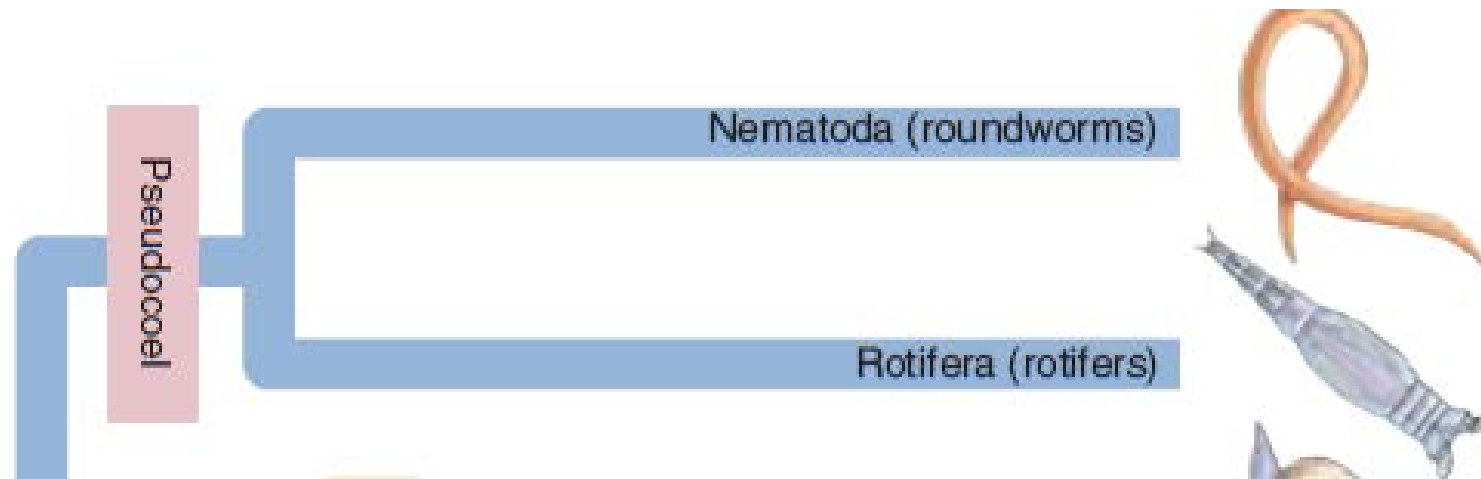
- Often called **ribbon worms** or proboscis worms.
- The worms have the body plan of a flat-worm, but also possess a fluid-filled sac that may be a primitive coelom.
- Ribbon worms are large, often 10 to 20 centimeters and sometimes many meters in length. They are the simplest animals that possess a **complete digestive system**, one that has two separate openings, a mouth and an anus.





# The Pseudocoelomates

- All bilaterians except solid worms possess an internal body cavity
- Pseudocoelomates lack a defined circulatory system; this role is performed by the fluids that move within the pseudocoel.



# Nematoda

- - A group of many kinds of round small worms, found everywhere on earth, many different species.
- 1. พยาธิตัวกลมในลำไส้ เช่น พยาธิเส้นด้าย, พยาธิปากขอ, พยาธิไส้เดือนตัวกลม
- 2. พยาธิตัวกลมในเนื้อเยื่อ เช่น พยาธิโรคเท้าช้าง, พยาธิตัวจิ๊ด
- 3. พยาธิตัวกลมที่เป็นอิสระ เช่น หนอนน้ำส้มสายชู, หนอนในน้ำเน่า, ไส้เดือนฝอย

# Nematoda

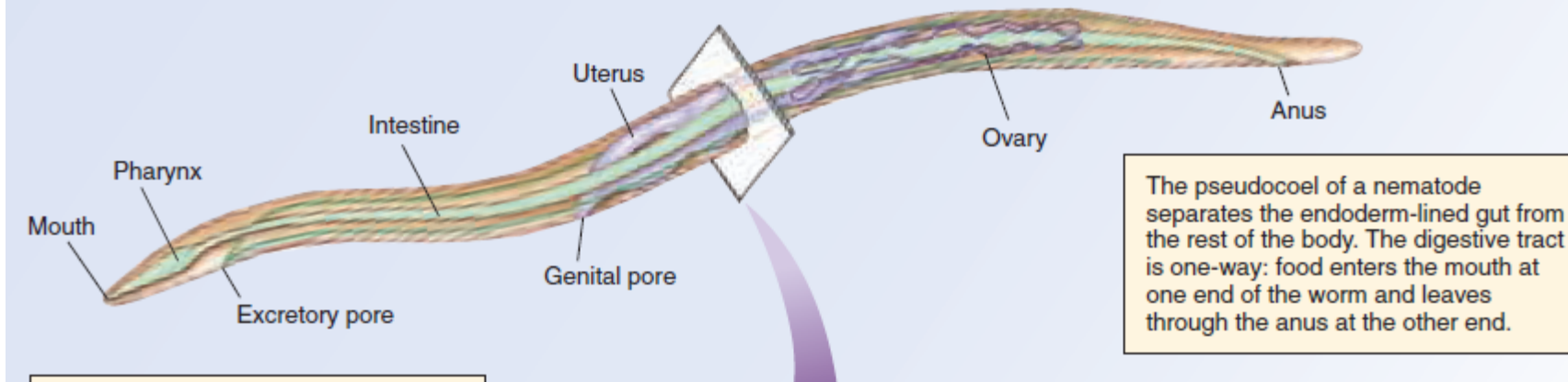
- 1. มีสมมาตรแบบผ่าซีก (**Bilateral symmetry**)
- 2. มีช่องว่างในลำตัวแบบเทียม (**Pseudocoelomate animal**) โดยมีช่องว่างอยู่ระหว่างเนื้อเยื่อชั้นกลางและเนื้อเยื่อชั้นใน
- 3. ลำตัวกลม ยาว แหลมหัวแหลมท้าย ไม่มีข้อปล้อง ผิวลำตัวเรียบ มีสารคิวทิเคิลหนาหุ้มตัว
- 4. ไม่มีระบบหมุนเวียนเลือด แต่ใช้ช่องเหลวในช่องว่างเทียมช่วยในการลำเลียงสาร
- 5. ไม่มีอวัยวะหายใจโดยเฉพาะ พวกที่ดำรงชีพแบบปราศหายใจแบบไม่ใช้ออกซิเจน แต่พวกที่อยู่อย่างอิสระใช้ผิวหนังเป็นส่วนแลกเปลี่ยนก๊าซกับสิ่งแวดล้อม

# Nematoda

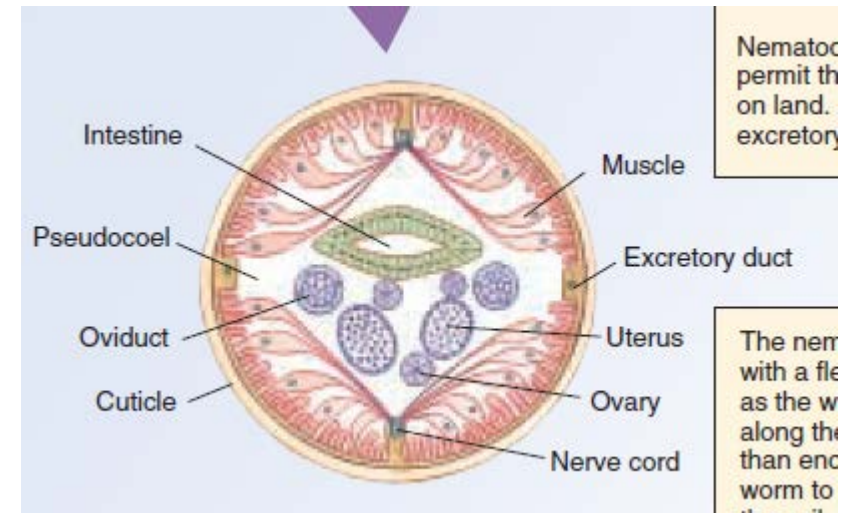
- 6. ระบบขับถ่ายประกอบด้วยเส้นข้างลำตัว (**Lateral line**) ซึ่งภายในบรรจุท่อขับถ่าย (**Excretory canal**) ไว้
- 7. ทางเดินอาหารสมบูรณ์ประกอบด้วยปากและทวารหนัก
- 8. ระบบประสาท ประกอบด้วยปมประสาทรูปวงแหวน (**Nerve ring**) อยู่รอบคอหอยและมีแขนงประสาทแยกออกทางด้านท้องและทางด้านหลัง
- 9. มีระบบกล้ามเนื้อยาวตลอดลำตัว (**Longitudinal muscle**)
- 10.** เป็นสัตว์แยกเพศตัวเมียมักมีขนาดใหญ่กว่าตัวผู้เนื่องจากตัวเมียต้องทำหน้าที่ในการออกไข่



## PHYLUM NEMATODA: Body cavity

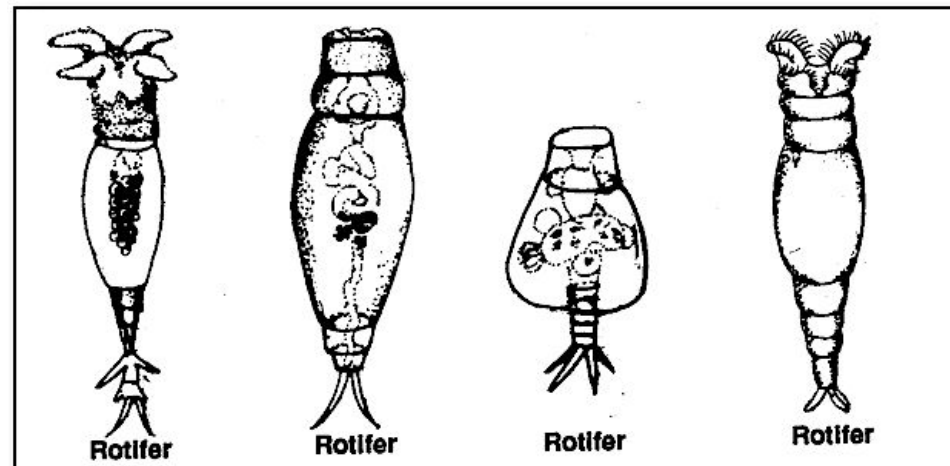


Roundworms are bilaterally symmetrical, cylindrical, unsegmented worms. Most nematodes are very small, less than a millimeter long—hundreds of thousands may live in a handful of fertile soil.



# Phylum Rotifera: Rotifers

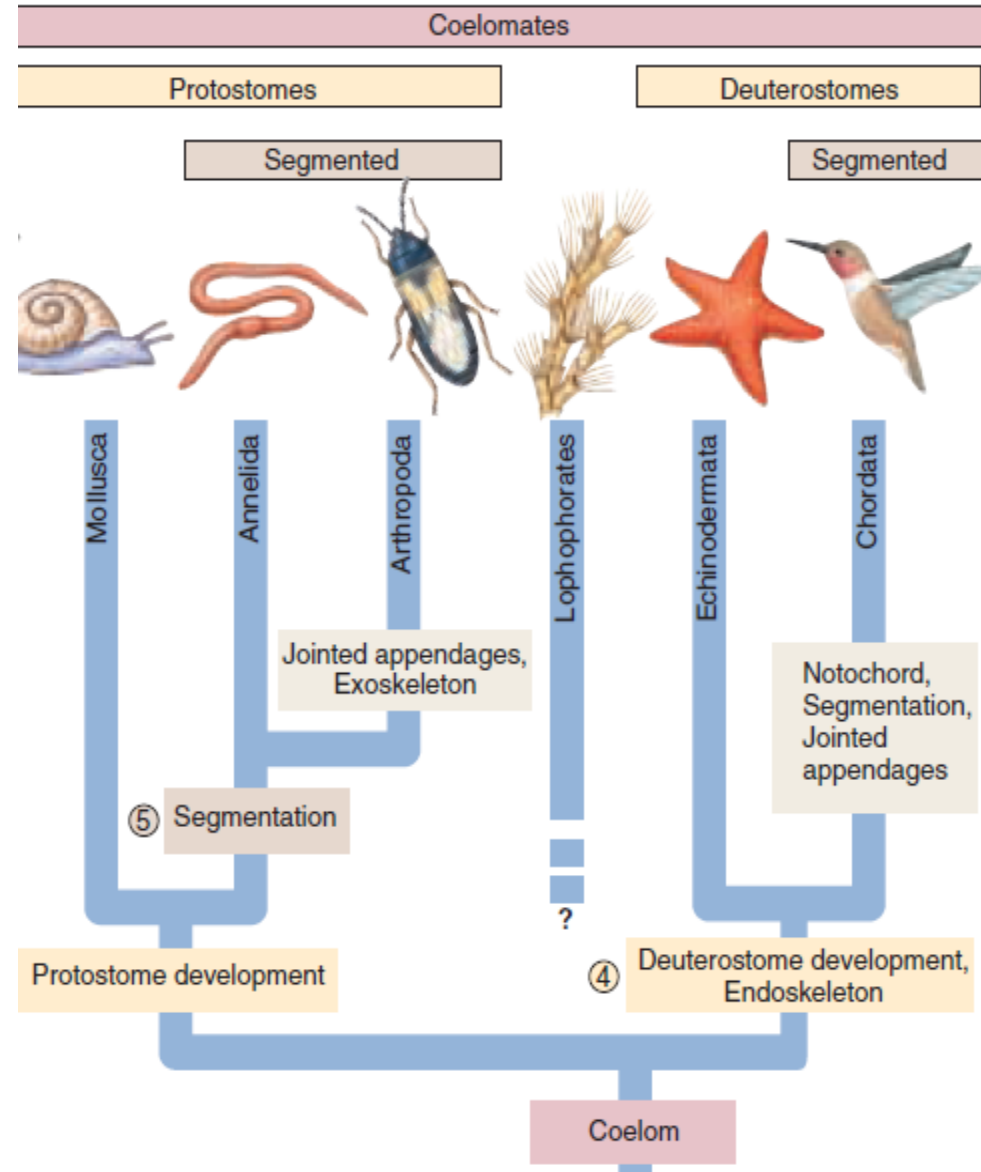
- bilaterally sym-metrical, basically aquatic animals that have a crown of cilia at their heads.
- Rotifers are often called “wheel animals” because the cilia, when they are beating together, resemble the movement of spokes radiating from a wheel.





# Coelomates

- new body design that repositions the fluid and allows the development of complex tissues and organs.



# Mollusca

- **Creatures with a shell, both land and sea, includes slugs and snails as well as cephalopods (Octopi, Squid, Cuttlefish).**

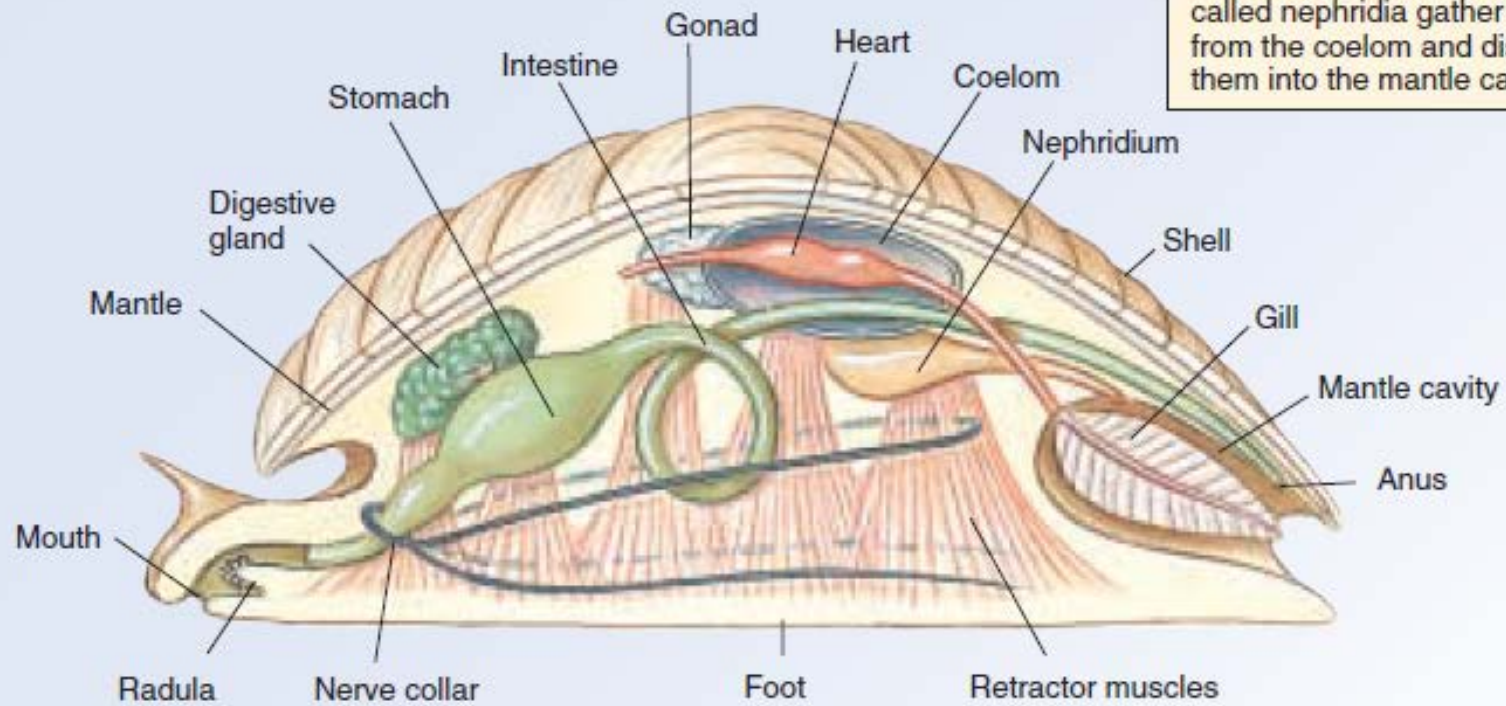
**Mollusks (phylum Mollusca) are an extremely diverse animal phylum, second only to the arthropods, with over 110,000 described species.**



**Chitons and nudibranchs are less familiar marine mollusks. Mollusks are characterized by a coelom**

the body. In some mollusks, the mantle secretes a hard shell.

Mollusks were among the first animals to develop an efficient excretory system. Tubular structures called nephridia gather wastes from the coelom and discharge them into the mantle cavity.



# Mollusca

- **Characteristics of Mollusca:-**

- 1) Bilaterally symmetrical.
- 2) Body has more than two cell layers, tissues and organs.
- 3) Body without cavity.
- 4) Body possesses a through gut with mouth and anus.
- 5) Body monomeric and highly variable in form, may possess a dorsal or lateral shells of protein and calcareous spicules.
- 6) Has a nervous system with a circum-oesophageal ring, ganglia and paired nerve chords.
- 7) Has an open circulatory system with a heart and an aorta.

# Mollusca

- **8)Has gaseous exchange organs called ctenidial gills.**
- 9)Has a pair of kidneys.**
- 10)Reproduction normally sexual and gonochoristic.**
- 11)Feed a wide range of material.**
- 12)Live in most environments.**

# The Classes of Phylum Mollusca

**Amphineura**

**Neopilina galathea**

**Monoplacophora**

**Chitons**

**Gastropoda**

**Cowries, Limpets, Slugs  
and Snails**

**Scaphopoda**

**Tusk Shells**

**Bivalvia**

**Bivalves = Muscles, Clams  
etc.**

**Cephalopoda**

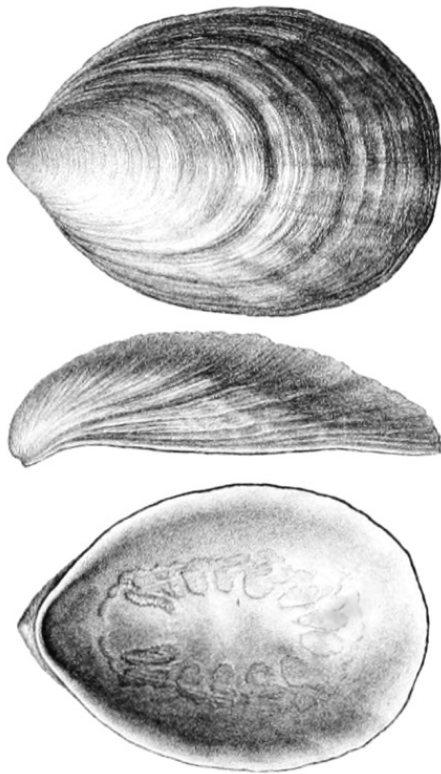
**Nautilus, Octopus and  
Squid**



**Chitons**



**Tusk shell**



**Monoplacophora**





# Gastropods



**Bivalve**



# Cephalopods

# Annelida

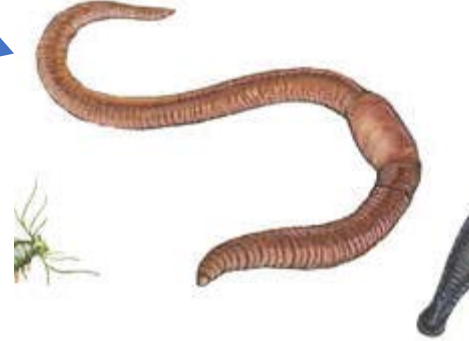
- **Everybody's favorite, worms. . .**
- From the Latin *Annellus* a little ring.
- - Segmented worms, includes the type of worms you'd find in your back garden and use for fishing.

# Characteristics of Annelida:-

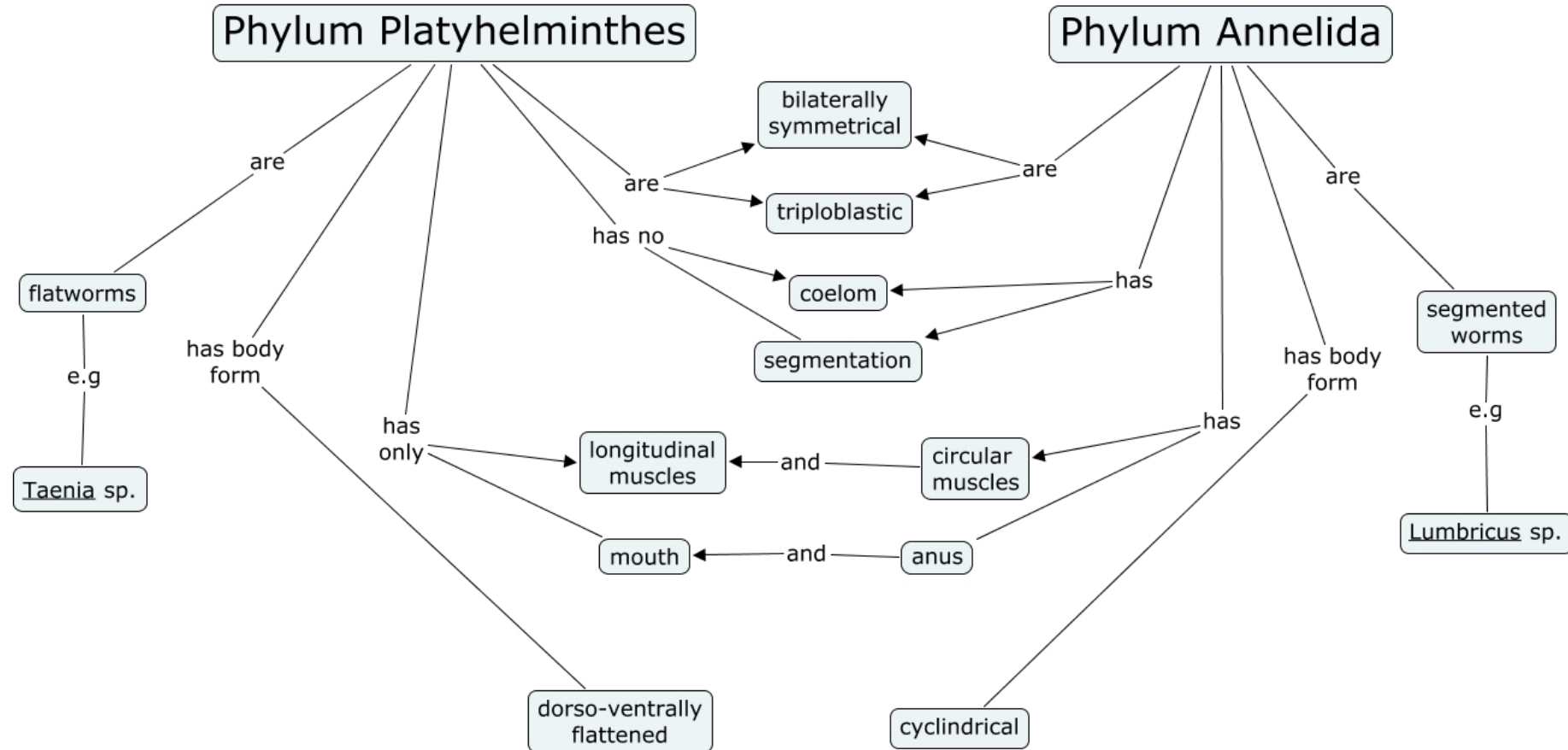
- - 1) Bilaterally symmetrical and vermiform.
  - 2) Body has more than two cell layers, tissues and organs.
  - 3) Body cavity is a true coelom, often divided by internal septa.
  - 4) Body possesses a through gut with mouth and anus.
  - 5) Body possesses 3 separate sections, a prosomium, a trunk and a pygidium.
  - 6) Has a nervous system with an anterior nerve ring, ganglia and a ventral nerve chord.
  - 7) Has a true closed circulatory system.
  - 8) Has no true respiratory organs.
  - 9) Reproduction normally sexual and gonochoristic or hermaphroditic.
  - 10) Feed a wide range of material.
  - 11) Live in most environments.



- class Polychaeta
- lass Aelosomata
- Subclass Oligochaeta
- subclass Branchiobdella
- subclass Hirundinea



# Compare between the phylum Platyhelminthes and phylum Annelida

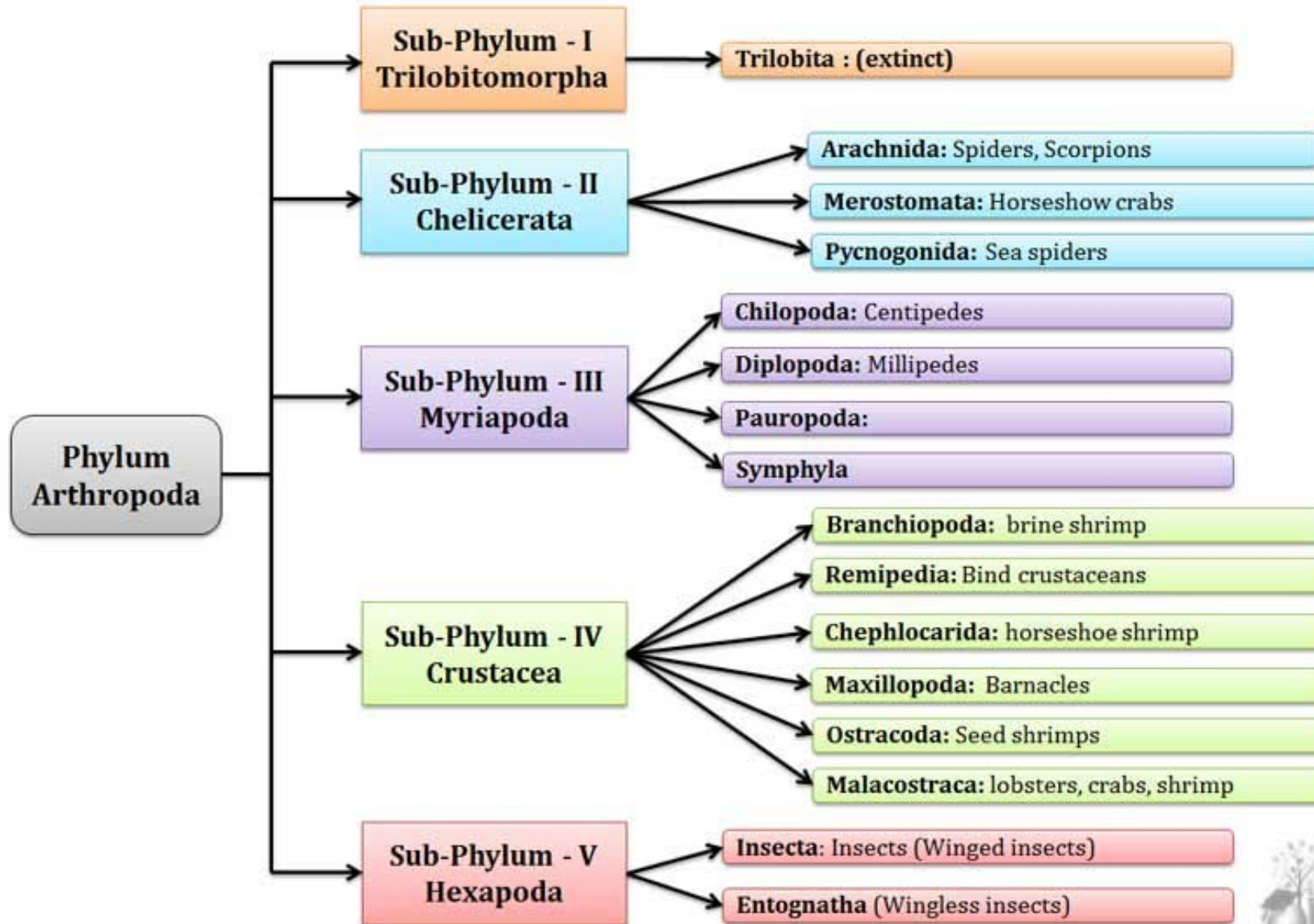




# Arthropoda

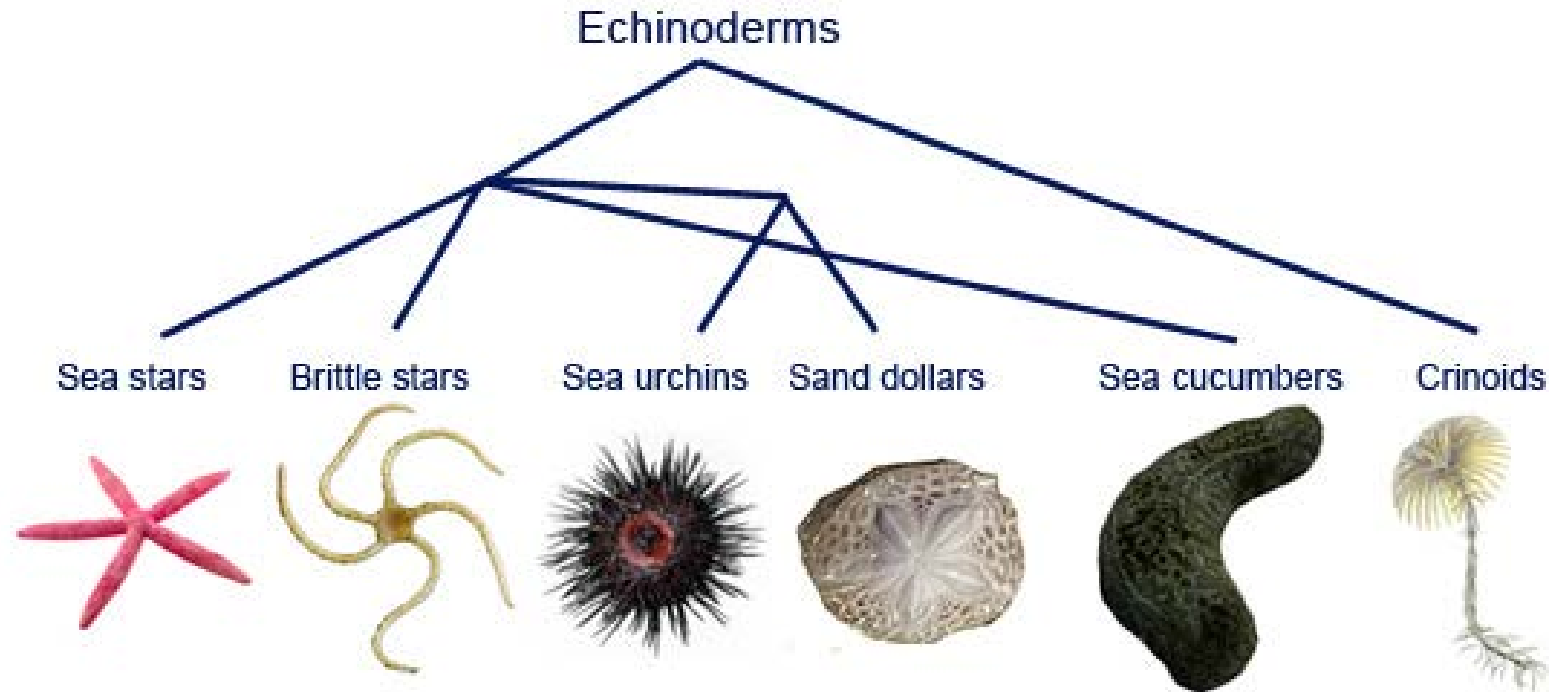
- Arthropoda - Animals with exoskeletons (hard chitinous shells that basically puts their bones on the outside), crustaceans like Shrimp, Crawfish, Lobsters, Crabs

# Classification of Phylum Arthropoda (Mind Map)

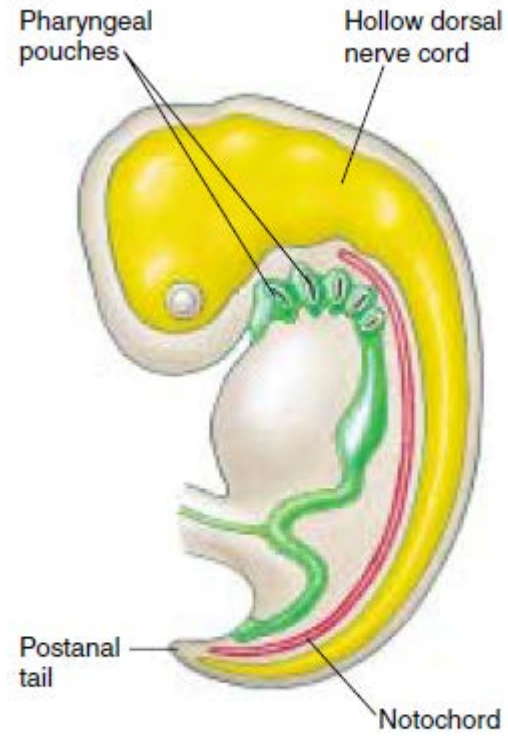


# Echinoderms

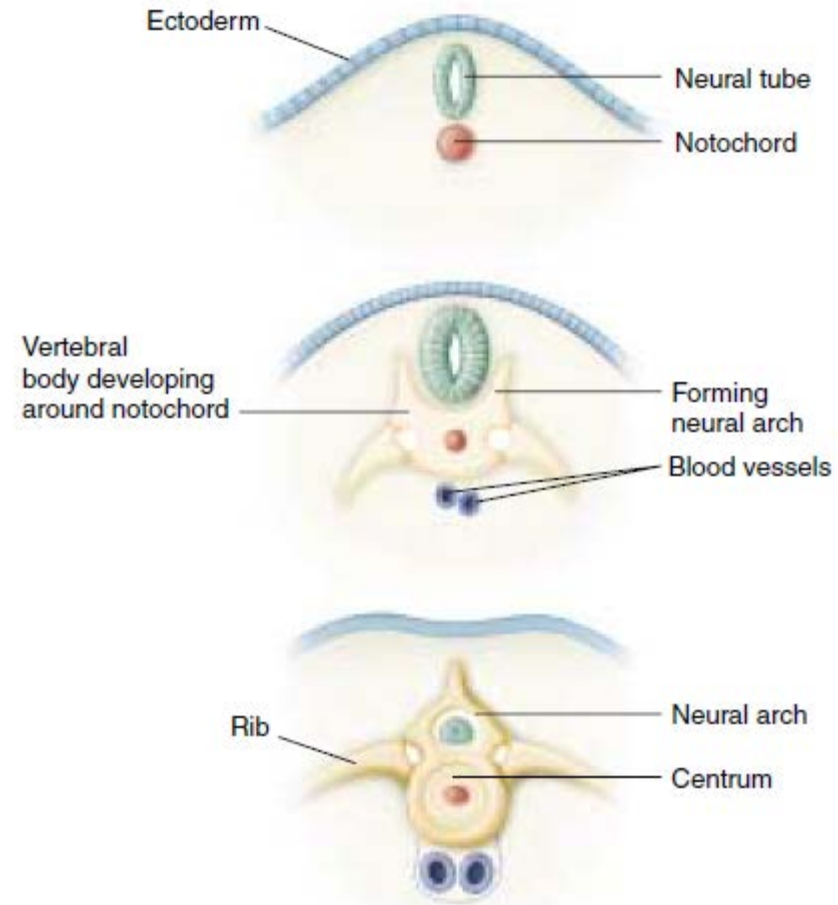
- Literally means spiny skin, this includes Urchins, starfish and similar. Urchins and starfish are closely related.

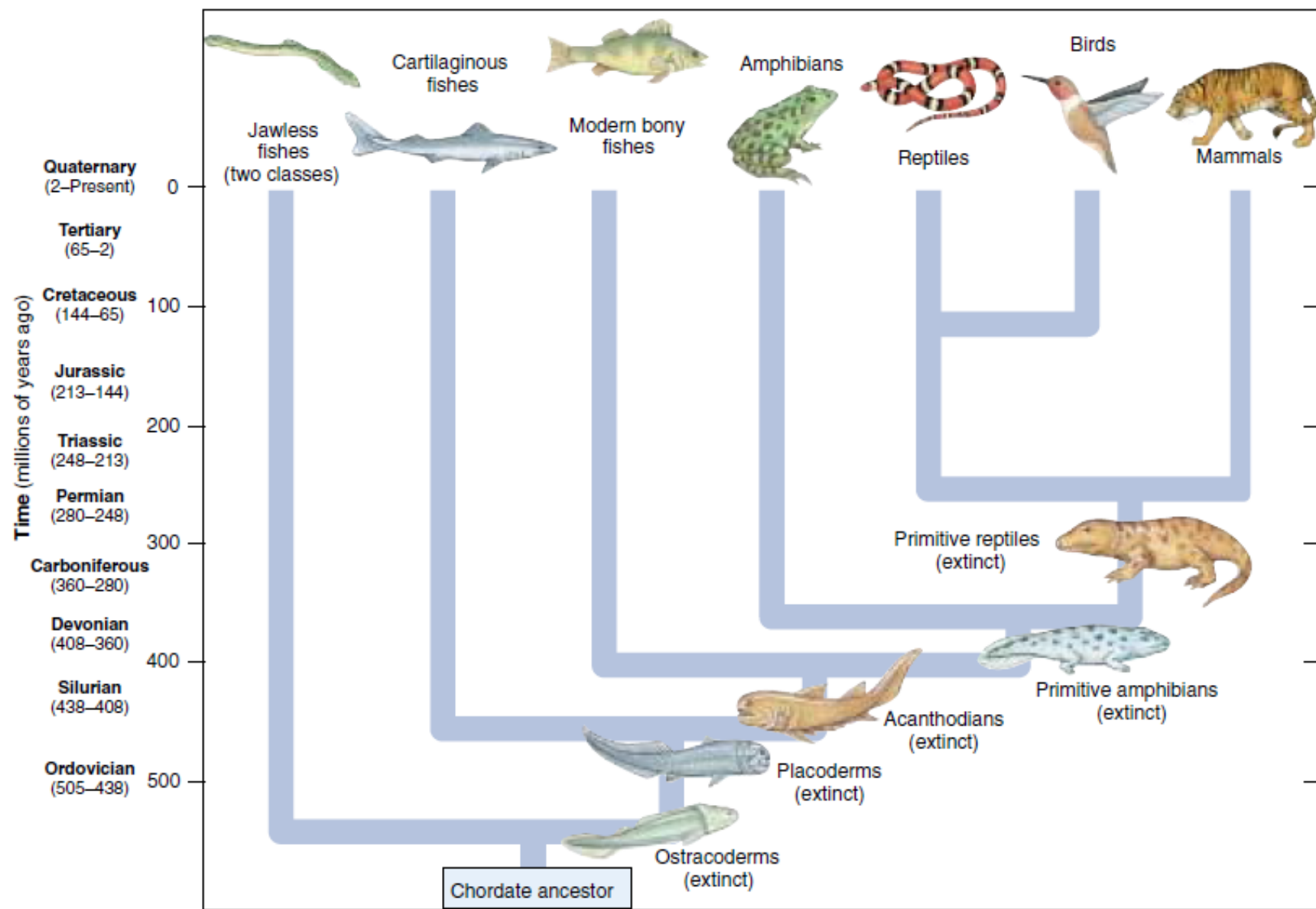


# Vertebrate



**FIGURE 48.2**  
Some of the principal features of the chordates, as shown in a generalized embryo.





# Chordata

- Chordata - Animals with spinal chords, like you and me. All the other animals we've discussed so far are fairly simple in structure, but Chordates have a central spinal column to transmit complex nerve impulses.
- Chordates form a [phylum](#) of creatures that are based on a bilateral [body plan](#),<sup>[4]</sup> and is defined by having at some stage in their lives all of the following

# Chordata

- A notochord, a fairly stiff rod of cartilage that extends along the inside of the body. Among the vertebrate sub-group of chordates the notochord develops into the spine, and in wholly aquatic species this helps the animal to swim by flexing its tail.
- A dorsal neural tube. In fish and other vertebrates, this develops into the spinal cord, the main communications trunk of the nervous system.

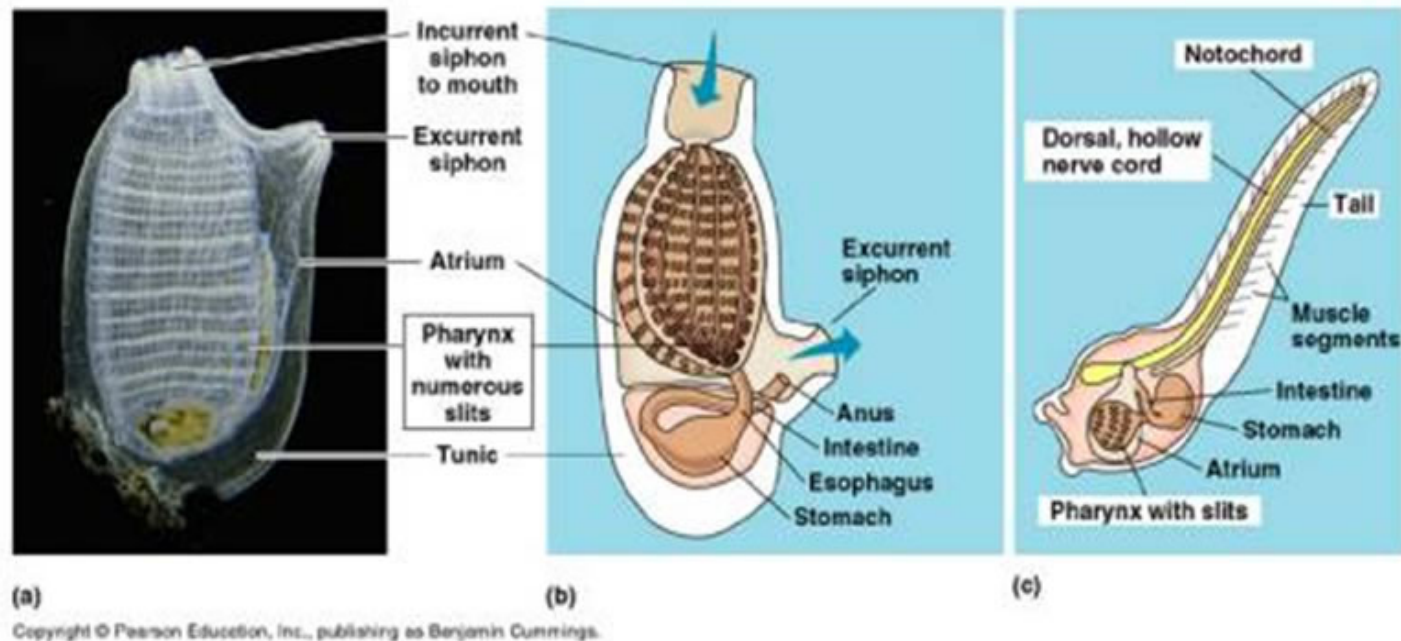


# Chordata

- Pharyngeal slits. The pharynx is the part of the throat immediately behind the mouth. In fish, the slits are modified to form gills, but in some other chordates they are part of a filter-feeding system that extracts particles of food from the water in which the animals live
- Post-anal tail. A muscular tail that extends backwards behind the anus.

# Chordata

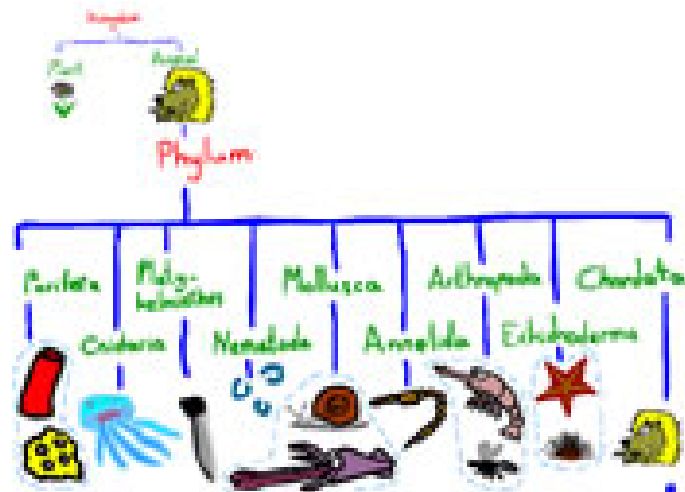
- 1. พวกที่ไม่มีกระดูกสันหลัง เรียกว่า **Protochordata**
  - **Sub-Phylum Urochordata** มีลักษณะคือ ตัวอ่อนมี **Notochord** เป็นแกนของร่างกายอยู่บริเวณหาง และมีช่องเหงือกเมื่อเจริญเติบโตเต็มวัย ส่วนหางจะหลุดไป จึงไม่มี **Notochord** เหลืออยู่ ลักษณะที่สำคัญคือมีปลอกหุ้มอยู่รอบตัวเป็นสารจำพวกเซลล์โลส ได้แก่ เพรียงลอย เพรียงหัวหอม เพรียงลา



# Chordata

- **-Sub-Phylum Cephalochordata** สัตว์จำพวกนี้มี **Notochord** ยาวตลอดลำตัว และยาวเลยไปถึงหัวด้วย และจะมีอยู่ตลอดชีวิต ได้แก่ แอมฟิออกซัส (**Amphioxus**)

2. พวกที่มีกระดูกสันหลัง ได้แก่ **Sub-Phylum Vertebrata** มีลักษณะสำคัญดังนี้ เป็นสัตว์ชั้นสูงมีจำนวนมาก มี **Notochord** ในระยะเอมบริโอ ต่อมากระดูกสันหลังมาแทนที่ (ยกเว้นปลาปากกลม) มีรยางค์ 2 คู่ (ยกเว้นปลาปากกลม) มีเม็ดเลือดแดง มีช่องเหงือกบริเวณคอหอย ในระยะตัวอ่อนแต่เมื่อเจริญเติบโตขึ้นช่องเหงือกจะปิด และมีปอดขึ้นมาแทน



## Chordata

Animals with spinal chords

## Class



# Chordata

- Mammals - the same as us, they are warm blooded, give birth to live young and provide milk to their young.
- Birds - Also warm blooded, have feathers and lay eggs.
- Reptiles - Cold blooded, with scales, lay eggs.
- Amphibians - Cold blooded, lay jelly like eggs, can live on land or water breathing through their skin and with lungs
- Fish - Cold blooded, lay eggs, breathe water

# Fish

- **Agnatha - Hagfishes , ugly things that I don't like but they have their important place in nature. They are slimy fish with no real jaw, just a circular row of teeth, they often eat dead animals, but are also parasites (creatures that live off other creatures without any benefit to the host and often harm the host), they use their circular mouth full of teeth to cut a circular shaped wound on the skin of a fish or a whale, they then eat a chunk of the flesh or suck blood.**
- **- Like sharks these fish don't have bones.**





**a Hagfish**



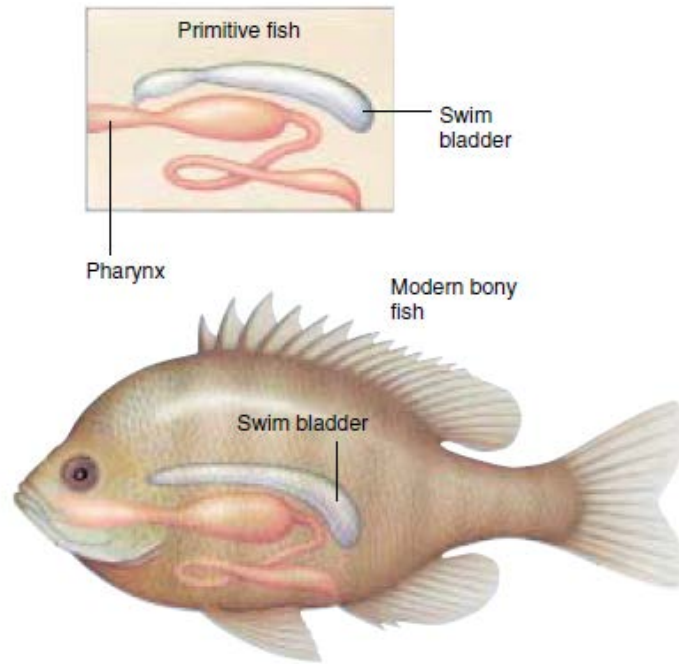
**b Lamprey**

© 2001 Brooks/Cole - Thomson Learning



# Osteithyes

- - Bony Fish, the biggest group of fish, both freshwater and saltwater. Have scales, bones, bony gill covers and swim bladders



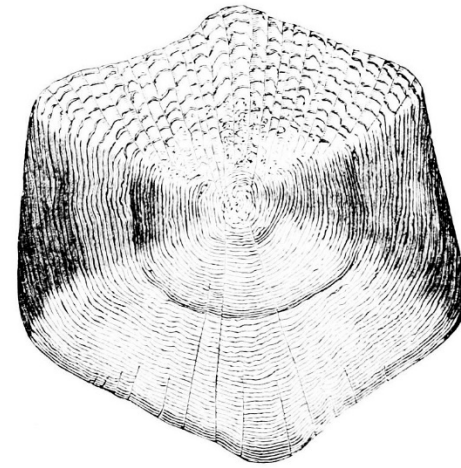
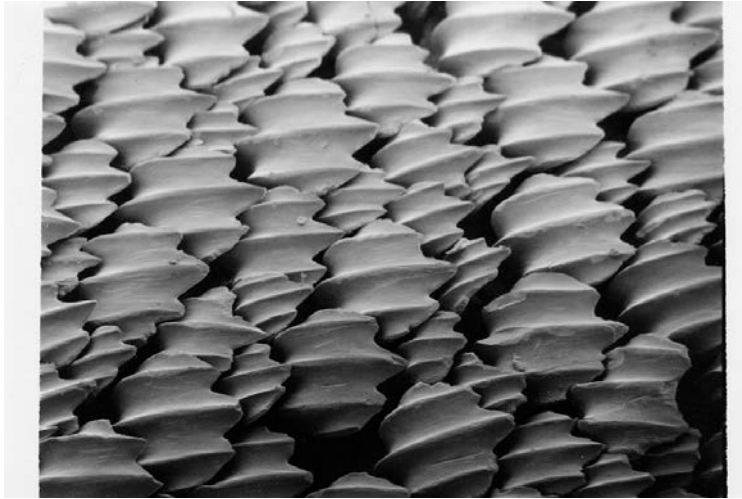
**FIGURE 48.16**  
Diagram of a swim bladder. The bony fishes use this structure, which evolved as a ventral outpocketing of the pharynx, to control their buoyancy in water.

# Bony fish

- Bony fish are characterized by a relatively stable pattern of [cranial bones](#), rooted, medial insertion of [mandibular](#) muscle in the lower jaw. The head and [pectoral girdles](#) are covered with large dermal bones. The eyeball is supported by a [sclerotic ring](#) of four small bones, but this characteristic has been lost or modified in many modern species. The labyrinth in the [inner ear](#) contains large [otoliths](#). The braincase, or neurocranium, is frequently divided into [anterior](#) and [posterior](#) sections divided by a [fissure](#).

# Bony fish

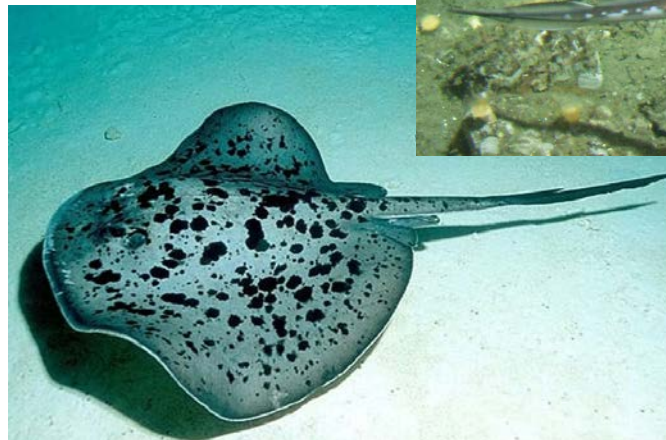
- In many bony fish these have evolved into [swim bladders](#), which help the body create a neutral balance between sinking and floating
- They also have an [operculum](#), which helps them breathe without having to swim.
- Bony fish have no [placoid scales](#). Mucus glands coat the body. Most have smooth and overlapping [ganoid](#), [cycloid](#) or [ctenoid](#) scales.





# Chondrichthyes

- **Cartilaginous fish, including Sharks, Rays and Chimaera, these fish don't have bones, instead they have cartilage - what's that ? - Touch you nose and your ears, feel that ? - That's cartilage. Its not solid like bone, but is very flexible and light.**







Chordata  
Animals with spinal chords

Class

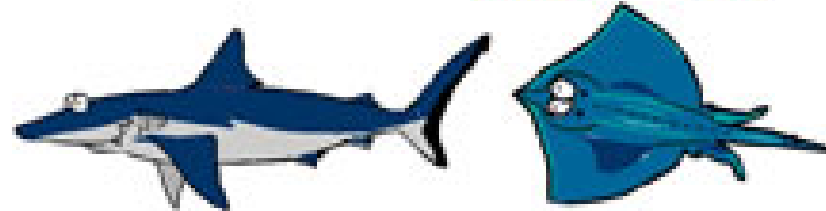


Sub Class

Bradyodonti  
(Chimaerae)



Elasmobranchii  
(Sharks + Rays)

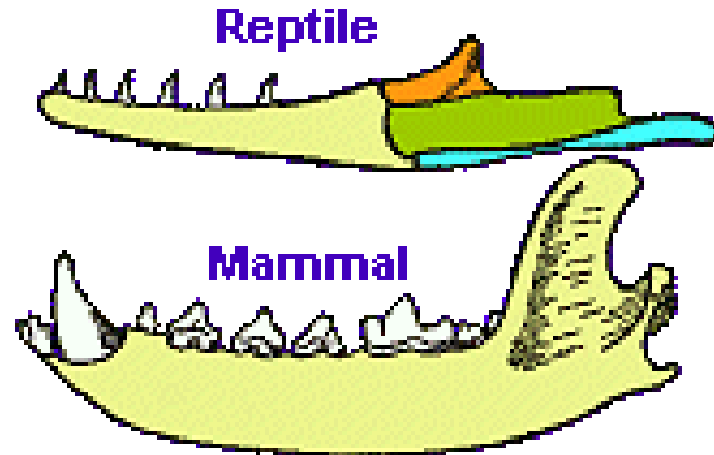


# Mammal

- **can produce milk to feed its young. This milk is produced by modified sweat glands called 'mammary' glands. It is from these glands that the whole group takes its name, 'Mammals.'**
- **possession of hair, something humans often have problems with but which they should respect more. No other animal has hair in the same form as mammals, and all mammals have some hair at least at the beginning of their lives - baby whales and dolphins are born with a moustache.**

# Mammal

- The lower jaw in mammals is a single bone on either side. In all other vertebrates there are more than one bone on each side of the jaw.



Notice the shapes of the teeth!!

# Mammal

- Finally mammals have a diaphragm. A sheet of muscle and tendon that separates the body cavity into two sections
- Warm blood

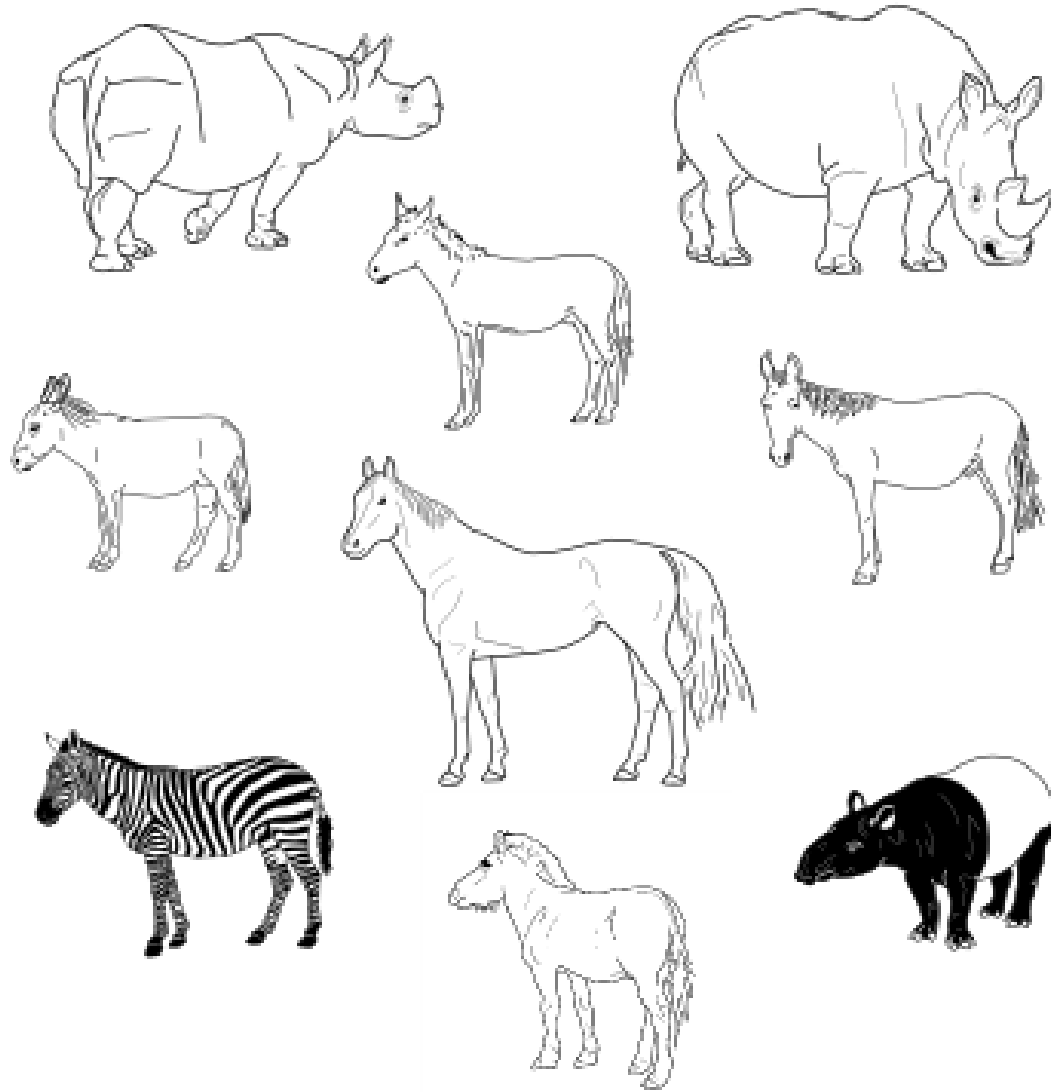
# Major Orders of Mammals:

- **Subclass Eutheria** ([Placental mammals](#))
- Order [Artiodactyla](#) (even-toed ungulates: [antelope](#), [deer](#), [camels](#), [pigs](#), [cows](#), [sheep](#), [hippos](#), etc.)
- Order [Carnivora](#) (carnivores: cats, [bears](#) [like the [panda](#), [polar bear](#), [grizzly](#), etc.], [weasels](#), [pinnipeds](#), etc.)
- Order [Cetacea](#) ([whales](#), [dolphins](#))
- Order Chiroptera ([bats](#))
- Order [Insectivora](#) (insect-eaters: [hedgehogs](#), [moles](#), [shrews](#))
- Order [Lagomorpha](#) ([rabbits](#), [hares](#), [pikas](#))
- Order Macroscelidea (elephant shrews)

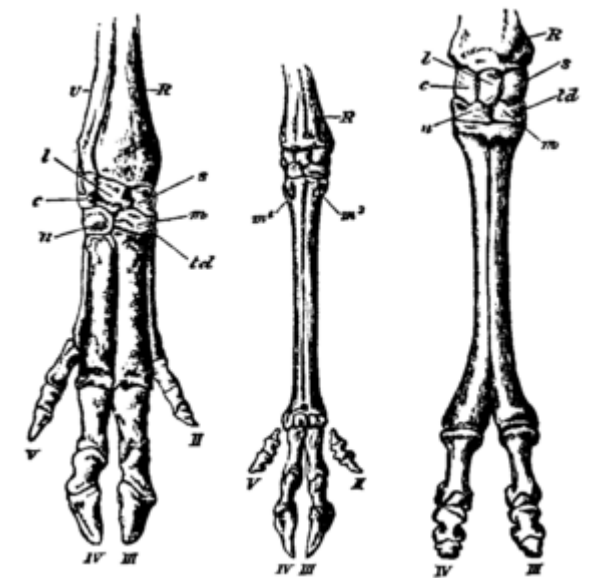
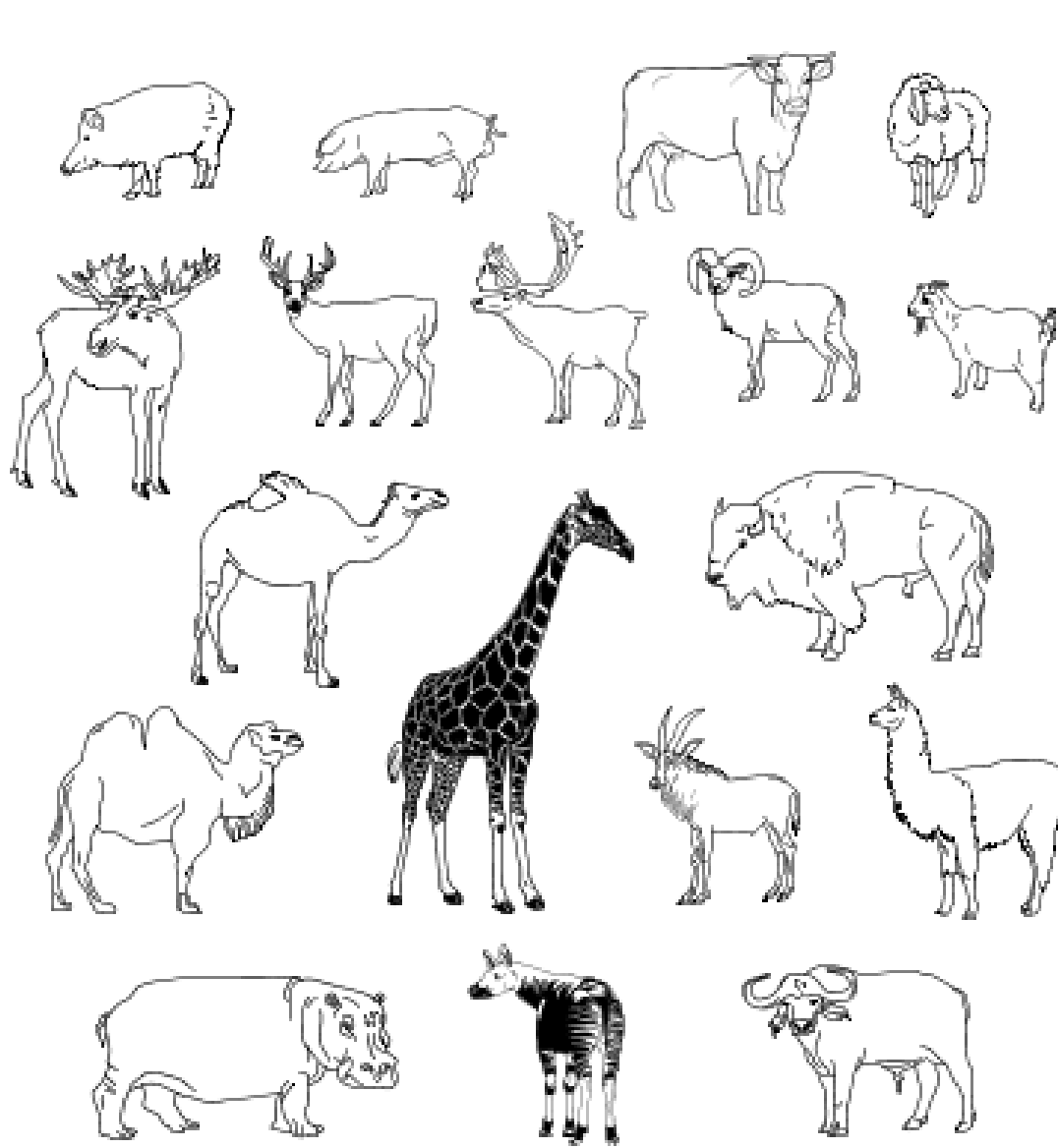
# Major Orders of Mammals:

- Order [Perissodactyla](#) (odd-toed ungulates: [horses](#), [rhinos](#), [tapirs](#))
- Order Pholidota (the [pangolin](#))
- Order [Primates](#) ([apes](#), monkeys, [lemurs](#), people)
- Order [Proboscidea](#) ([elephants](#), [mammoths](#), [mastodons](#), etc.)
- Order [Rodentia](#) (rodents: [rats](#), [mice](#), [squirrels](#), [gerbils](#), [hamsters](#), etc.)
- Order Sirenia ([sea cows](#), [manatees](#))
- Order Tubulidentata ([aardvarks](#))
- Order Edentata [also called Xenarthra] ([sloths](#), [armadillos](#))
- Order Hyracoidea (hyraxes)





odd-toed ungulates



**even-toed ungulates**



pangolin



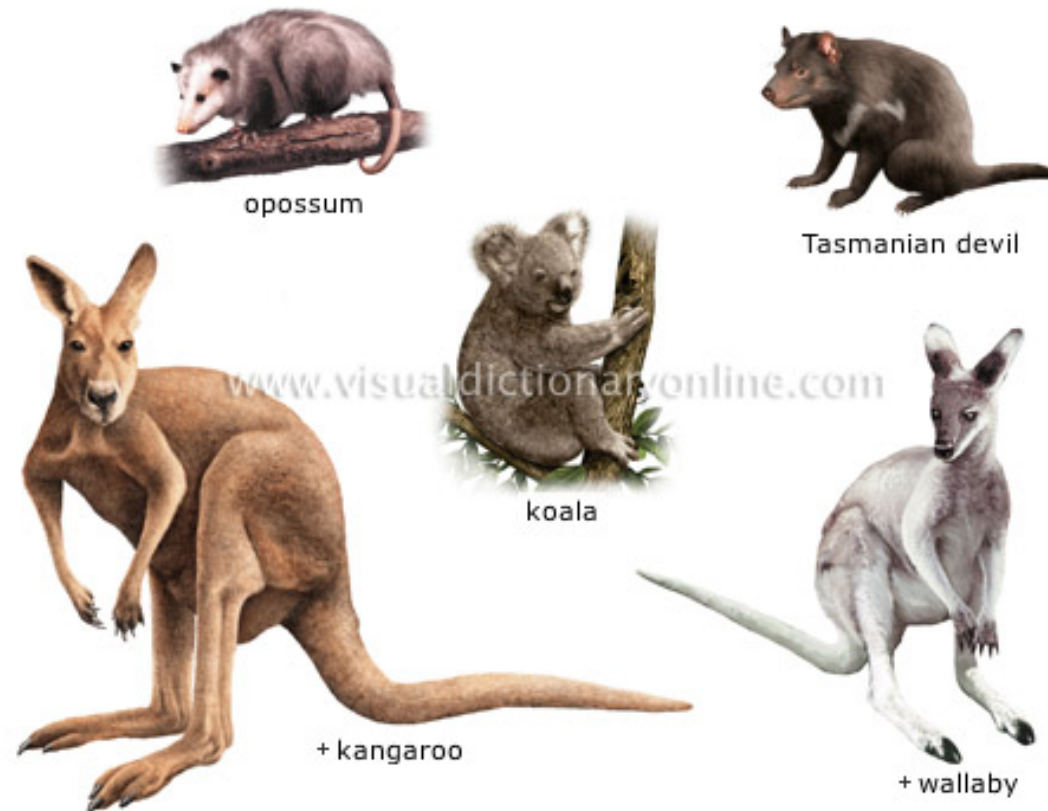
hedgehogs



manatees

## Subclass Metatheria

- about 270 species of mammals whose young are in an immature state, most females have pouches



# Subclass Metatheria

- Order Didelphimorphia - opossums
- Order Paucituberculata - shrew-like insectivores
- Order Microbiotheria - only one living species, called "monito del monte" (*Dromiciops australis*)
- Order Dasyuromorphia - numbat, extinct Tasmanian wolf
- Order Peramelemorphia - bandicoots and bilbies
- Order Notoryctemorphia - marsupial moles
- Order Diprotodontia - (10 families and 117 species) kangaroos, wallaby, wombats, koalas

# Subclass Prototheria

- Order [Monotremata](#)
- 2 families of mammals that lay eggs with leathery shells and nourish the young with milk from belly pores
- Family Ornithorhynchidae, [duck-billed platypus](#) and Family Tachyglossidae, [spiny anteaters](#))





