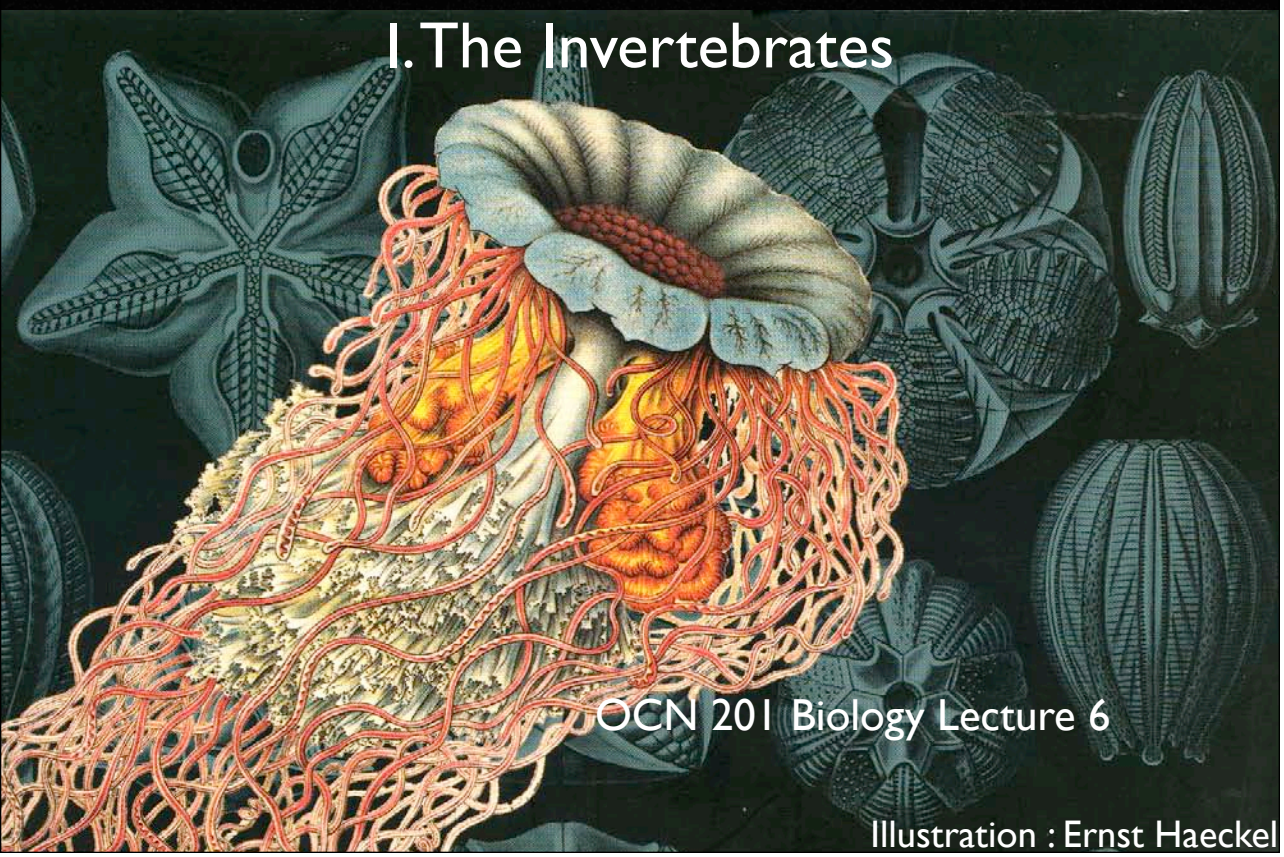
Marine Animals

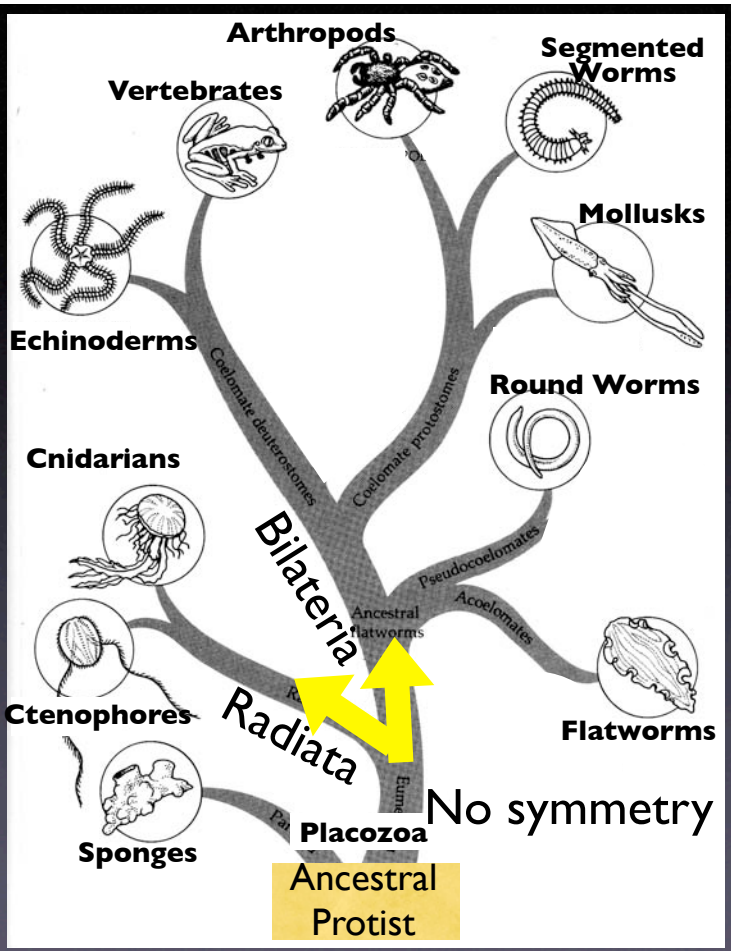
I. The Invertebrates



OCN 201 Biology Lecture 6

Illustration : Ernst Haeckel

The Animal Family Tree

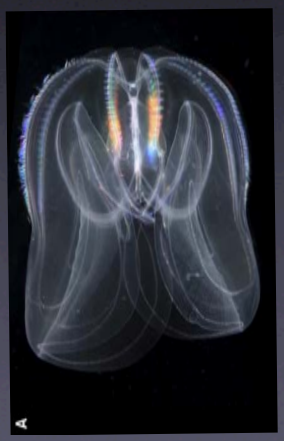


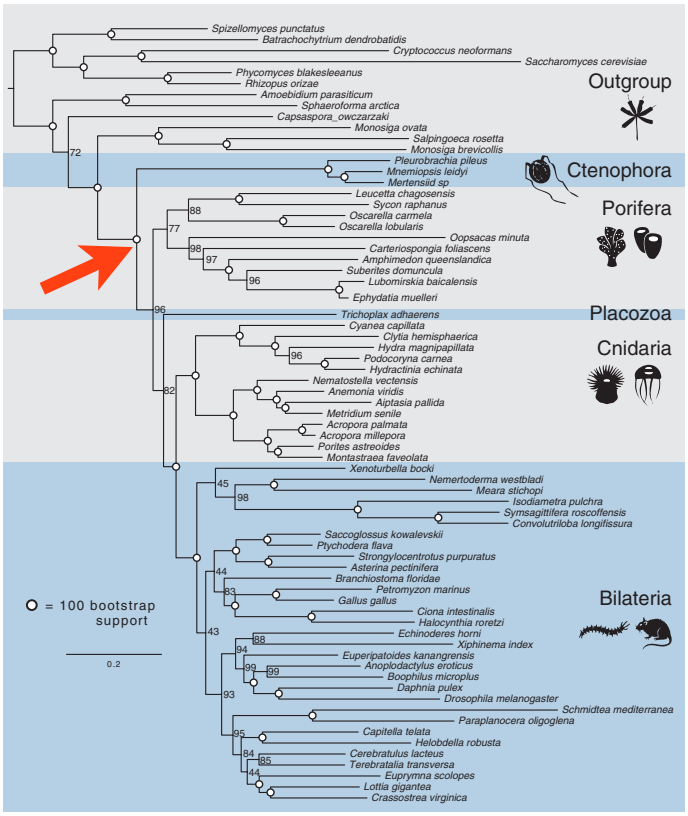
RESEARCH ARTICLE SUMMARY

The Genome of the Ctenophor *Mnemiopsis leidyi* and Its Im for Cell Type Evolution

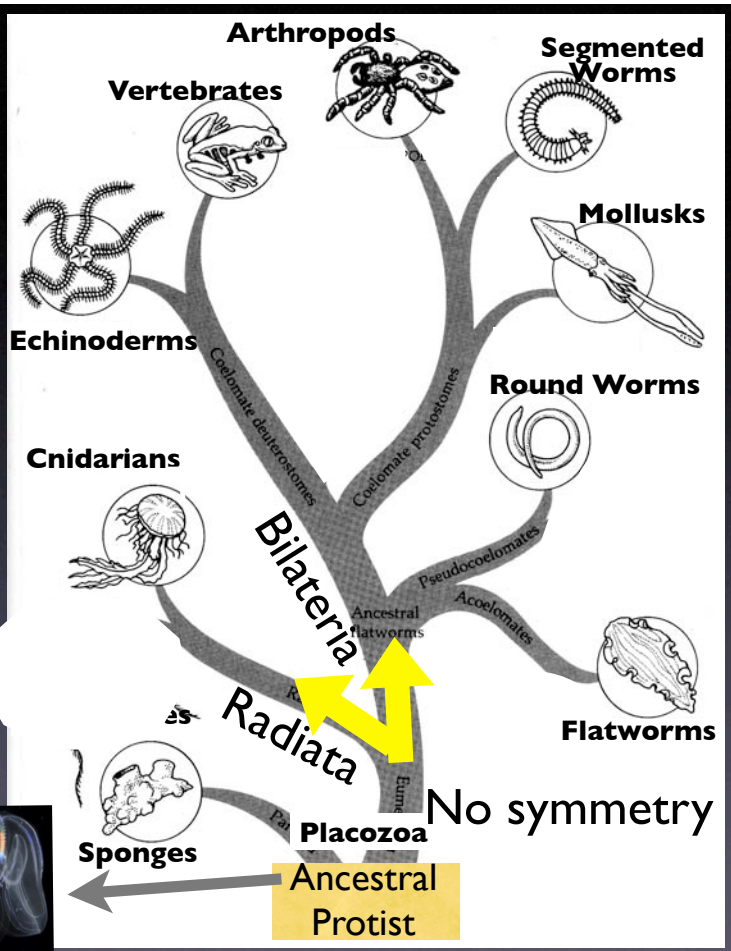
Joseph F. Ryan, Kevin Pang, Christine E. Schnitzler, Anh-Dao Nguyen, F David K. Simmons, Bernard J. Koch, Warren R. Francis, Paul Havlak, NISC Comparative Sequencing Program, Stephen A. Smith, Nicholas H. Steven H. D. Haddock, Casey W. Dunn, Tyra G. Wolfsberg, James C. Mul Mark Q. Martindale, Andreas D. Baxevanis*

(Science, Dec 2013)





The Animal Family Tree



ctenophores

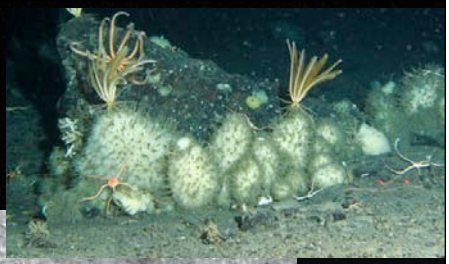
Invertebrate Phyla

- Placozoa
- Porifera (sponges)
- Cnidarians (jellyfish, corals, hydroids)
- Ctenophores (comb jellies)
- Flat Worms
- Round Worms
- Molluscs (clams, snails, squid, octopi)
- Segmented Worms
- Arthropods (copepods, crabs, shrimp)
- Echinoderms (sea stars, brittle stars)

Placozoa

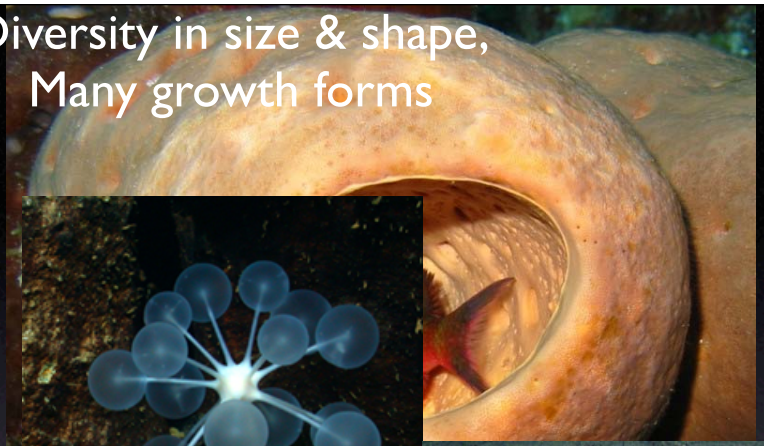
- Simplest animal?
- Lacks symmetry
- Only four cell types
- No tissues or organs
- Found on surfaces
- Probably feeds on surface algae and bacteria
- Can fold itself to create a digestive pocket

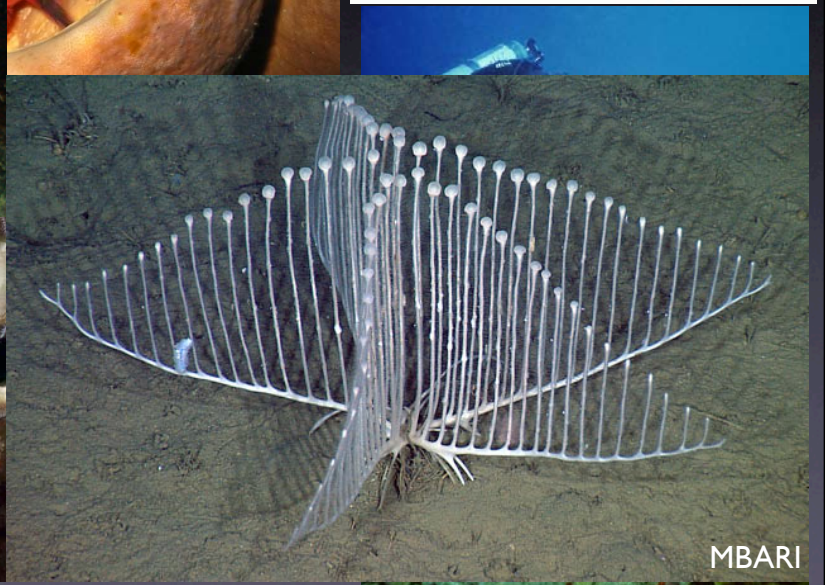
Porifera
(sponges)



- "Skeleton" may be calcareous or silica spicules, or entirely of the protein collagen
- Benthic -- intertidal to abyssal, all latitudes
- Suspension Feeders (strain plankton, bacteria. A few exceptions)
- Large range of cell types, lack of tissue types
- Source of many bioactive compounds

Diversity in size & shape,
Many growth forms





Sponge Skeletons

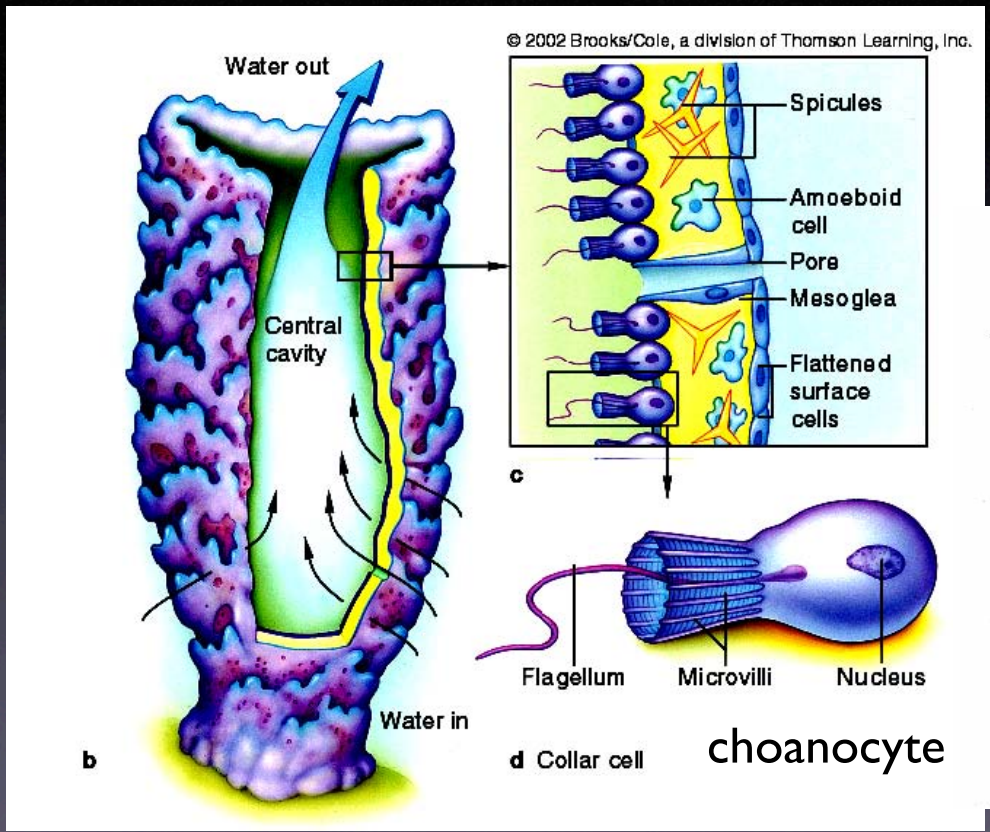
Natural Sponge

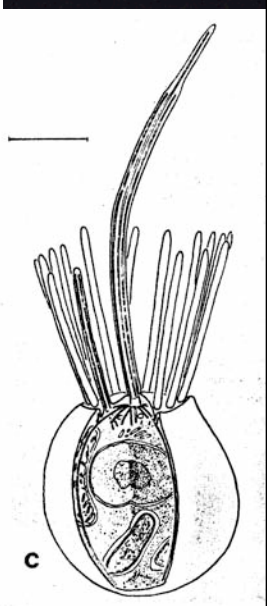
collagen

Calcareous Sponge

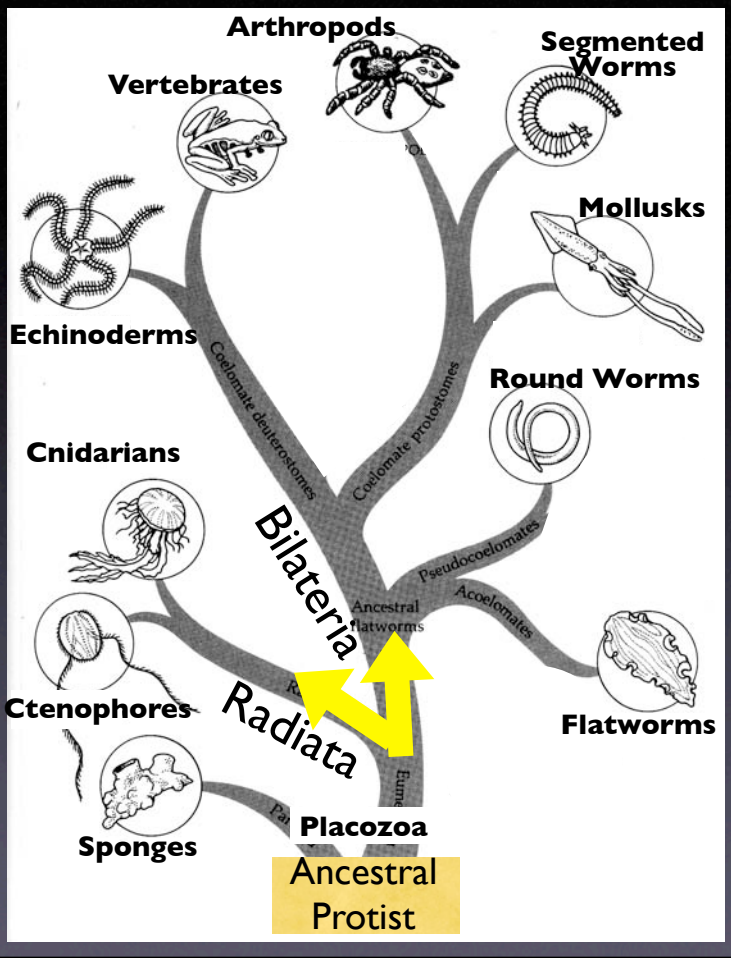
Glass sponge (Venus' Flower Basket)

Sponge Anatomy





The Animal Family Tree



Ctenophores

(comb jellies)

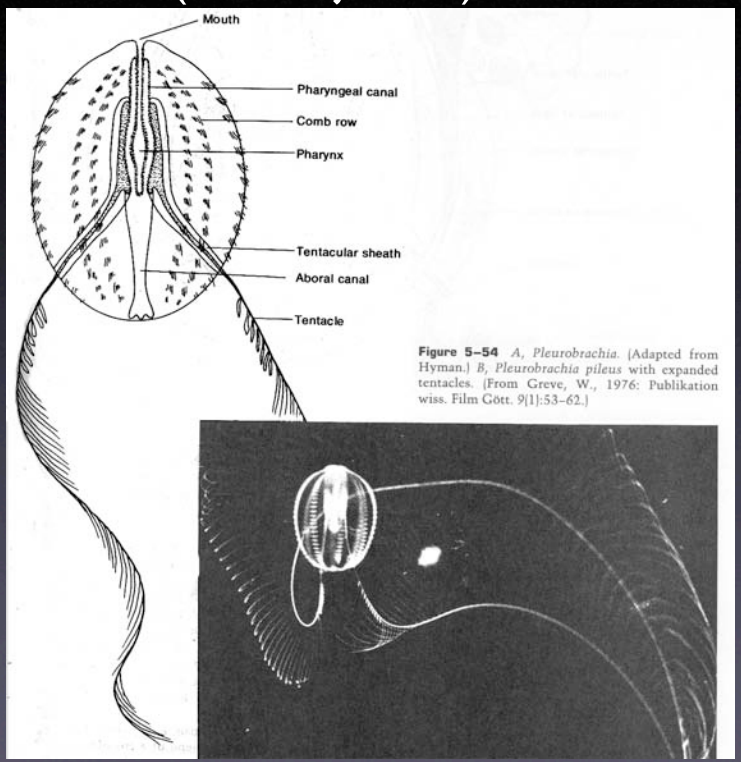
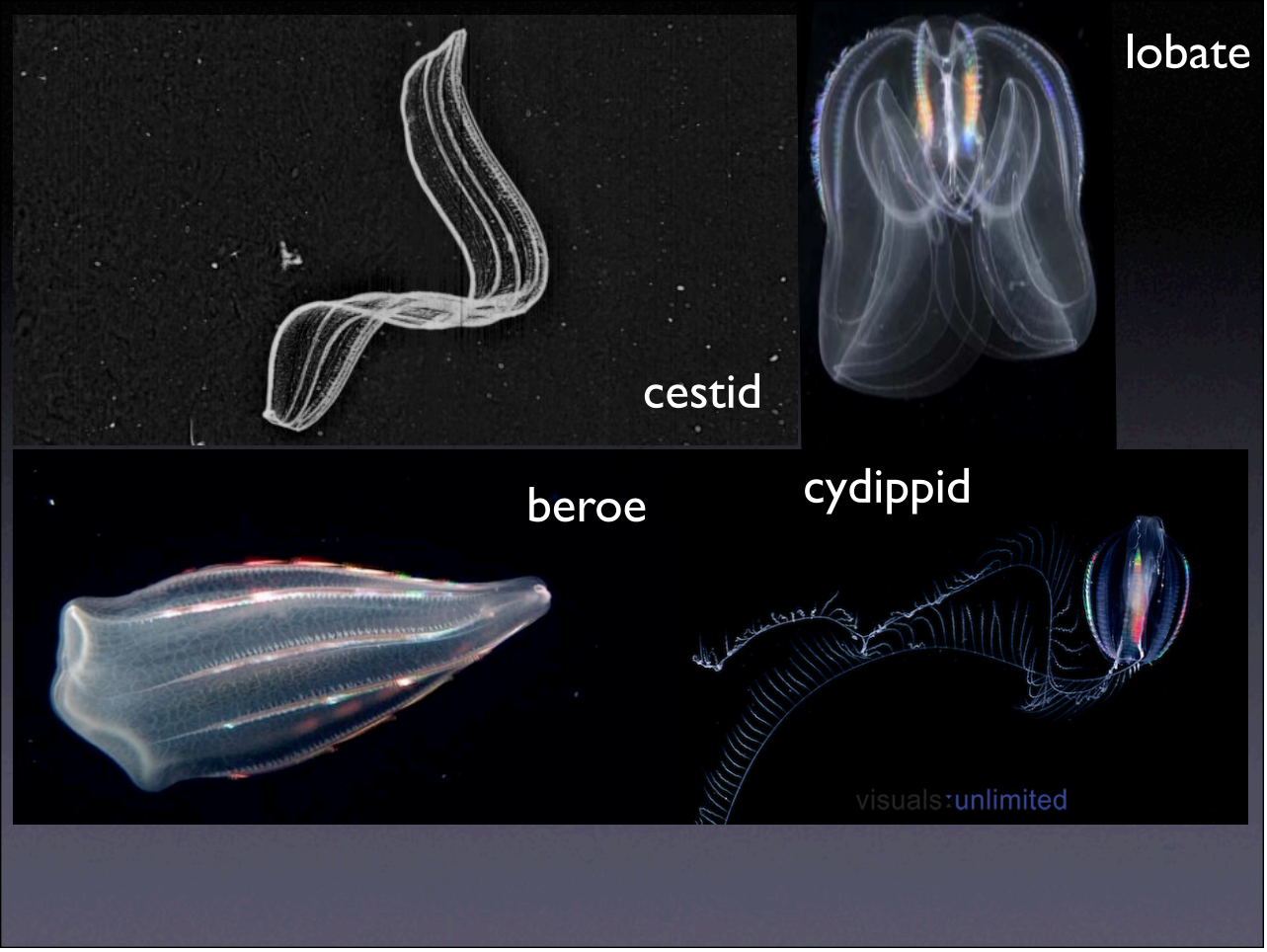


Figure 5–54 *A, Pleurobrachia.* (Adapted from Hyman.) *B, Pleurobrachia pileus* with expanded tentacles. (From Greve, W., 1976: Publikation wiss. Film Gött. 9(1):53–62.)

Ctenophores
(comb jellies)

Ctenophores
(comb jellies)

- Earliest branching metazoan phylum?
- All are marine
- Pelagic from 0 to >3000 m (few benthic creepers)
- Have eight rows of cilia (comb rows)
- Carnivorous
  - Use tentacles with sticky colloblasts
  - Some directly ingest prey (*Beroe*)



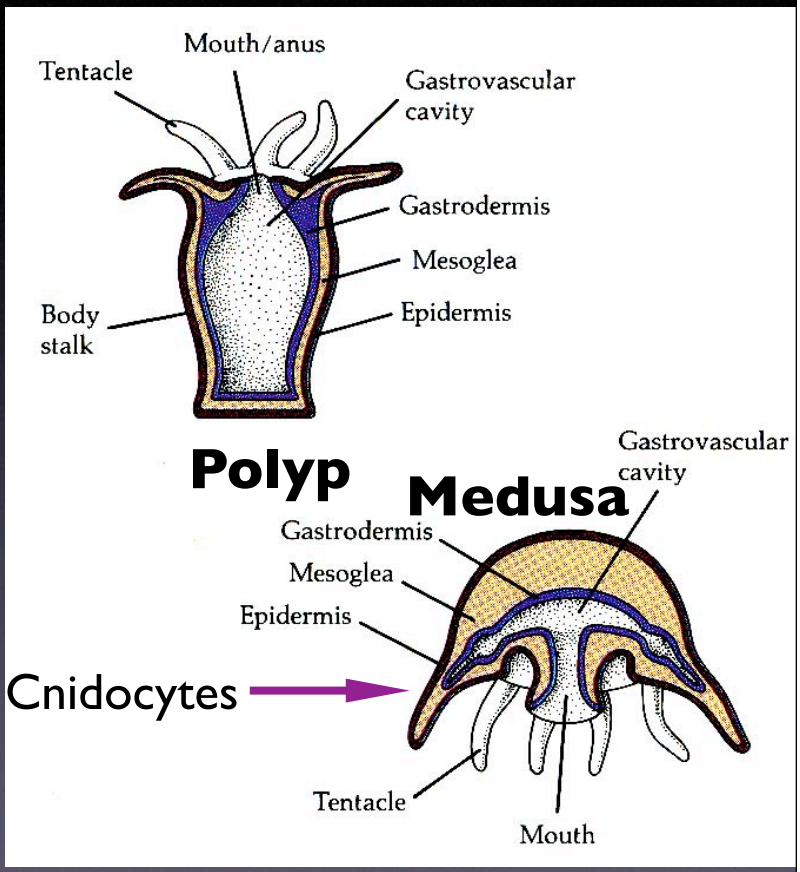
Ctenophores

Cnidarians

(anemones, corals, jellyfish)

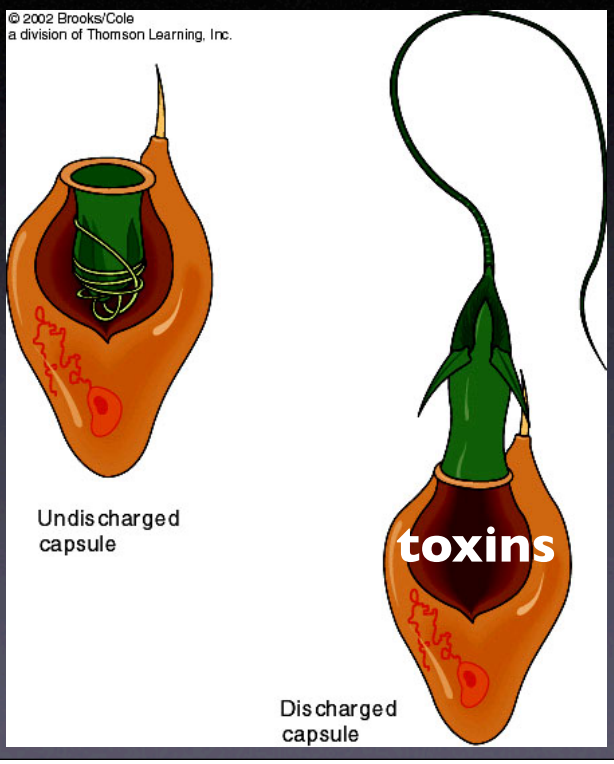
- Named for the stinging cells (cnidocytes)
- Radial symmetry
- Two forms: polyps and medusae (some have alternation of generations)
- Asexual and Sexual Reproduction

- Radial symmetry
- Simple Digestive system (blind sac)
- No circulatory, respiratory or excretory systems
- carnivores/detritovores
- Primitive nerve networks



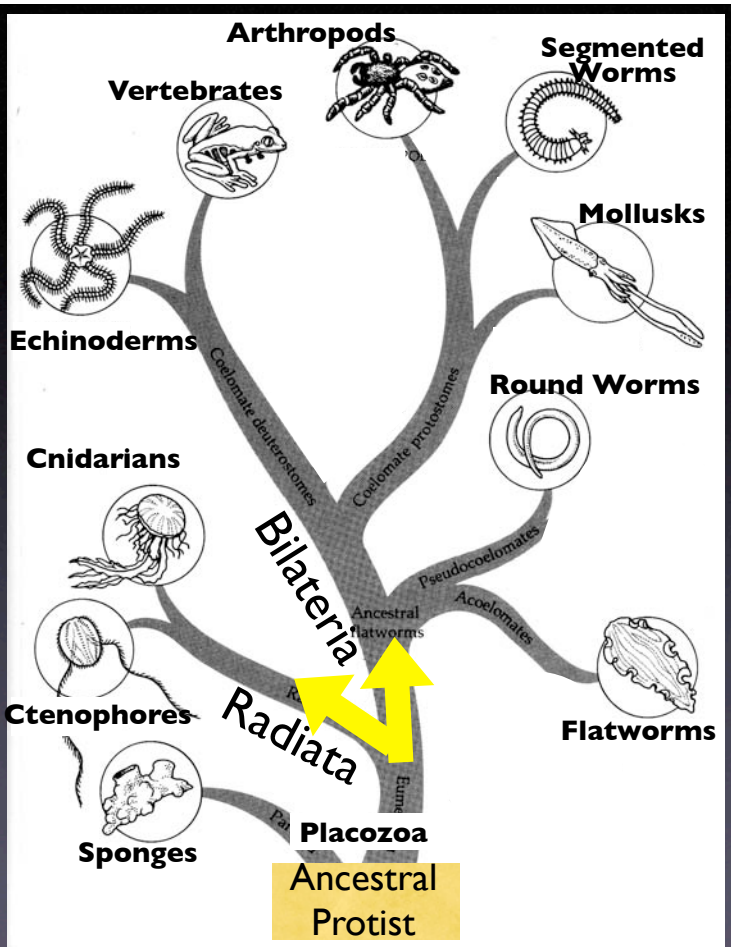
Cnidocytes

- Prey capture
- Turf wars
- Defense



Jellyfish

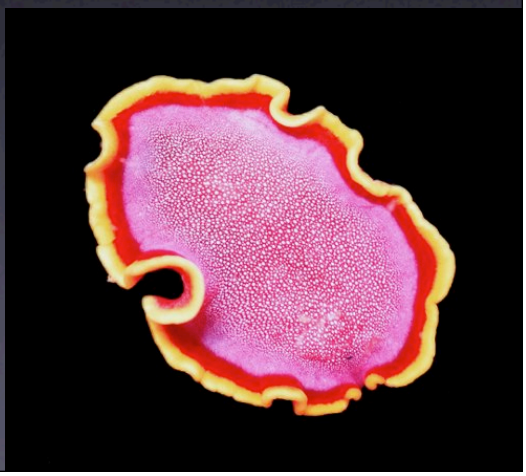
The Animal Family Tree



Flatworms

(Platyhelminthes)

- Turbellarian flatworms are marine, benthic
- Infauna from intertidal to deep sea
- Carnivorous or herbivorous
- Move by cilia or undulations
- Mouth but no anus
- Cephalization

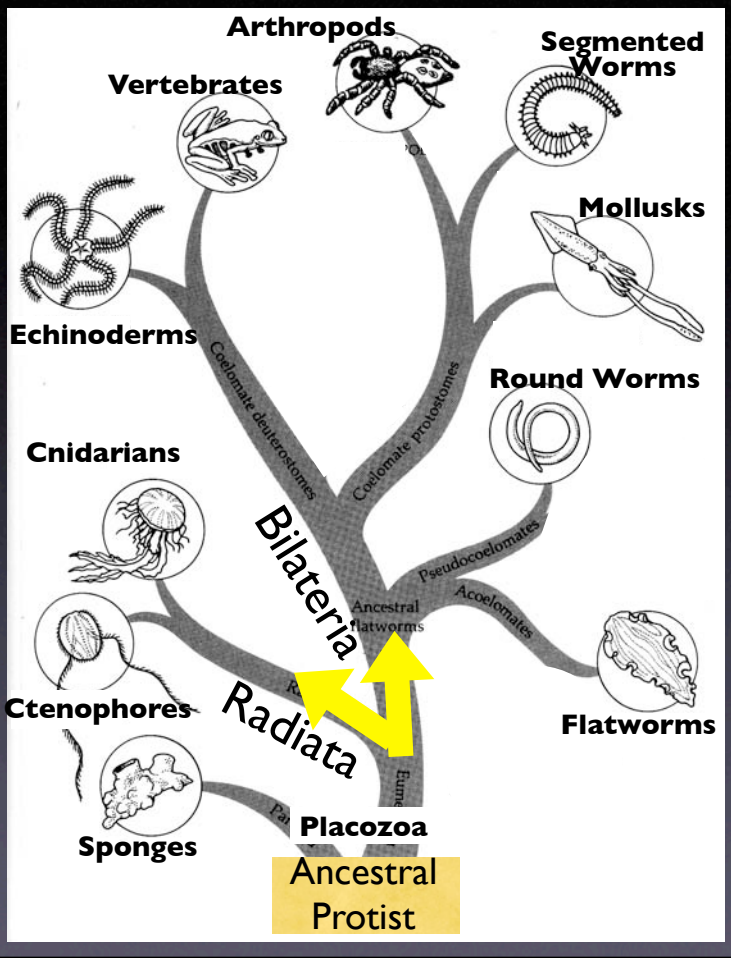


Roundworms

(Nematodes)

- Flow-through digestive system!
- Found all over (terrestrial, freshwater, marine)
- VERY abundant free-living in benthic infauna
- Many other types are parasitic
- Many are deposit feeders, detritivores

The Animal Family Tree



Molluscs

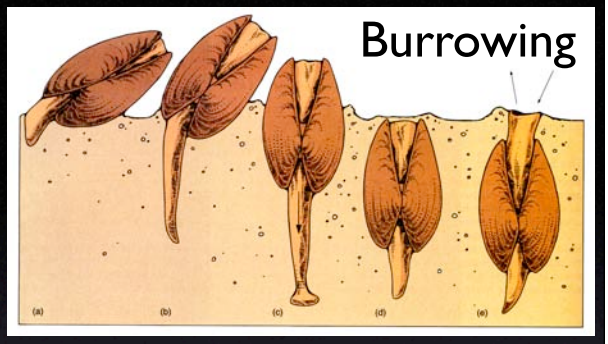
MAJOR CLASSES

- Bivalvia (Clams, oysters, mussels)

- Gastropoda (snails, nudibranchs)

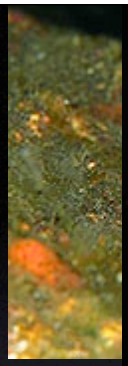
- Cephalopoda (squid, octupus, nautilus)

Bivalves



- Many burrowing and boring
- Others attach to rocky surfaces
- Suspension feeding or selective deposit feeding

Gastropods



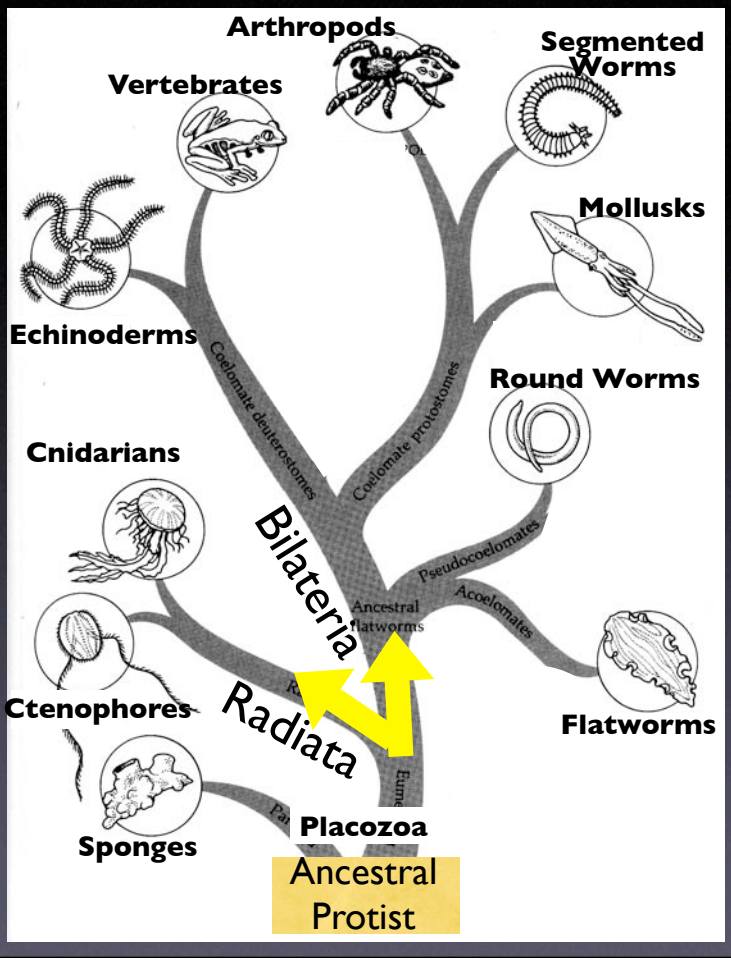
- Many with shells (snails, whelks, etc.) some types without shells (e.g. nudibranchs)
- Some planktonic forms (e.g. pteropods)
- Herbivores and carnivores, deposit and suspension feeders
- Have a radula (a toothed scraper)

Cephalopods

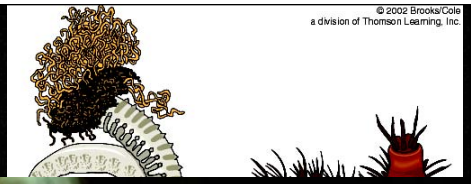
- Well developed brains and eyes
- Many have ink sacs
- Only one type still has external shell (Chambered nautilus)
- Carnivores; Have a radula and beak for tearing food
- Many can rapidly change colors (camouflage, communication)

Molluscs

The Animal Family Tree



Segmented Worms
(Annelids)



- Major Class: the **Polychaetes**
- Mostly benthic, a few planktonic

  - predatory epifauna

  - tube-dwelling infauna (deposit/ suspension feeders)

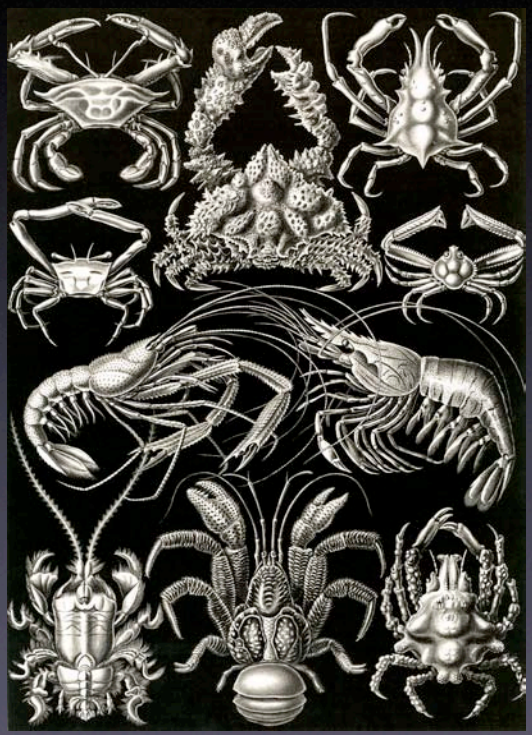
well developed central nervous system

Polychaetes

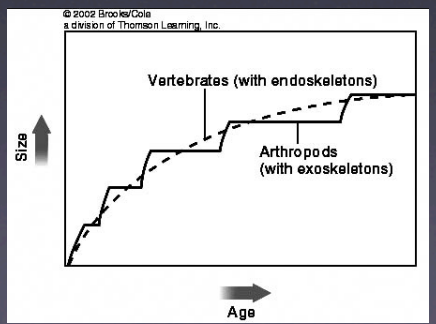
Food capture & Gas Exchange

Arthropoda

(jointed foot)

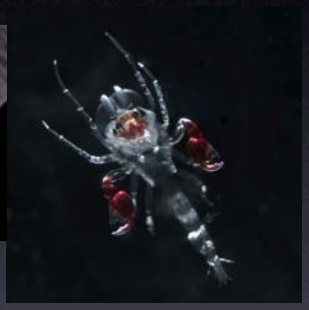


- Exoskeleton (protection, leverage)
- Striated Muscle (quick, powerful)
- Herbivores, carnivores, omnivores
- External Skeleton requires molting



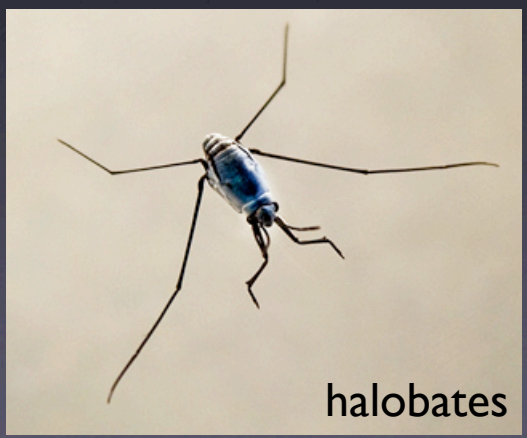
Arthropoda: Crustacea

Malacostraca



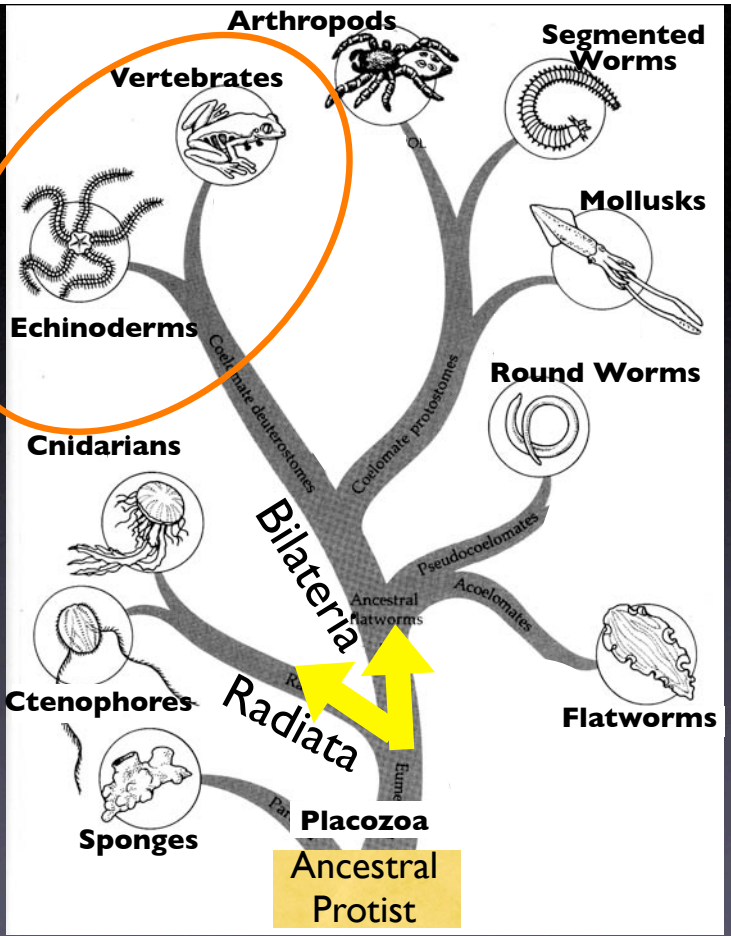
Arthropoda

- Vast majority of marine arthropods are crustaceans
- Exceptions: marine insects, cheliceriformes (e.g., horseshoe crabs, pycnogonids)



Arthropods

The Animal Family Tree



Echinoderms

- Echino derm = spiny skin
- Most are suspension or deposit feeders, sea stars also predatory
- From intertidal to abyssal depths, nearly all are benthic
- Have tube feet
- Bilaterally symmetric as larvae, adults pentaradially symmetric

Echinoderms

Echinoderms

Questions?