Biology lecture 7 (part 1)

Deuterostomes:

- Endoskeleton appears for the first time
- Entercoelous development of the coelom
- Deuterostome and protosome split around the Cambrian period

Echinoderms:

- Deuterostome development and endoskeleton appear for the first time
- Endoskeleton is made of hard calcium plates cover by a thin layer of dedicate skin
- They are bilaterally symmetric as larva forms (which suggests they evolved from a bilaterally symmetric ancestor) but radial symmetric (pentaradial symmetric, radial symmetric in only 5 ways) in adult forms
- Bilateral symmetry has been lost since early echinoderms are mostly sessile
- All of them are benthic, which means bottom dwellers/feeders
- Body plan have only oral and aboral surfaces (usually the oral surface is on the bottom, this is not true for sea urchins and sand dollars)
- Have no head or brain
- Nervous system consists of radial nerves and sensory neurons in the tube feet
- Have an unique water vascular system which functions in locomotion, feeding, gas exchange and excretion
- This system is made up of central ring canal surrounding the esophagus and five radial canals extending into the body and arms
- A hole on the aboral surface called the **madreporite** allows the sea water to come into the water vascular system
- The radial canals extend into the tube feets
- At the base of each tube feet is a muscular sac called the ampulla that contracts and force water into the tube feet (blocked off from the rest of the canal by one way valves)
- When the tube feet is expanded, it attaches to the substrate
- Relaxation of the ampulla brings the fluid back and this allows the tube feet to move
- It can also use skin gills for respiration

Reproduction:

- Can reproduce asexually by fragmentation or parthenogensis
- Fragmentation is used to escape predators or prevent infection
- Parthenogensis allows eggs to develop without fertilization
- Not much genetic diversity is gained through this method except genetic mutation and meiosis
- Sexual reproduction also occurs, echinoderms have separate sexes and external fertilization and they are broadcast spawners
- Larva have ciliated arms, planktonic (drifting) lifestyle

Crinoidea:

- Sea lilies and feather stars
- Alot of arms (10 to hundreds)
- Large sessile (lilies) or motile but rarely move
- Filter feeders that orient their arms in the water currents to trap food particles through the mucus exerted via their tube feet

Sea urchins/sand dollars:

- No arms
- Sea urchins are hemispherical and covered with spines attach to the underlying skeleton
- Sand dollars are flattened sea urchins
- Sea urchins are more herbivores whereas sand dollars are more filter feeders that live on the sediment
- Sea urchins have calcareous teeth that can break down tough algae materials

Sea cucumbers:

- Body is a flexible, muscular sac
- Reduction of endoskeleton to microscopic plates embedded in the body wall (that's why they are soft)
- Detritivores, scavengers, filter-feeders
- As a defense mechanism, they can shoot sticky stuff from their intestine out through their anus which usually entangle their attackers
- Butt breather
- Have 5 rows of tube feets

Sea stars:

- Predators
- Central disk with 5 arms
- Locomotion achieved through the movement of the tube feets
- Able to feed on bivalves by insert the inside of their stomach to the inside of the bivalve shell and secrete digestive enzymes that eats away the visceral mass

Brittle stars/Basket stars:

- Central disk with long and slender arms that have many spines (brittle stars)
- Brittle stars are filter feeders, predators, detritivores
- Basket stars have branched arms and are filter feeders