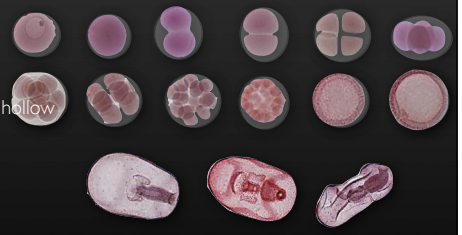
ECHINODERMS

spiny-skinned deuterostomes

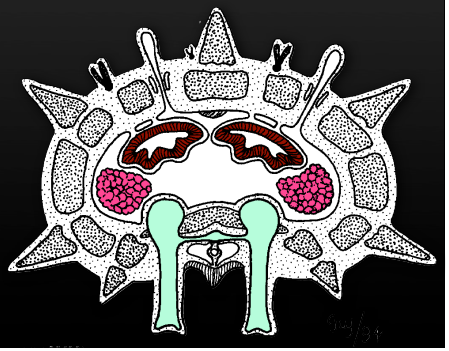
ECHINODERMS

- **PHYLUM ECHINODERMATA**
  - deuterostomes – blastopore forms anus first in development, then mouth forms from gut, coelom forms thru enterocoely
  - Development:
    - Unfertilized egg has nucleus
    - Fertilized egg has no nucleus
    - Cell splitting - cells stay same size
    - Blastula stage – blastoderm surrounding hollow blastocoel
    - Gastrula stage – ectoderm surrounding, blastopore invaginates into archenteron
    - Larvae – systems begin to form

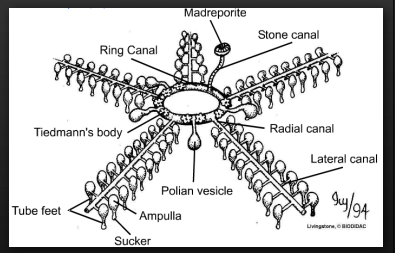


- Characteristics of Echinoderms:
  - Share many features with Chordates:
    - Tornaria (bipinnaria) larvae form similar to Hemichordata
    - Enterocoelomate and deuterstome
  - Primitively they have radial symmetry
  - Echinoderms have no circulatory or excretory systems
  - Water vascular system
    - Tube feet
  - Calcareous ossicles make up endoskeleton

tornaria larva

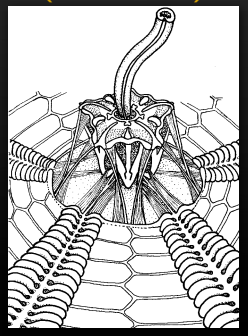


- CLASS CRINOIDEA
  - Sea lilies, Feather Stars
  - Anus and mouth on oral side, 5-10 arms around central disk (Calyx)
  - Fossil forms sessile, body on a stalk
  - Filter feed with tube feet
- CLASS ASTEROIDEA
  - Sea stars, Starfish
  - Tube feet for locomotion and feeding
  - Water Vascular System allows them to move and feed
  - Water flow: madreporite - stone canal – ring canal – radial canal – lateral canal – tube feet (composed of ampulla and podium)
  - In Asteroids, arms taper away from central disk



- CLASS OPHIUROIDEA
  - Brittle stars, arms do not taper away from central disk
  - Use arms for movement
  - Tube feet used for filter feeding and respiration
  - Anus on one side (aboral) [or absent], mouth on bottom side (oral)
- CLASS ECHINOIDEA
  - Sea urchins, sand dollars, sea biscuits
  - No distinct arms, covered in spines
  - Aristotle's Lantern – used for feeding, scraping and tearing plants and algae
  - Sand dollars are filter feeders with reduced Lantern
  - Endoskeleton is called a "test", ossicles are fused together

aristotle's lantern (from the inside)



- CLASS HOLOTHUROIDEA
  - Sea Cucumbers
  - Elongated without radial symmetry (secondarily bilateral)
  - Have tentacles around mouth for filter feeding
  - Tube feet clustered on bottom (sole) used for locomotion
  - Tube feet on top are respiratory, also have respiratory trees inside
  - When frightened, they spew their guts out of their anus and grow new ones later

CHORDATES

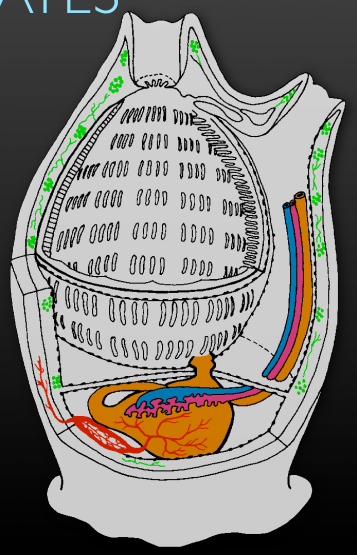
animals with notochords

HEMIS

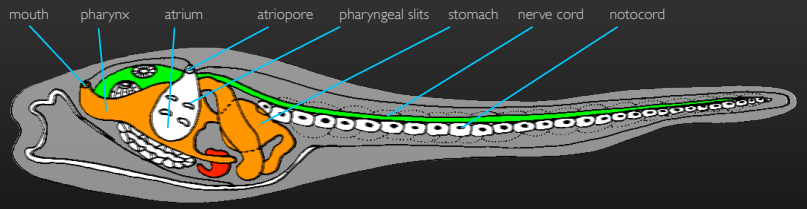
- **PHYLUM HEMICHORDATA**
  - Acorn worms – marine animals with chordate-like characteristics
  - Differences – no postanal tail, no true notochord
  - Similarities – Pharyngeal slits, dorsal and ventral hollow nerve cord
  - Share characteristics Echinodermata in larval stages, Dipleura larval stage is very similar to Tornaria in Hemichordates
  - Deuterostomes with enterocoely
  - Filter feed with pharyngeal gill slits

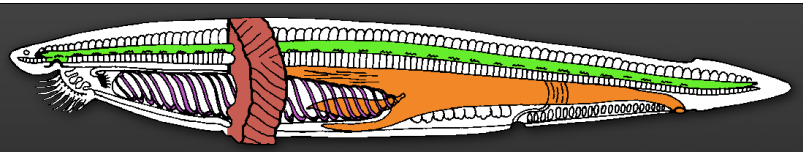
CHORDATES

- **PHYLUM CHORDATA**
  - Four main characteristics:
  - postanal tail
  - pharyngeal slits
  - notochord
  - dorsal hollow nerve cord
- **SUBPHYLUM UROCHORDATA**
  - Tunicates and Sea Squirts
  - Larval stage is very similar to a tadpole with all 4 characteristics but sessile adult forms only have pharyngeal gill slits retained (ascidian tadpole)
  - Elaborate filter feeding mechanism
  - Adult retains separate anus and mouth opening, hermaphroditic with external fertilization



ASCIDIAN TADPOLE





- **SUBPHYLUM CEPHALOCHORDATA**
  - Amphioxus, Lancelets
  - Notochord extends into head cavity
  - Retain all 4 characteristics as adults
  - Filter feeders, live in bottom substrate
  - Gonochoristic with external fertilization, no larval stage