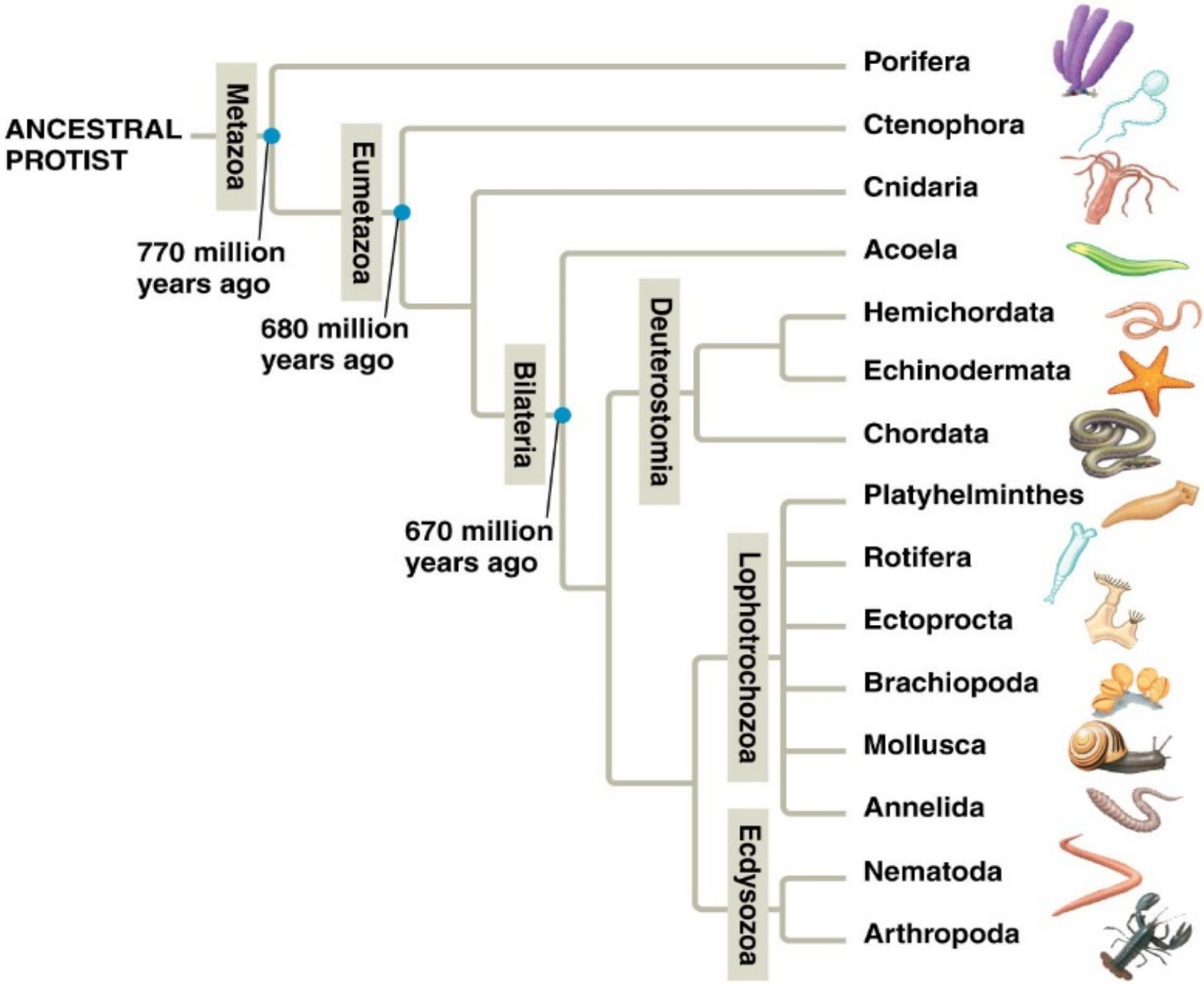
Unit 2b – Mollusca-Echinodermata

Cladogram of animals



Several Evolutionary Events:

Eumetazoa (Tissues)

Bilateria (Bilateral Organisms)

Deuterostomia (Blastopore becomes Anus).

Lophotrochozoa (Lophophorate Phyla and Trochophore Larva)

Ecydscozoa (Goes through ecdysis).

Phylum: Mollusca

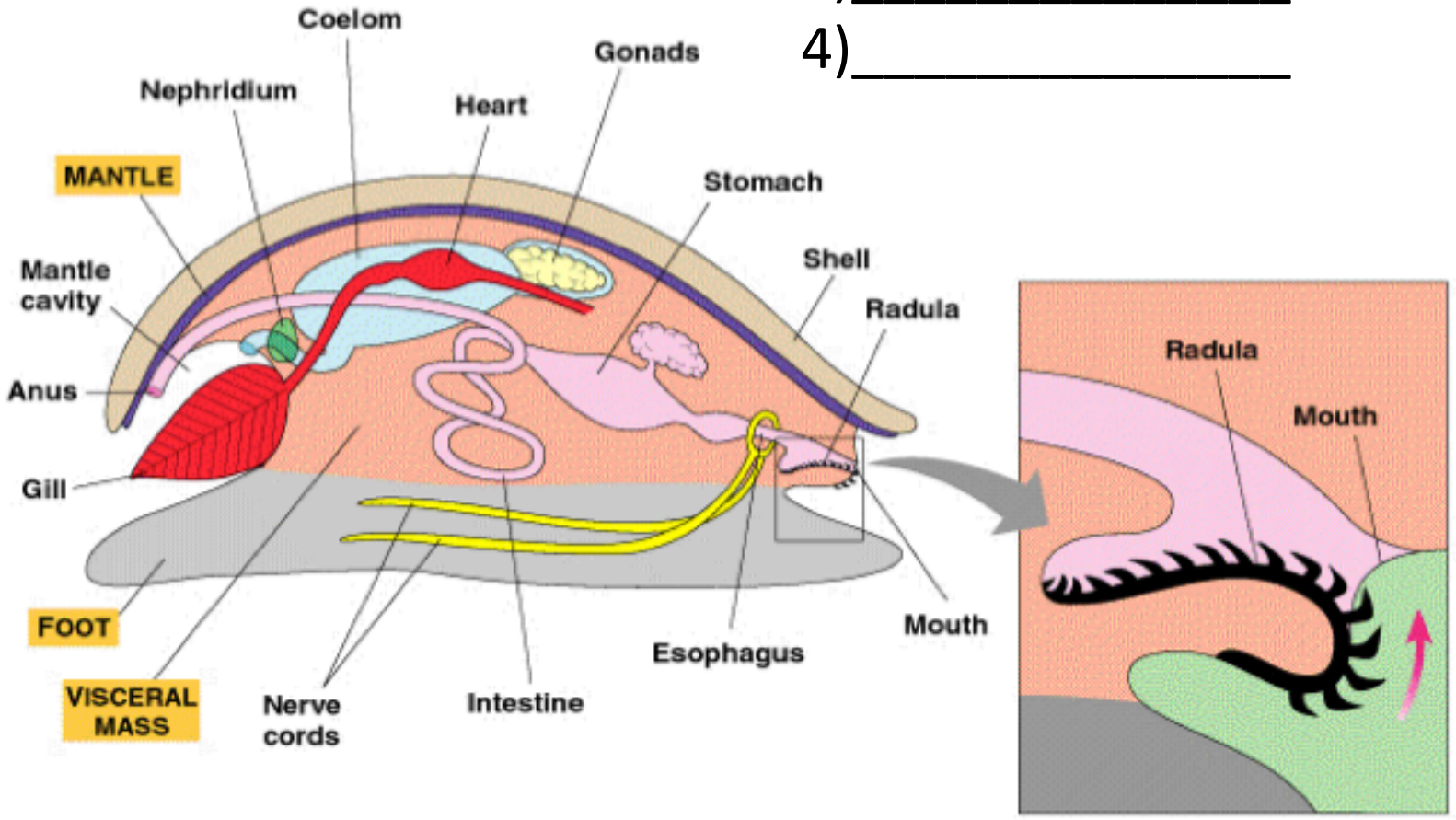
- Most are marine (some are freshwater or terrestrial)
- Most are protected by a shell (calcium carbonate)
- Most contain a radula
- Most have an OPEN circulatory system.

Basic Body Parts of the HAM: 1) Foot

2) Mantle

3) Visceral Mass

4) _____

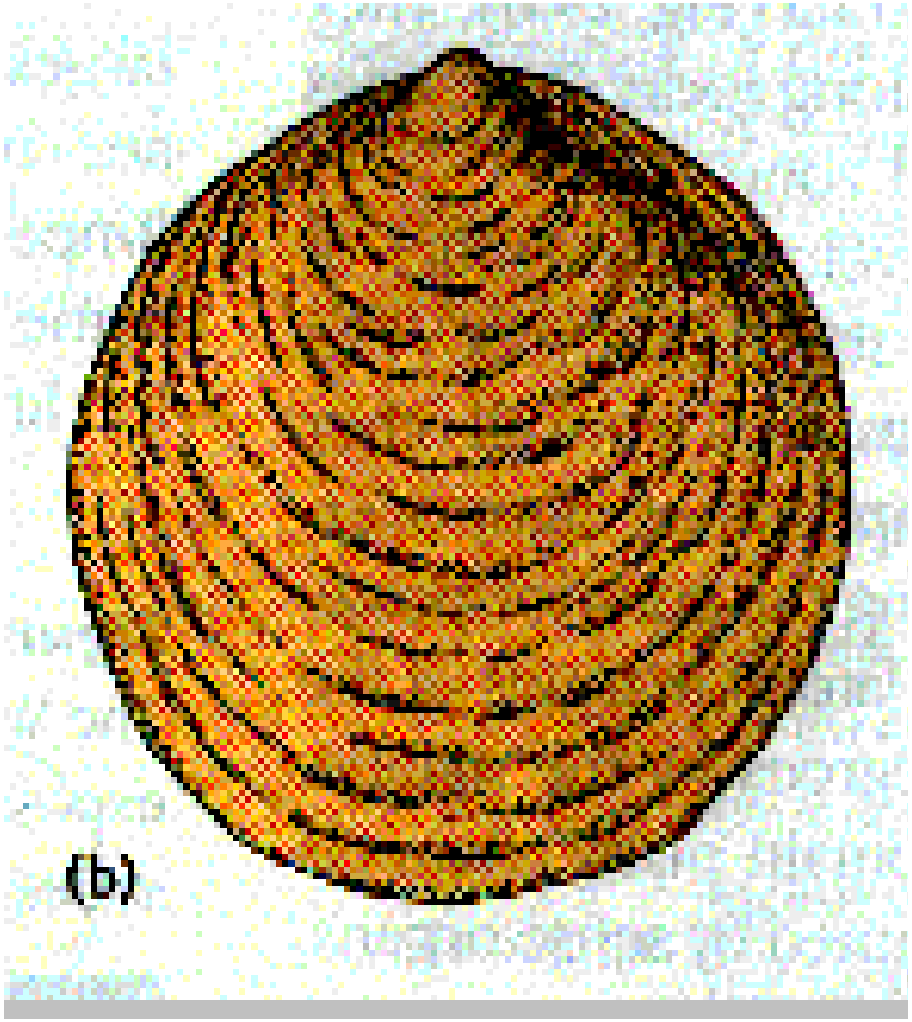


Phylum Mollusca

- Class: Monoplacophora (Neopilina)
- Class: _____ (Chitons)
- Class: Gastropoda (Snails, Slugs)
- Class: Scaphopoda _____ (Tooth or Tusk Shells)
- Class: Bivalvia (Clams, Mussels, Oysters, scallops)
- Class: Cephalopoda _____ (Squids, Octopuses)

Class: Monoplacophora

- Single shelled
- Segmented
- Deep Marine
- Reduced head
- Foot for locomotion
- Radula present



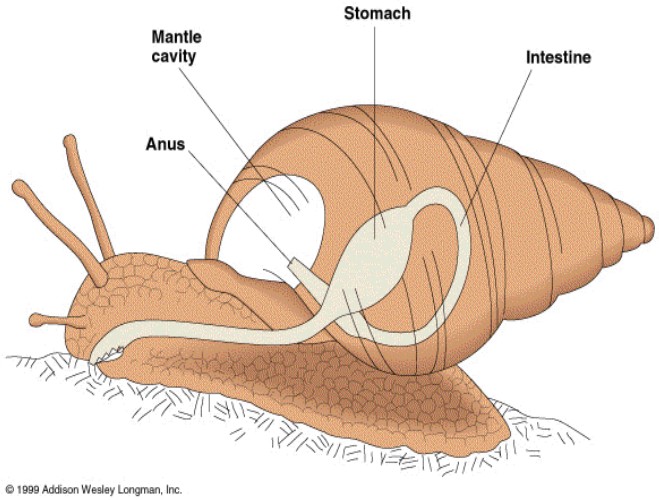
Class: Polyplacophora

- Marine
- Shell with eight overlapping plates
- Foot used for locomotion
- Head reduced
- Radula present

Class: Gastropoda

Class: Gastropoda

- Marine, Freshwater, and Terrestrial
- Asymmetrical due to _____
- Shell coiled (reduced or absent in some)
  - (dextral vs. sinistral)
- Foot for locomotion
- Radula present

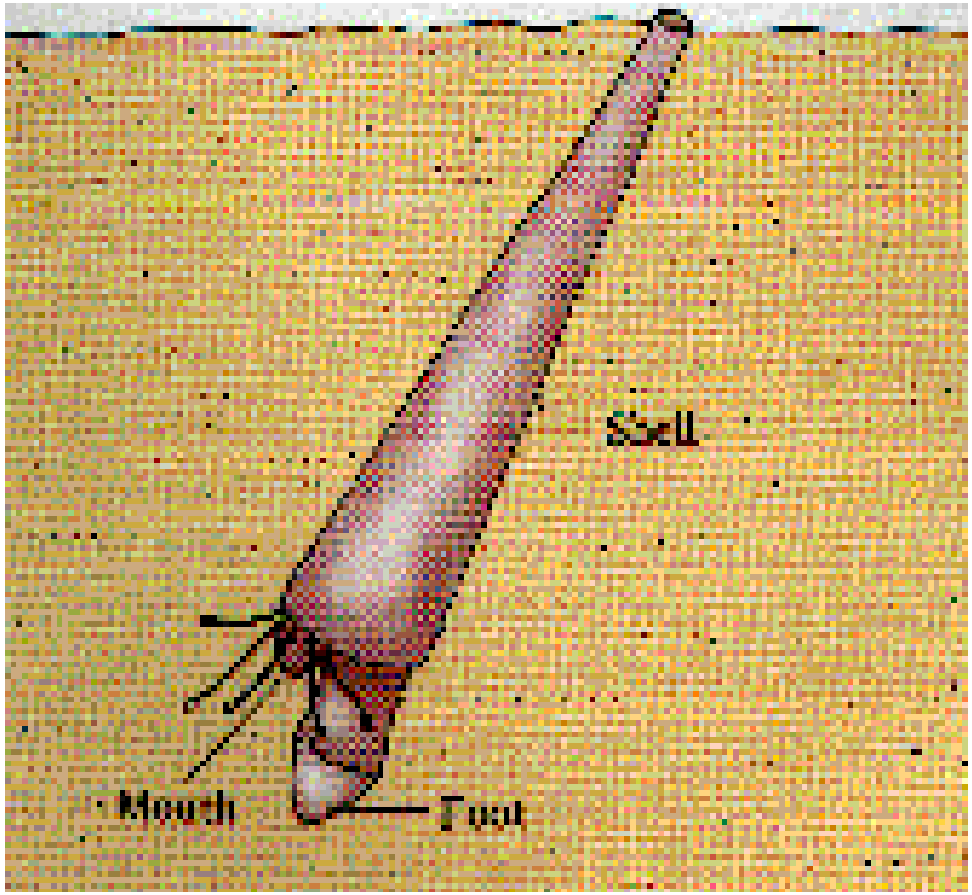


(a) A land snail

(b) A sea slug. Nudibranchs, or sea slugs, lost their shell during their evolution.

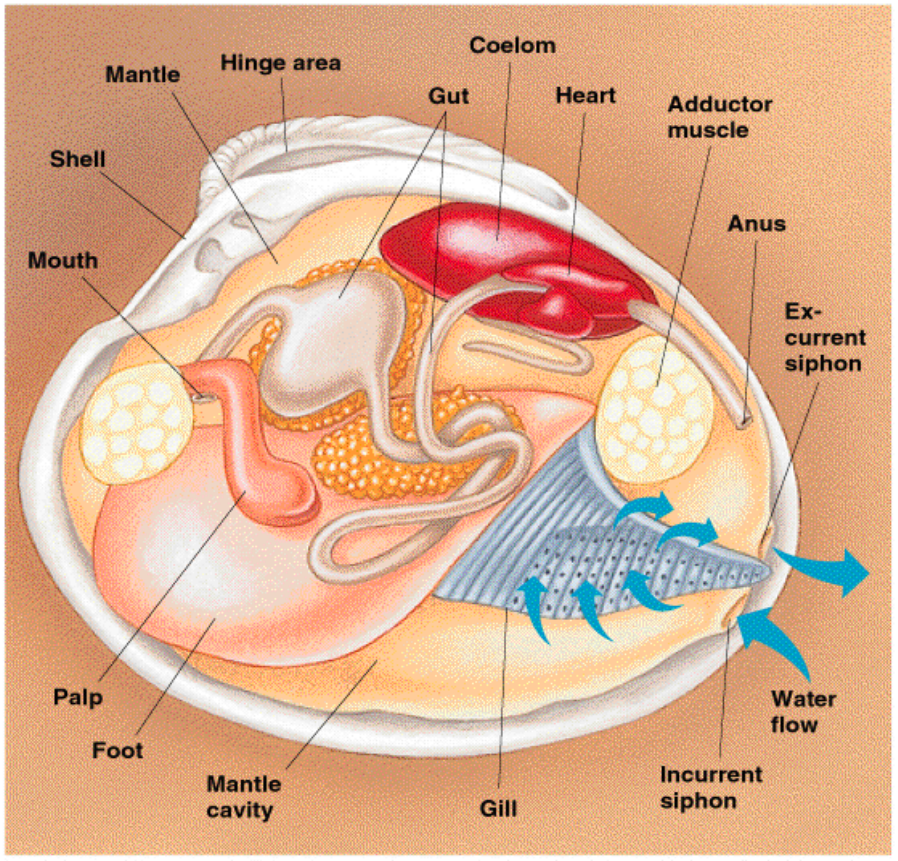
Class: Scaphopoda

- Benthic marine
- Filter feeders
- Foot used to burrow into sand
- _____ used to move food to gizzard



Class: Bivalvia

- Marine and Freshwater
- Flattened shell with two valves
- Head reduced
- Filter feeders (siphons)
- No radula



Class: Cephalopoda

- All Marine
- Head surrounded by tentacles
- Shell external, internal or absent
- Mouth with radula
- Locomotion by siphon (made from mantle)
- _____ Circulatory System

Phylum: Annelida

- Repeated Segments
- Specialized Segments
- Connections

Giant Gippsland Earthworm, Australia

Average 6 feet! (up to 15!)

Classification

- Class: _____
  - (Earthworms)
- Class: Polychaeta
  - (Marine worms)
- Class: Hirudinea
  - (Leeches)

Class: Oligochaeta

- Reduced head
- No _____
- A few setae per segment

Class: Polychaeta

- Well developed head
- Parapodia with setae
- Tube-dwelling and free-living

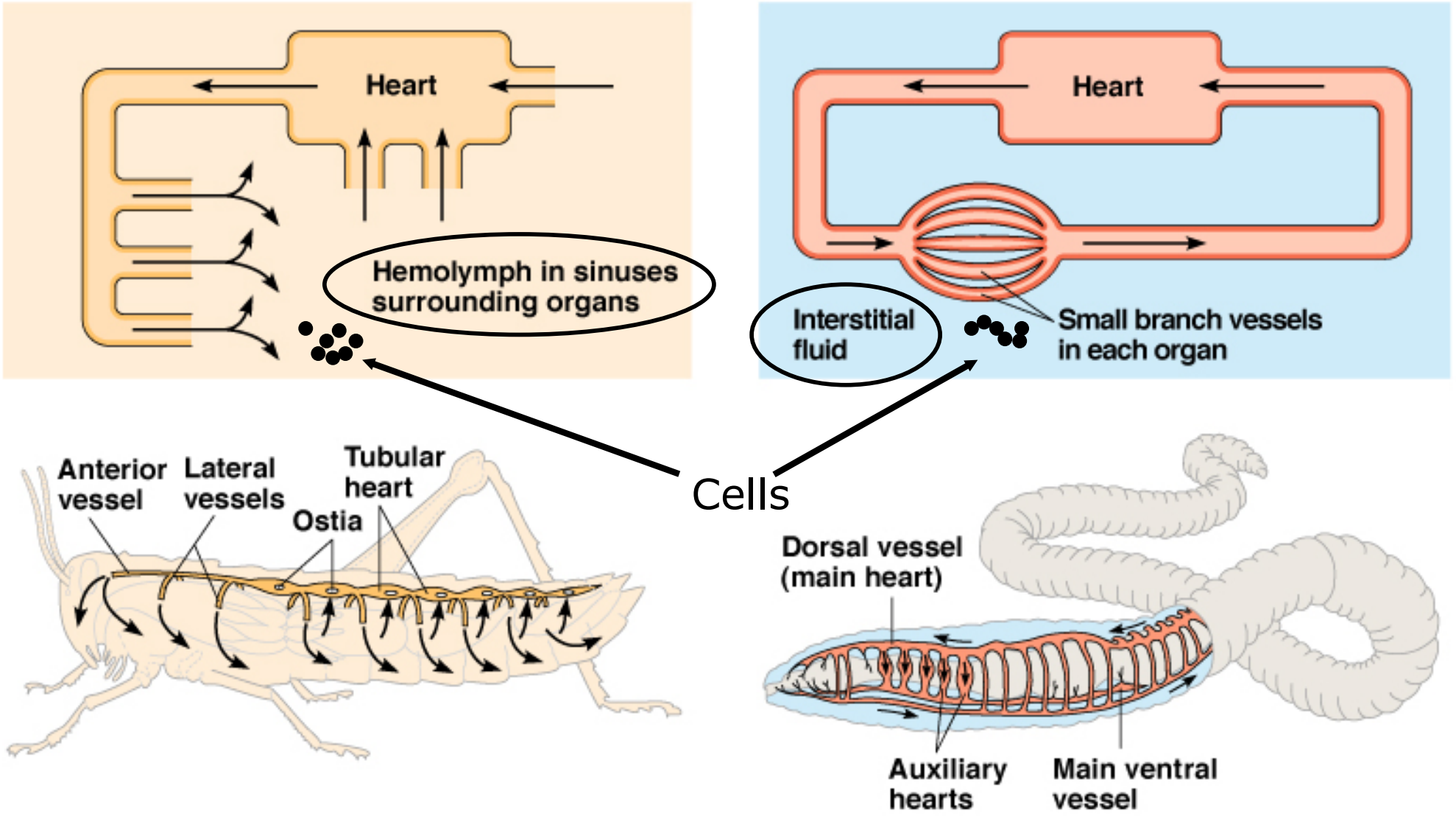
Class: Hirudinea

- Body usually flattened
- Reduced segments and coelom
- Setae absent
- Suckers at both ends
- Parasites, predators and scavengers

Animal Circulation and Gas Exchange

Circulation In Animals

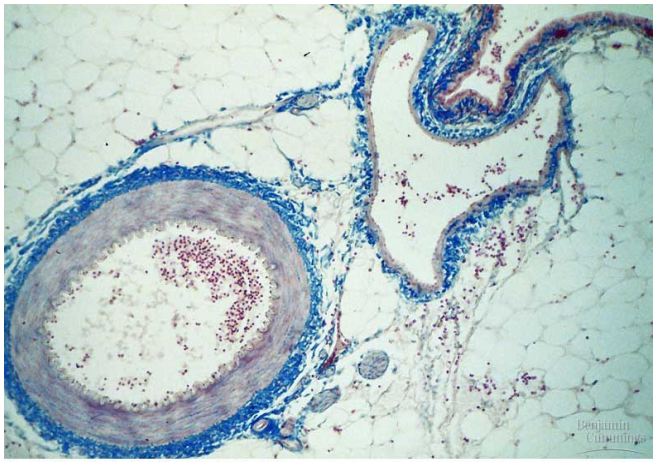
- _____ Circulatory Systems
  - Arthropoda, Mollusca
  - Hemolymph (no blood or interstitial fluid)
- _____ Circulatory Systems
  - mollusca, nematoda, annelida, vertebrates
  - blood
  - interstitial fluid



(a) Open circulatory system

(b) Closed circulatory system

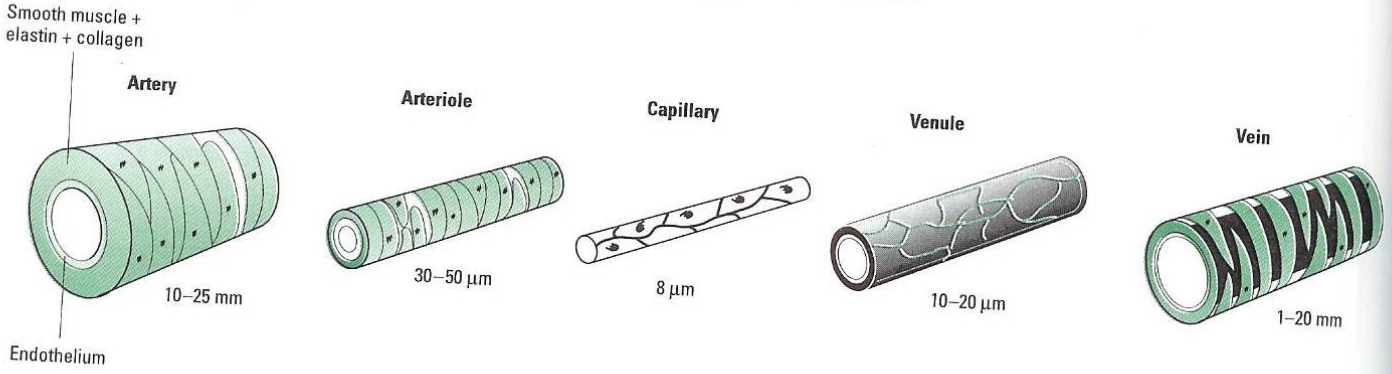
Cardiovascular System



- Heart
  - atria & ventricles
- Arteries
- Arterioles
- Capillaries
- Venules
- Veins

Table 7.6 Properties of different kinds of blood vessels and distribution of blood in mammals (total volume = 8–9% body volume).

	Typical diameter	Wall thickness	Composition of vessel wall (% diameter)				% of total blood volume contained	
			Endothelium	Muscle	Collagen	Elastin	Systemic	Pulmonary
Aorta	25 mm	2 mm	5	22	33	40	–	–
Artery	4 mm	1 mm	10	35	25	30	12	7
Arteriole	30 μm	20 μm	10	50	20	20		
Capillary	8 μm	<1 μm	100	0	0	0	11	1
Venule	20 μm	2 μm	40	10	40	10	41	14
Vein	20 mm	1 mm	8	32	40	20		
Heart								14



Phylum: _____

- Walking worm
- Was thought to be link between annelids and arthropods
- Unjointed appendages but segmented

Phylum: Arthropoda

- Hard exoskeleton, segmented
- Segments carry paired appendages
- Open circulatory system
- Nervous system similar to annelids
- Contains 80% of all identified species (Currently about 1 million species)

Arthropod Diversity

- Versatile exoskeleton
- Segmentation and appendages
- Tracheae
- Highly developed sense organs
- Complex behavior patterns
- Metamorphosis

Arthropod Classification

- Subphylum: Trilobita
- Subphylum: Cheliceraformes
  - Class: Merostomata (Horseshoe crabs)
  - Class: Pycnogonida (Sea Spiders)
  - Class: Arachnida (Scorpions, Spiders, Ticks, Mites)

Arthropod Classification

- Subphylum: Crustacea
  - Class: Crustacea (Lobster, Crabs, Shrimp)
- Subphylum: Myriapoda (Uniramia)
  - Class: Chilopoda (Centipedes)
  - Class: Diplopoda (Millipedes)
- Subphylum: Hexapoda
  - Class: Insecta (Insects)

Subphylum: _____

- All extinct (Permian era - 250 mya)
- Segmented without specialization
- Paired appendages

Subphylum: Cheliceraformes

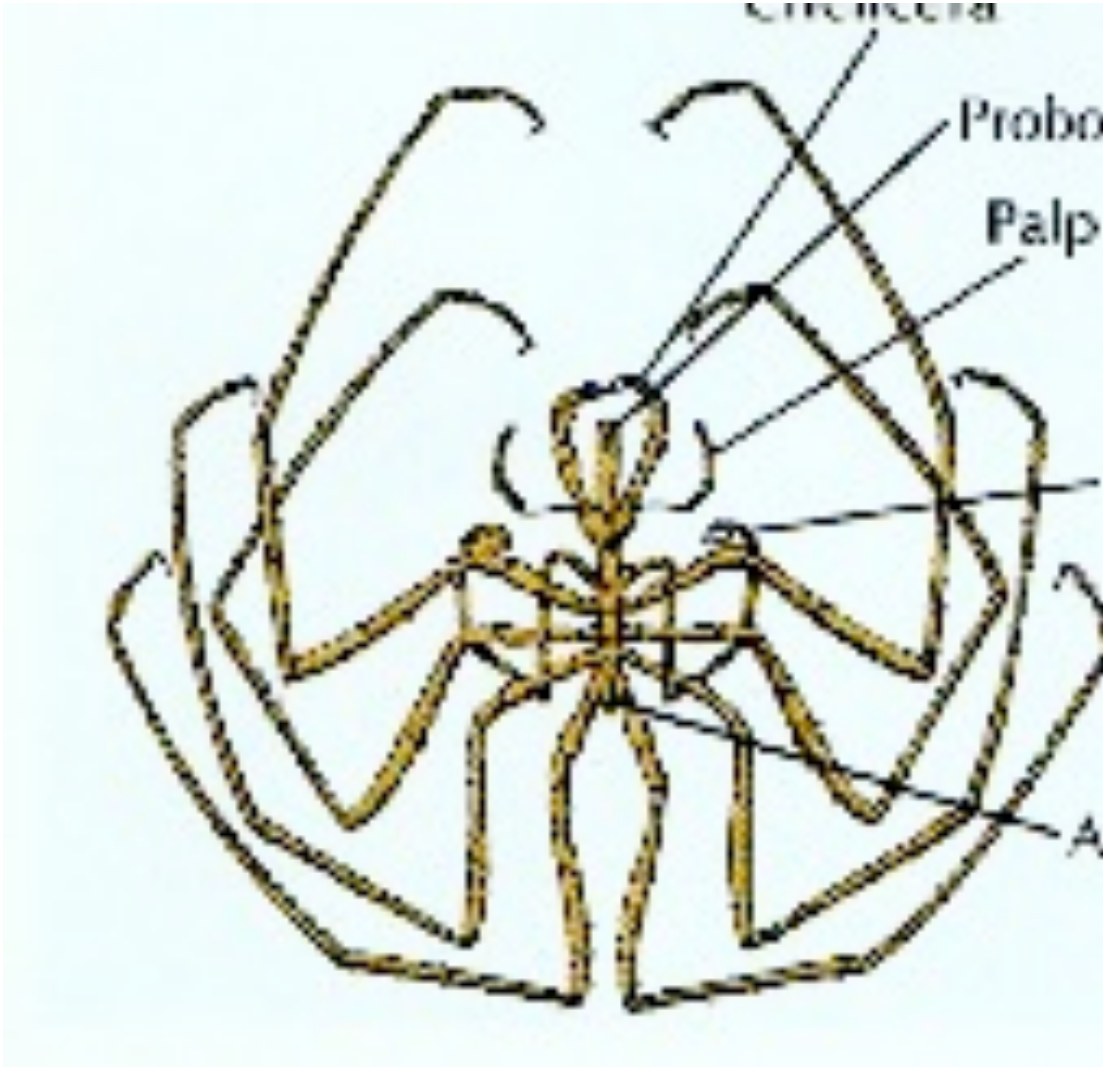
- Six pairs of appendages
  - one pair of Chelicerae
  - one pair of pedipalps (not in horseshoe crabs)
  - four pair of walking legs
- No mandibles
- No antennae

Class: Merostomata

- Six pairs of appendages
  - one pair of chelicerae
  - five pair of walking legs
- Unchanged since the triassic period
- Shallow coastal waters
- Larvae similar to trilobites

Class: Pyconogonida

- Called Sea spiders (not true spider)
- May have extra legs (duplicate segments)
- Polar oceans



Class: Arachnida

Class: Arachnida

- Scorpions are the first terrestrial invertebrates
  - pedipalps modified as pinchers
  - tail modified with stinger
- Ticks and Mites are parasitic
- Spiders contain modified Chelicerae
  - used as fangs to inject poison
- produce silk used for webs, eggs, escape, courtship

Subphylum: Crustacea

(a)

(b)

(c)

Subphylum: Crustacea

- Contain two pair of antennae
- Each appendage is biramous (two main branches)
- Mandibles
- Body of two or three parts
- Mostly marine

Subphylum: Myriapoda

Subphylum: Myriapoda (Uniramia)

- Contain one pair of antennae
- Each appendage is uniramous (one main branch)
- Mandibles

Classes: Chilopoda & Diplopoda

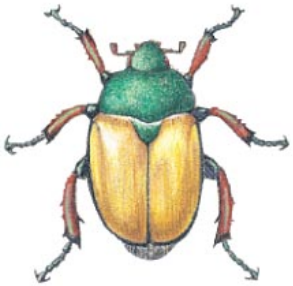
- _____
  - Centipedes
  - _____ pair of jointed legs per segment
  - poison claws
  - predators

- _____
  - Millipedes
  - _____ pair of jointed legs per segment (fused)
  - herbivores

Subphylum: Hexapoda
Class: Insecta

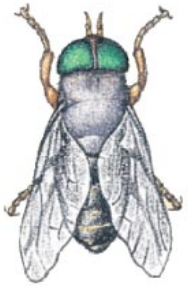
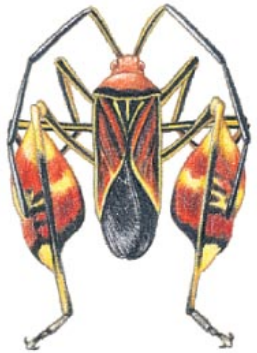
- Most diverse of all arthropods
- May have been the cause of angiosperm diversity
- Metamorphosis
  - complete
  - incomplete

Fig. 33-37a

Order	Approximate Number of Species	Examples
Blattodea	4,000	German cockroach 
Coleoptera Beetles	350,000	Japanese beetle 
Dermaptera	1,200	 Earwig

2 pairs of wings; front thickened elytra

Fig. 33-37b

Order	Approximate Number of Species	Examples
Diptera Flies	151,000	Horsefly 
Hemiptera True Bug	85,000	Leaf-footed bug 
Hymenoptera Bees, Wasps, & Ants	125,000	 Cicada-killer wasp

1 pair of wings; back form knobs called halteres

Two pairs of wings, ½ have hard outer shell, sucking mouth parts

Winged/less 2 pairs membrane wings; thin waist

Fig. 33-37c

Order	Approximate Number of Species	Examples
Isoptera	2,000	 Termite
Lepidoptera Butterflies & moths	120,000	 Swallowtail butterfly
Odonata Dragonflies & Damselflies	5,000	 Dragonfly

Two wings covered with scales

Two membranous wings; large compound eyes. Long abdomen

Phylum: Echinodermata

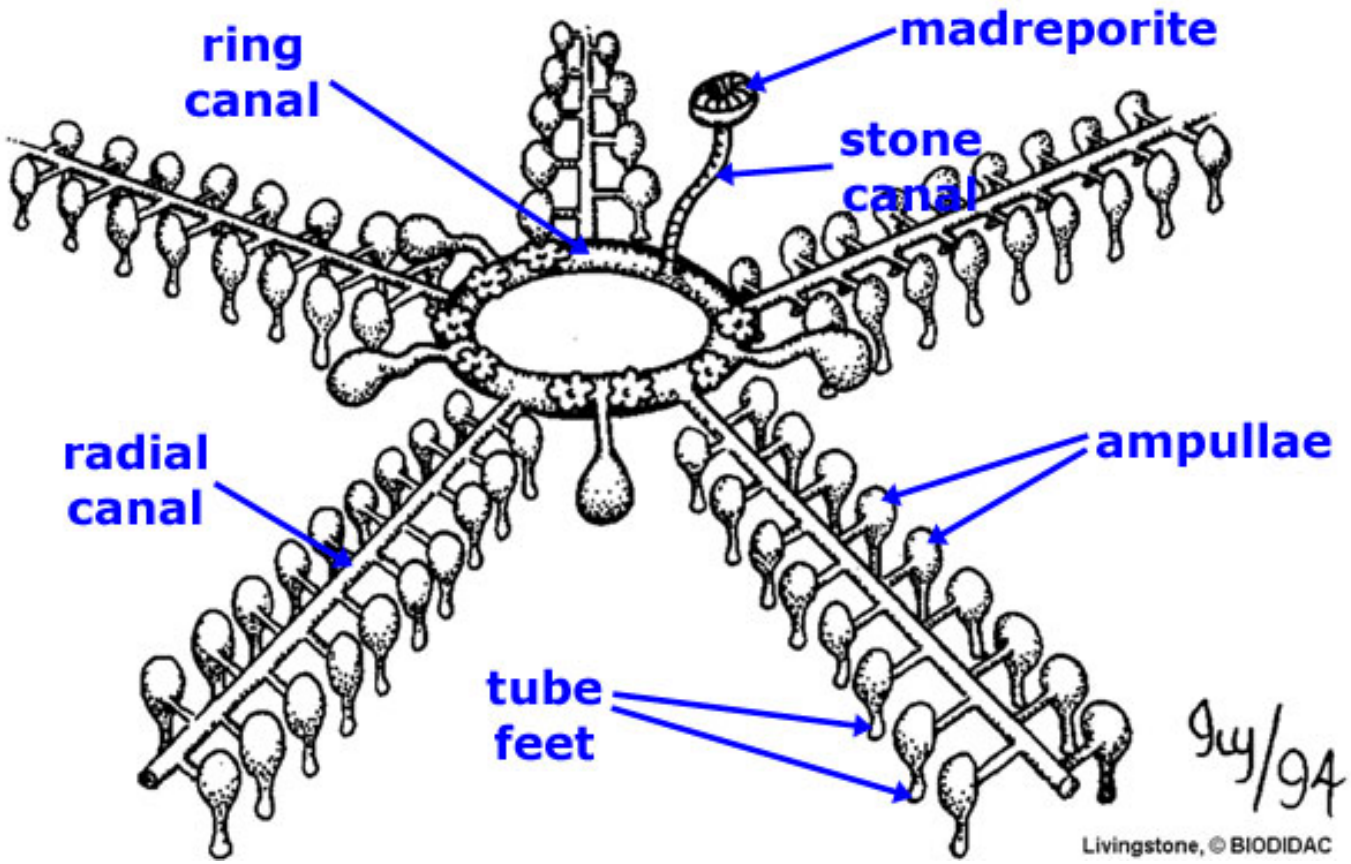
- _____
  - radial and indeterminate cleavage
  - Enterocoelous
  - anus from blastopore

Phylum: Echinodermata

- Radial Symmetry
- Water Vascular System
  - Ambulacral groove
  - Madreporite
- All marine

Water Vascular System

- _____
- Stone Canal
- Ring Canal
- Radial Canal
- Lateral Canal
- Ampulla
- Tube Feet



Classification

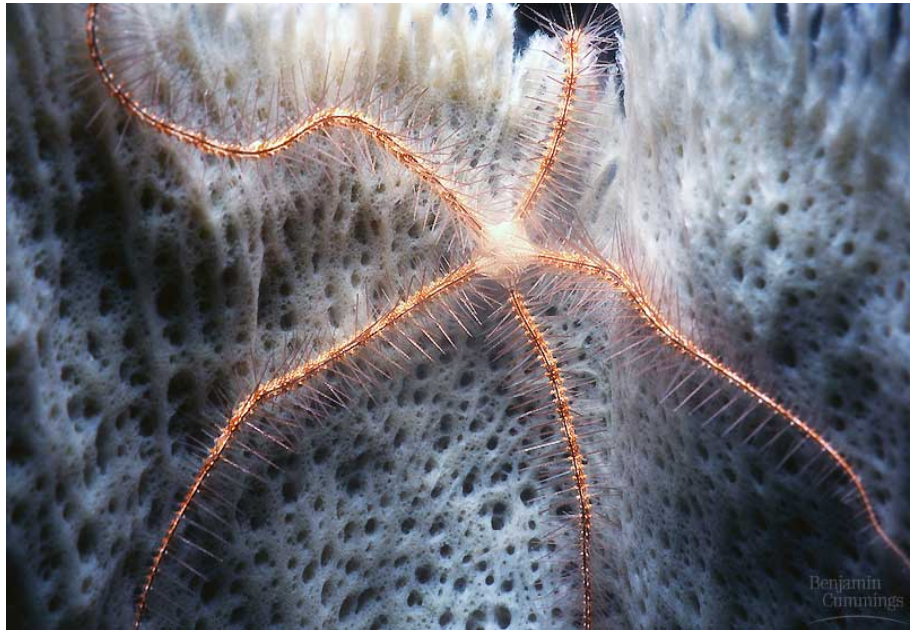
- Class: Asteroidea (Seastars)
- Class: Opiuroidea (Brittlestars)
- Class: Echinoidea (Sea Urchins, Sand Dollars)
- Class: Crinoidea (Sea Lilies)
- Class: Holothuroidea (Sea Cucumbers)

Class: Asteroidea

- Five arms radiating from a central disc
- Open ambulacral groove
- Madreporite on the aboral side
- Contain pedicellariae and papulae

Class: Ophiuroidea

- Five thin arms radiating from a central disc
- Closed ambulacral grooves
- Madreporite on the oral side
- No suckers on tube feet, pedicellariae or papulae



Class: Echinoidea

- No arms but have five rows of tube feets
- Contain spines
- Closed ambulacral grooves
- Madreporite on the aboral side
- Contain pedicellariae and Papulae
- Aristotle's lantern

Class: Crinoidea

- Attached to substrate with many branched arms
- Open ambulacral grooves
- No Madreporite
- No pedicellariae or papulae

Class: Holothuroidea

- Soft bodied
- Ambulacral areas with tube feet
- Internal Madreporite
- No pedicellariae or papulae
- Closed ambulacral grooves