

Invertebrates

Kingdom Anamalia

Phylum Porifera

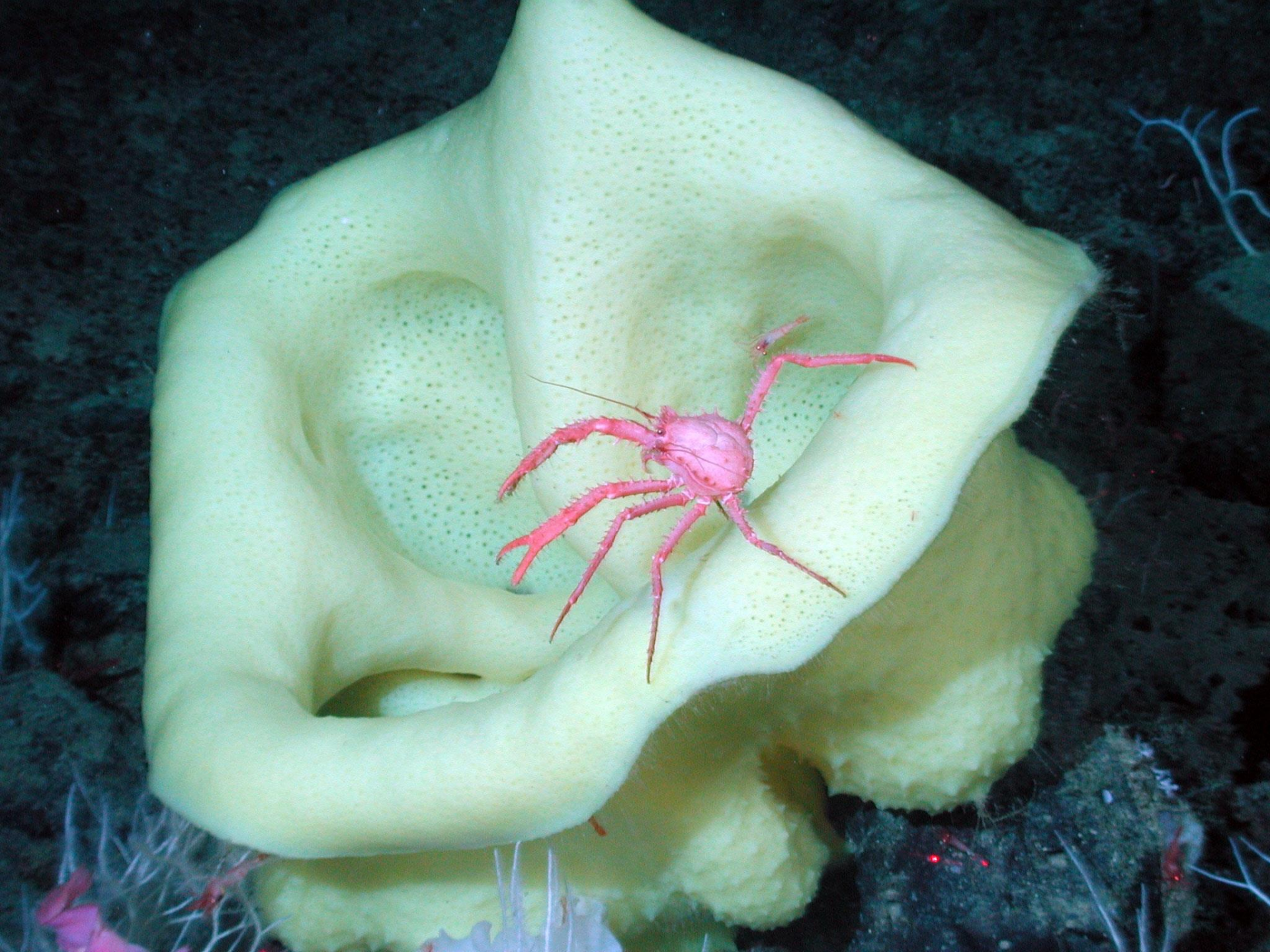
Porifera

- Common Name:
Sponges
- Latin- “Pore-bearing”













Structure and Function

- Adults are sessile, benthic, filter-feeding organisms.
- No true tissues or organs

Outgoing
water

Osculum

Spicules

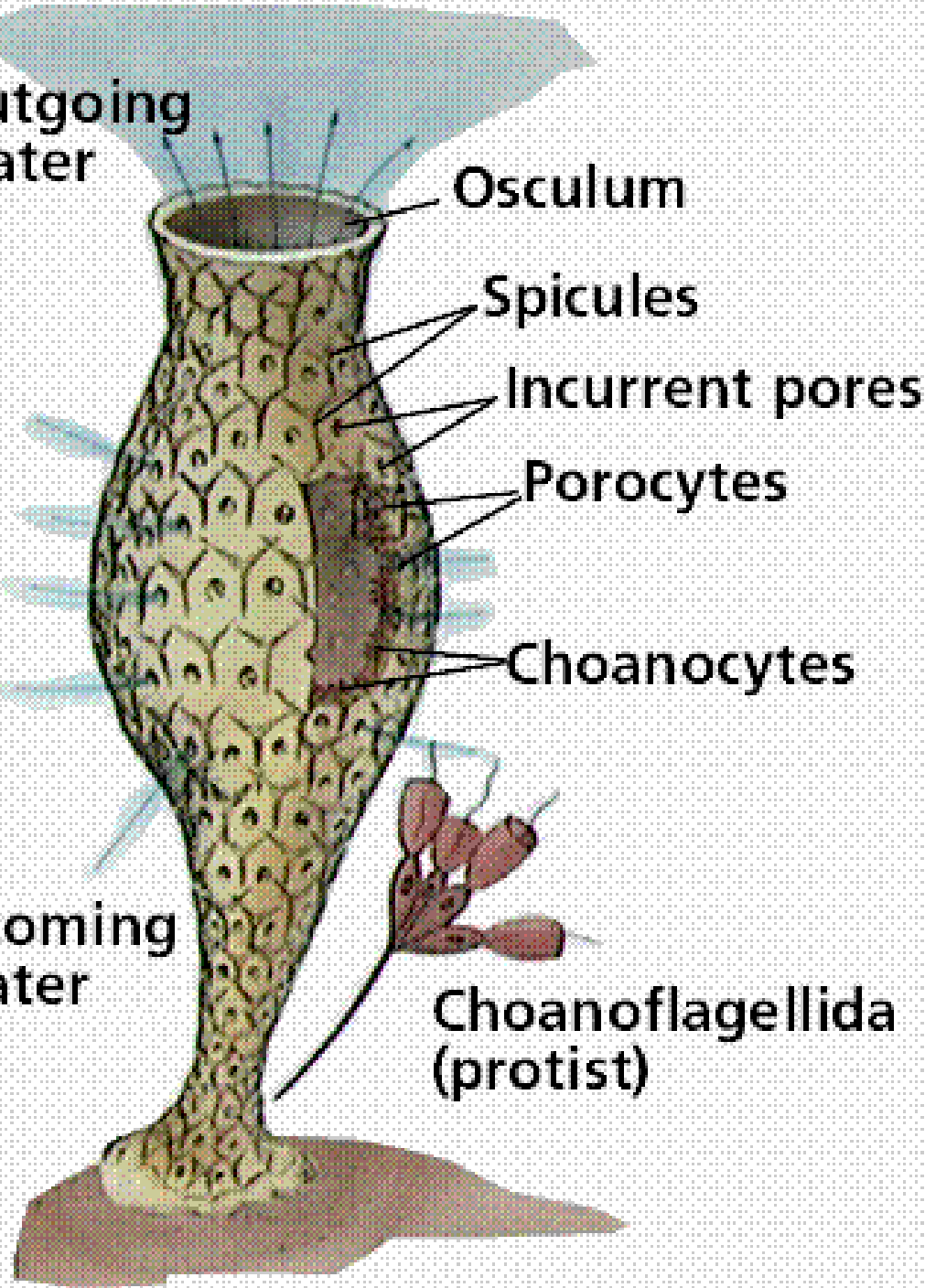
Incurrent pores

Porocytes

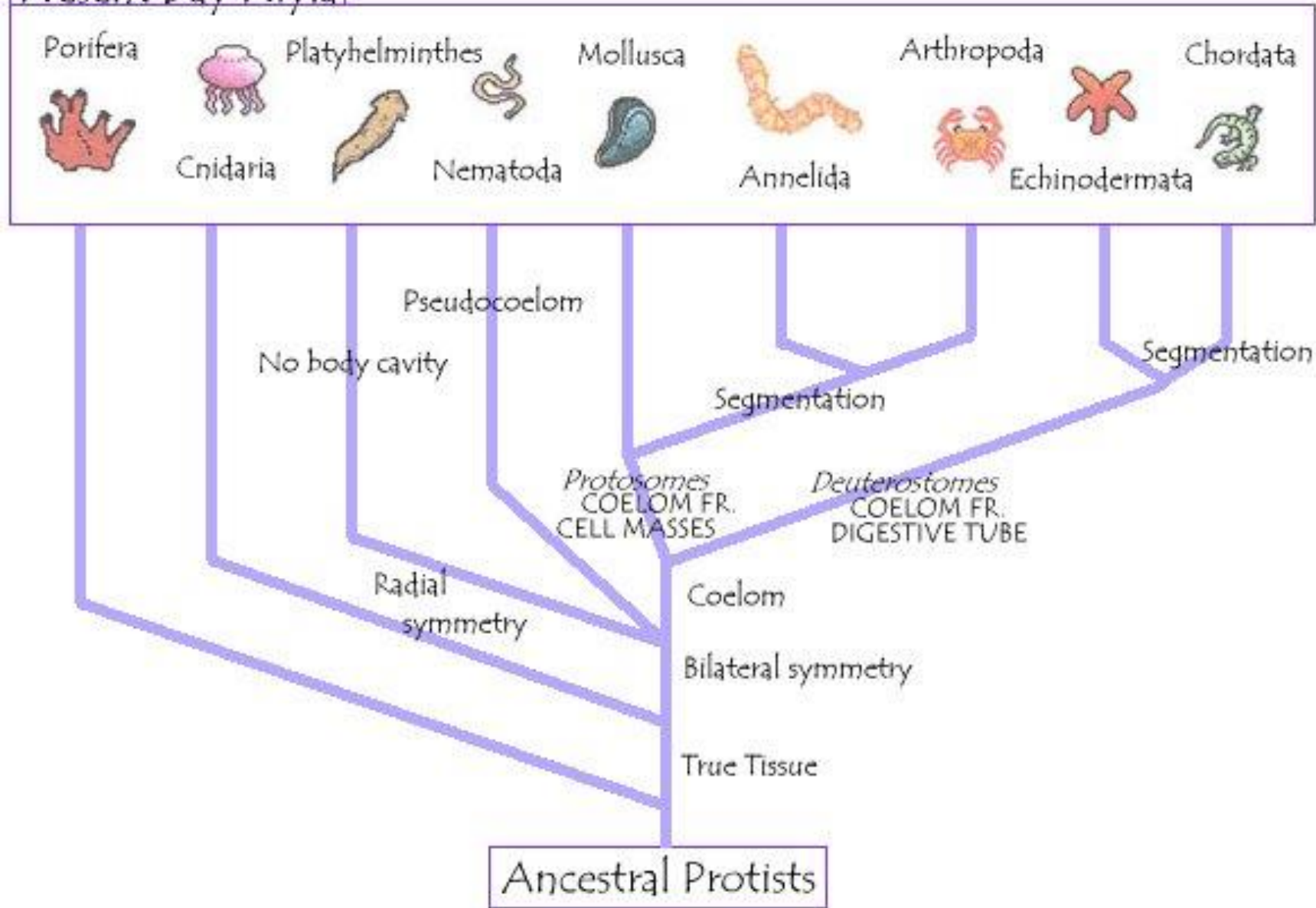
Choanocytes

Incoming
water

Choanoflagellida
(protist)



Present Day Phyla



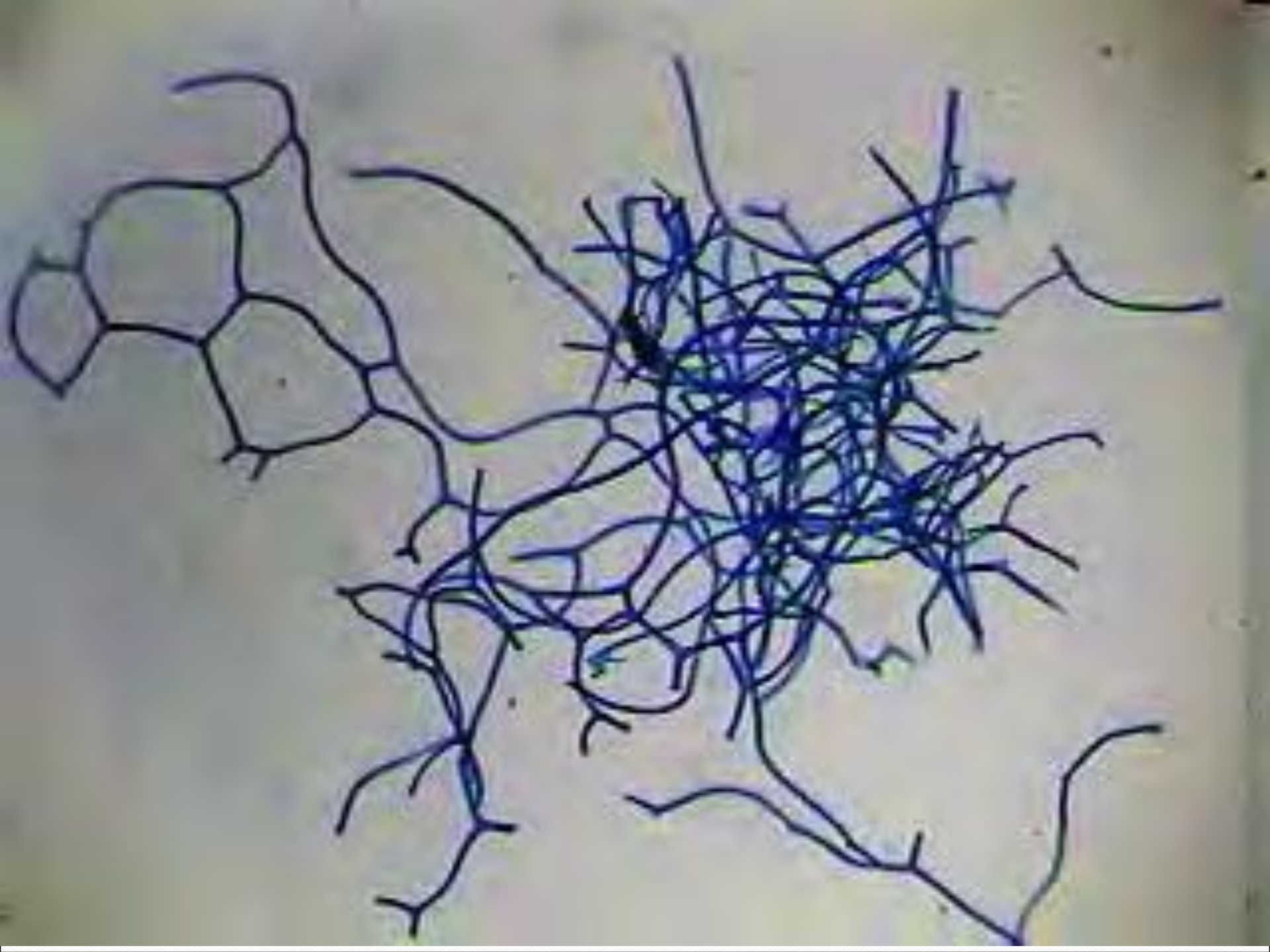
Phylogenetic Tree of *KINGDOM ANIMALIA*

- Ask about William Wilson (1907)

- Individual sponge cells can function independently

Body Plan and Classification

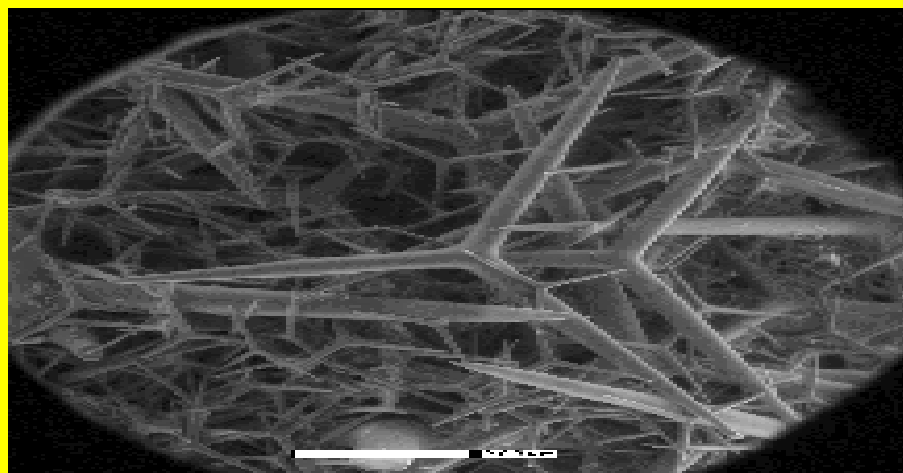
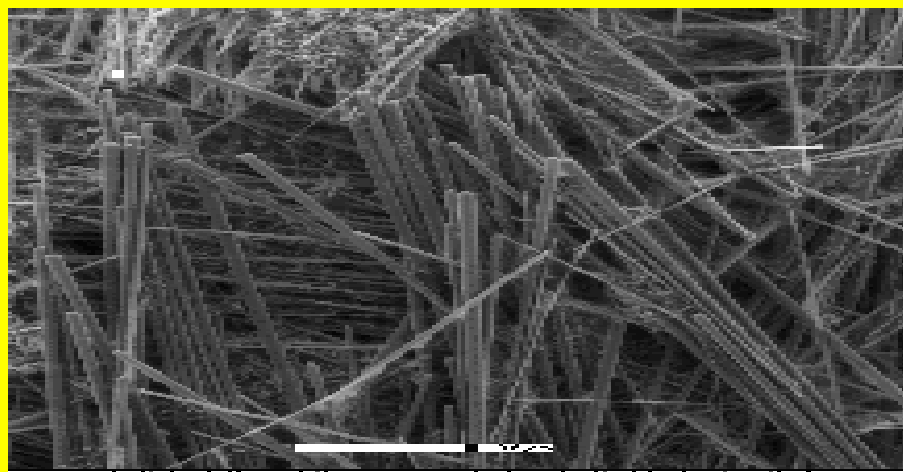
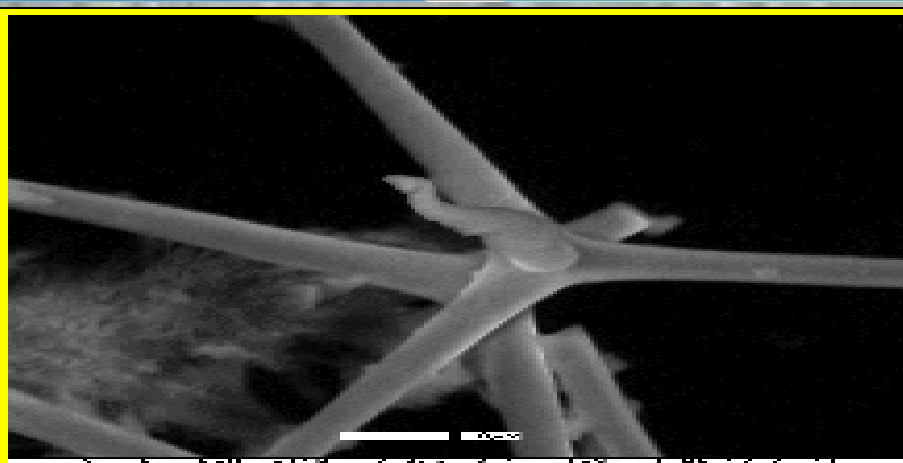
- Sometimes radially symmetrical, but usually asymmetrical.
- Class Demospongia are internally supported by protein fibers called spongin



- Other sponges have skeletons consisting of hard mineralized spicules

- Class Calcarea: Calcium Carbonate (CaCO_3),

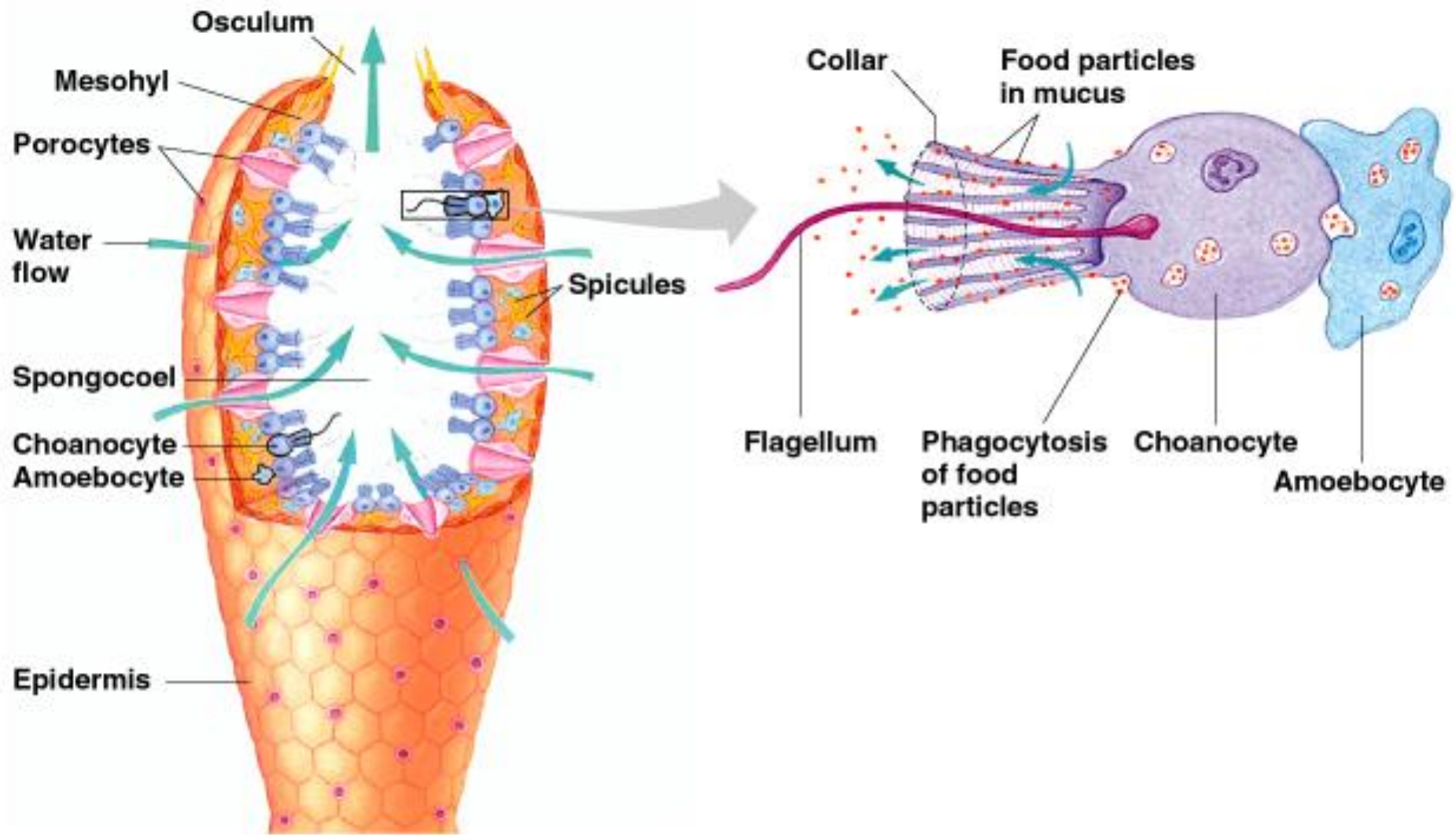
- Class Hexactinellida: Silicon Dioxide (SiO_2)



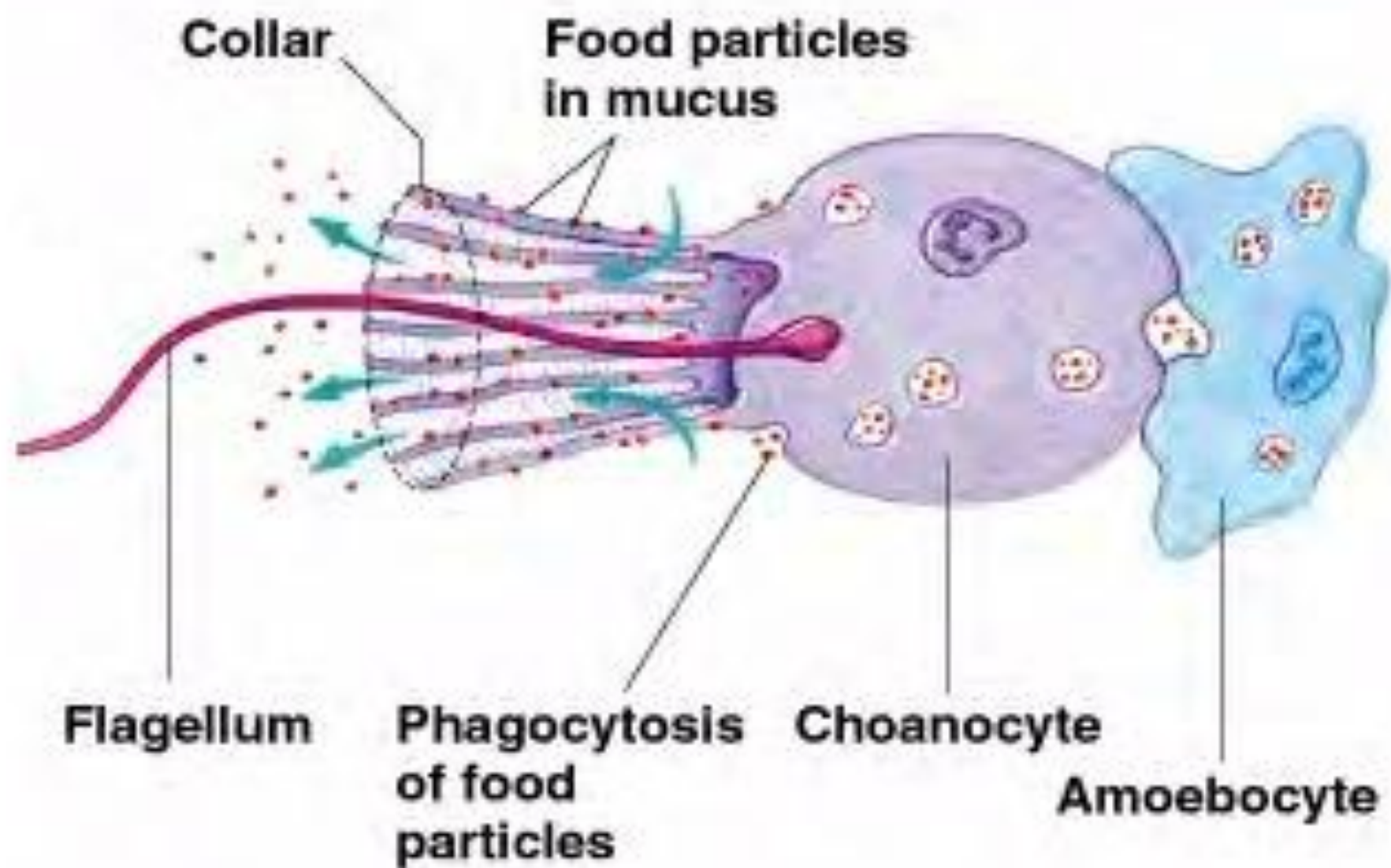
S **H** **A** **R** **E** **P** **R** **O** **V** **E** **P** **R** **O** **T** **E** **S** **T** **H** **E**



- Body wall consists of two layers of cells separated by a jelly-like substance (mesohyl)
- Arranged as cylinders with one open end and one closed end



- Interior of cylinder is lined with collar cells, or Choanocytes





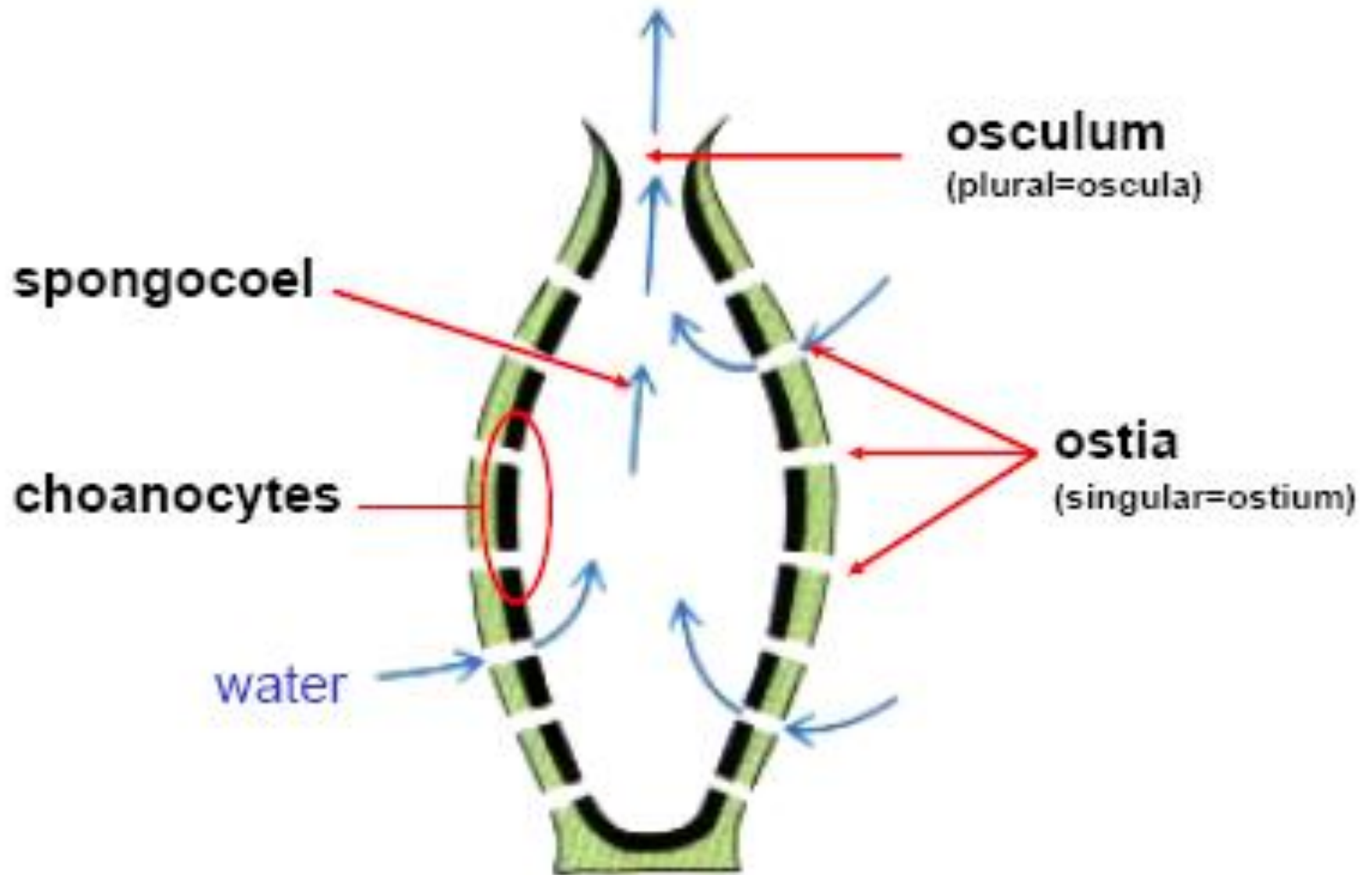
- Choanocytes beat flagella to draw water into sponge through pores (extracts food and oxygen)
- Water then leaves through osculum (hole at the top of sponge)

- Exterior of cylinder is lined with cells called pinacocyte
- Similar to epithelial cells
- One layer thick

- Porocytes are cells that make up the pores. The hole in the porocyte is called the ostium

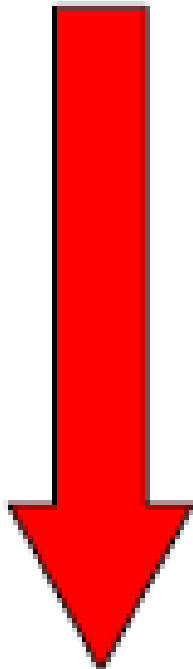
- Amoebocytes are free-moving cells that feed on foreign matter and bacteria.
 - Provide nutrients to the entire organism
- Interior of sponge is called the spongocoel

General Body Plan



3 Body Types

Based on the complexity of the water canals:

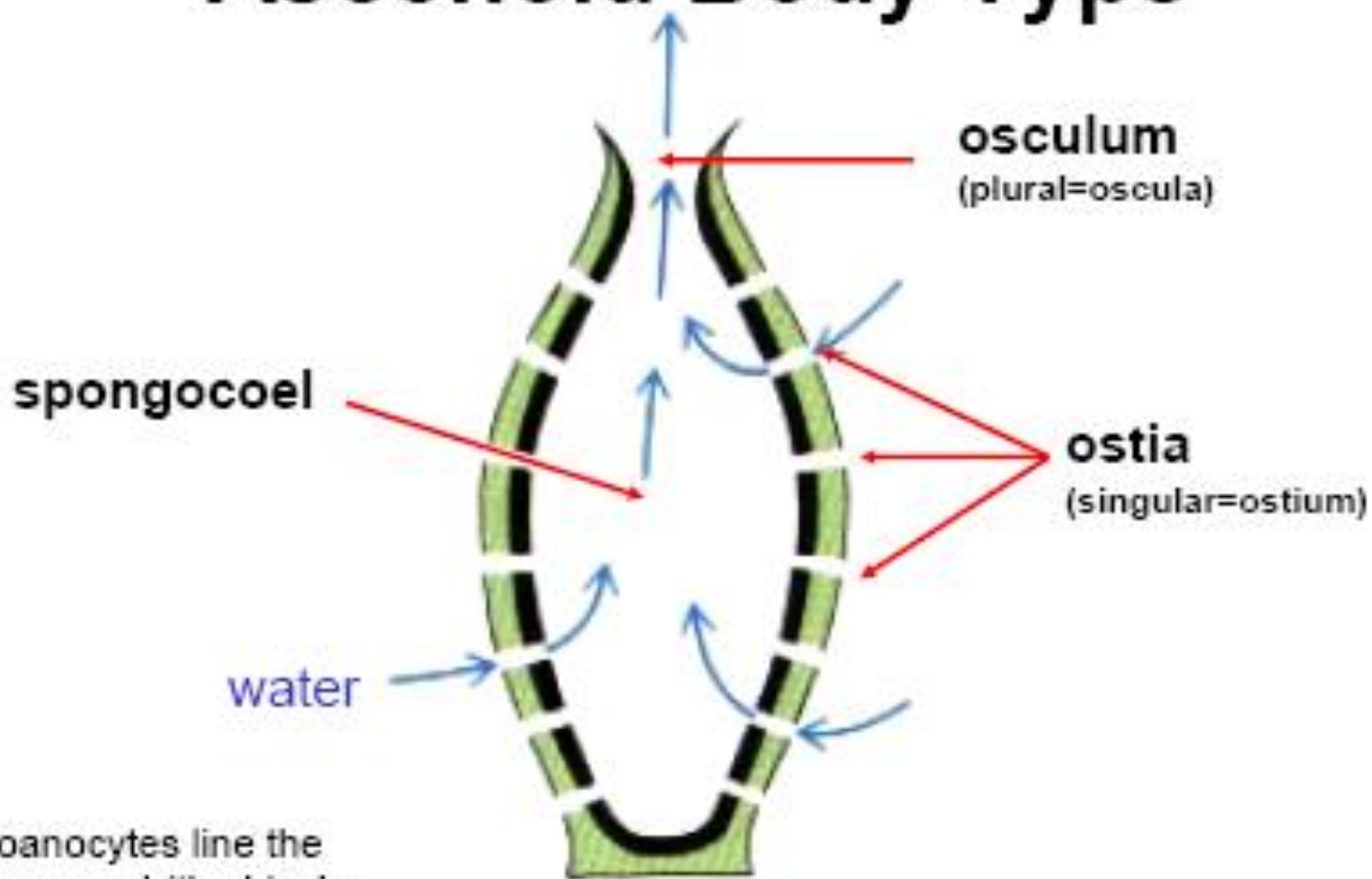


- **Asconoid**
- **Syconoid**
- **Leuconoid**

Increasing size

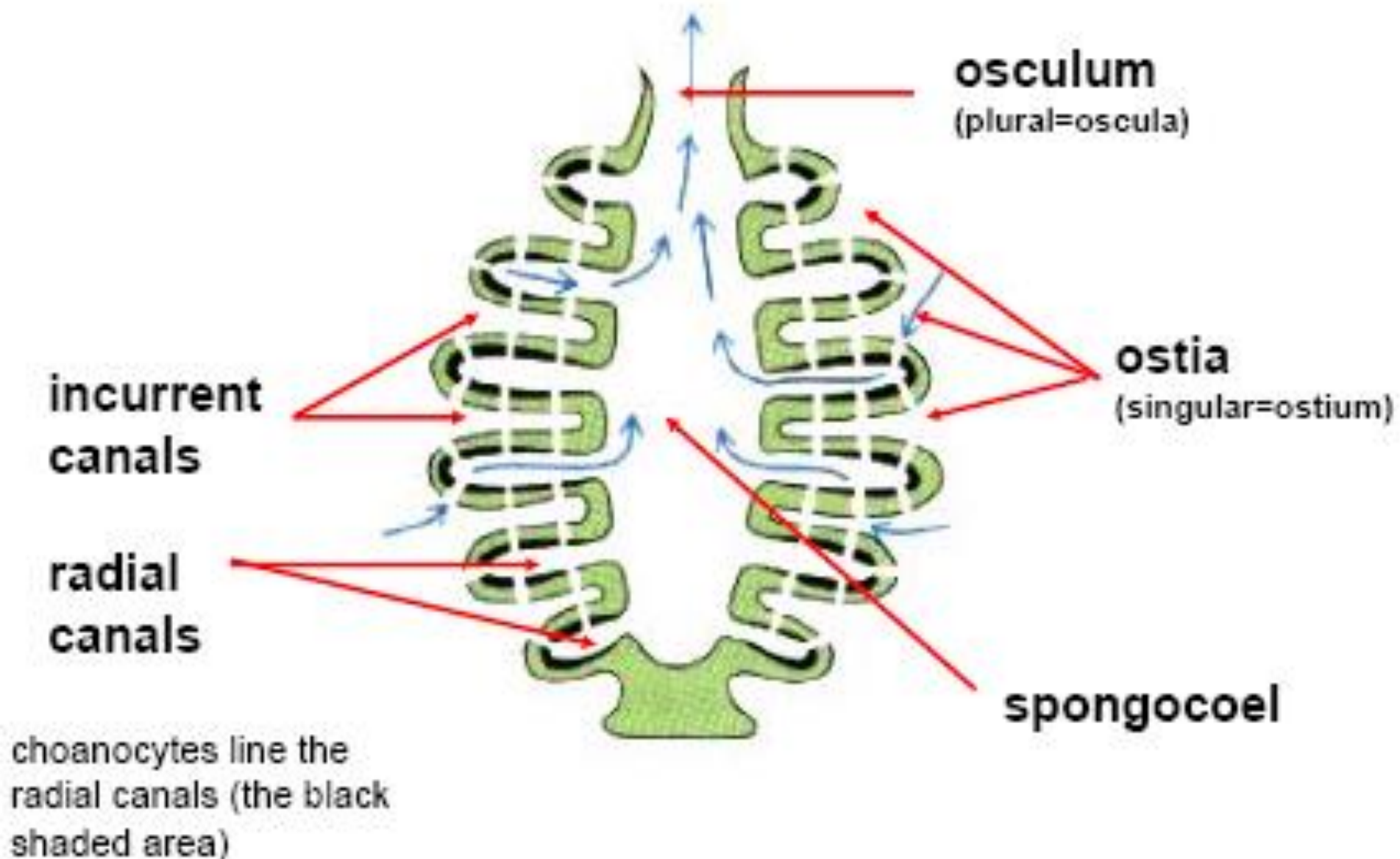
Increasing Surface Area :Volume

Asconoid Body Type

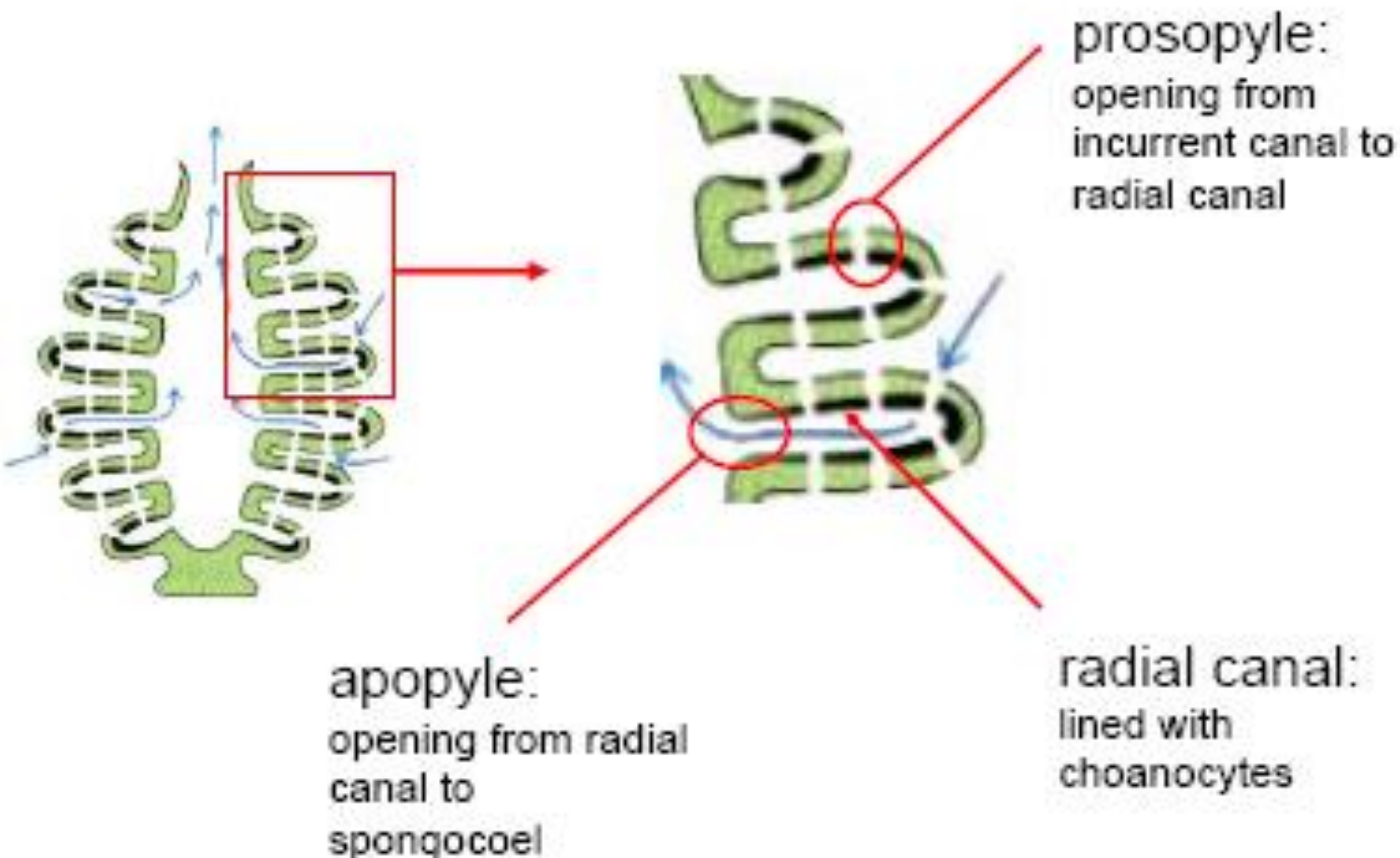


Choanocytes line the spongocoel (the black shaded area)

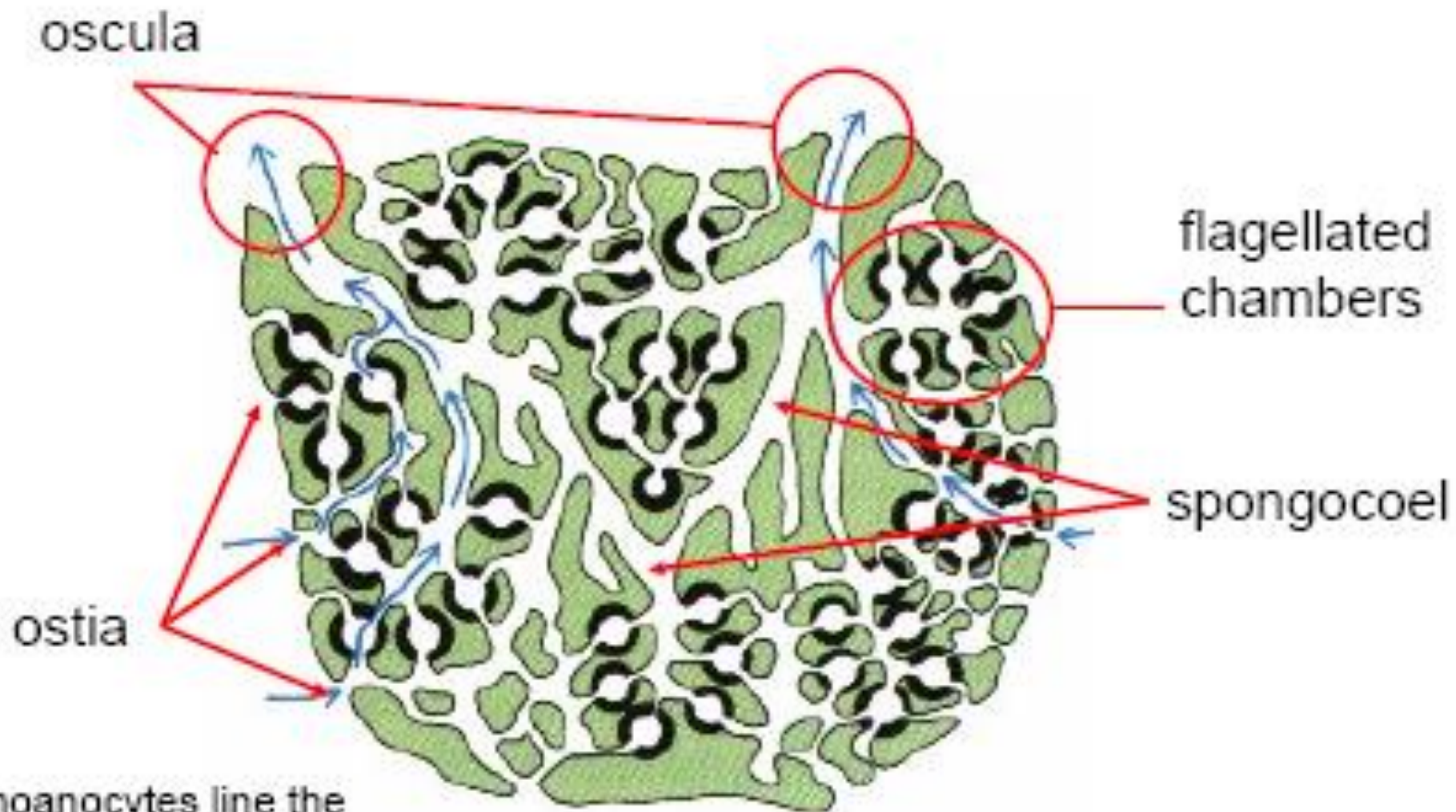
Syconoid Body Type



Syconoid Body Type



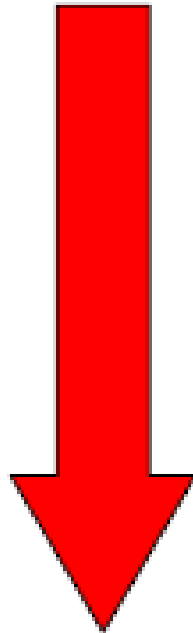
Leuconoid Body Type



Choanocytes line the flagellated chambers (the black shaded area)

3 Body Types

Based on the complexity of the water canals:



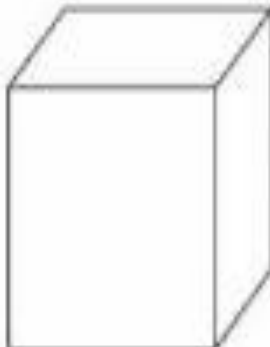
- Asconoid
- Syconoid
- Leuconoid

Increasing size

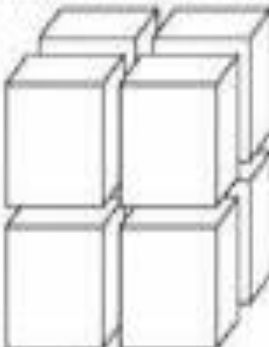
Increasing Surface Area :Volume

$$SA = l^2 \times 6$$

$$V = l^3$$



One 4-cm
cube



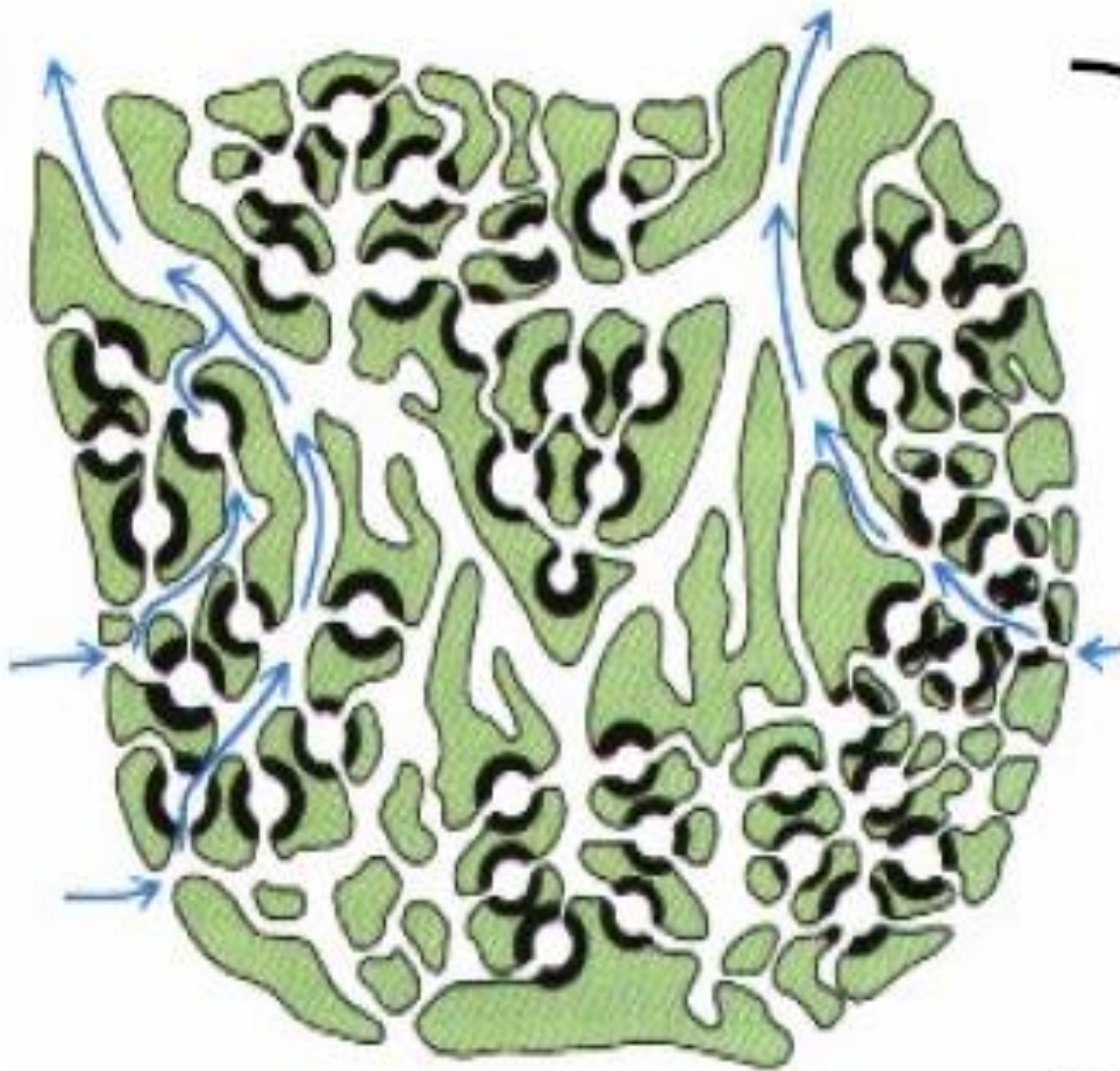
Eight 2-cm
cubes



Sixty-four
1-cm cubes

Surface area			
96 cm ²	192 cm ²	384 cm ²	
Volume			
64 cm ³	64 cm ³	64 cm ³	
Surface area: Volume per cube			
1.5:1	3:1	6:1	





The large SA:V of
leuconoid sponges



More space for
choanocytes



More water flow



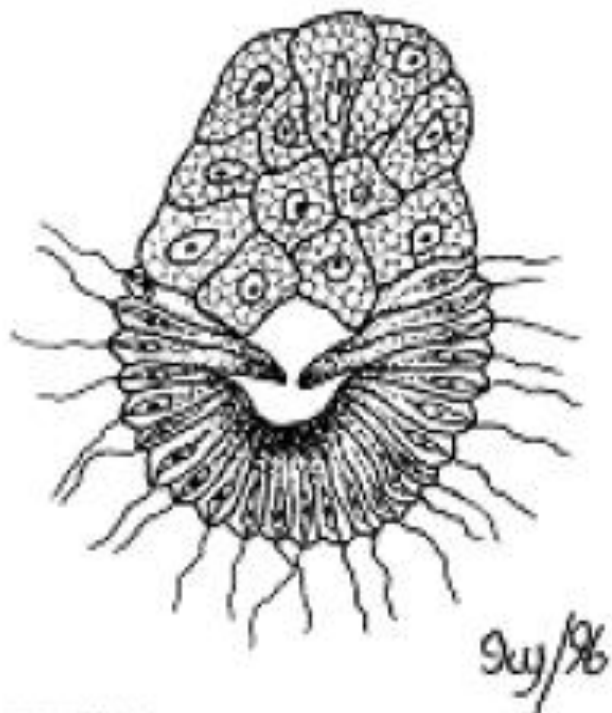
Larger size

Reproduction

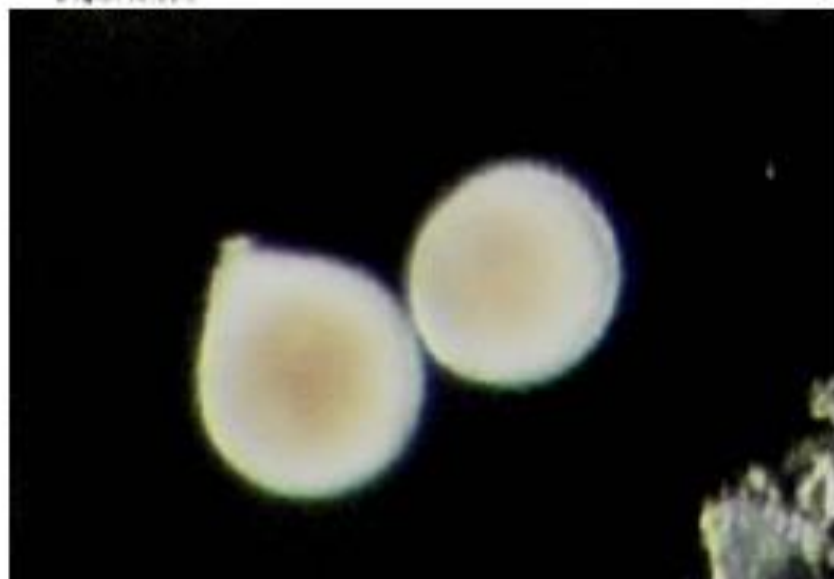
- Asexual- budding, fragmentation, regeneration, gemmules (freshwater “spores” produced in unfavorable conditions)
- Sexual- sperm produced by one sponge enters the pores of another

- Choanocytes carry engulf sperm and transfer them to amoebocytes, which carry sperm to egg.
- Formed free-swimming larvae move off to settle and grow.

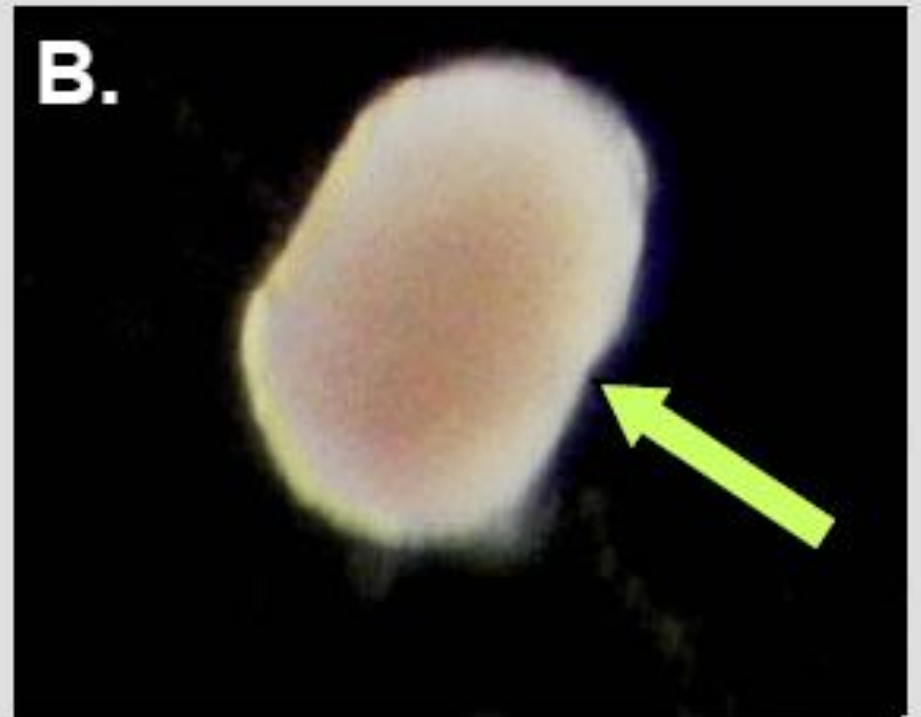
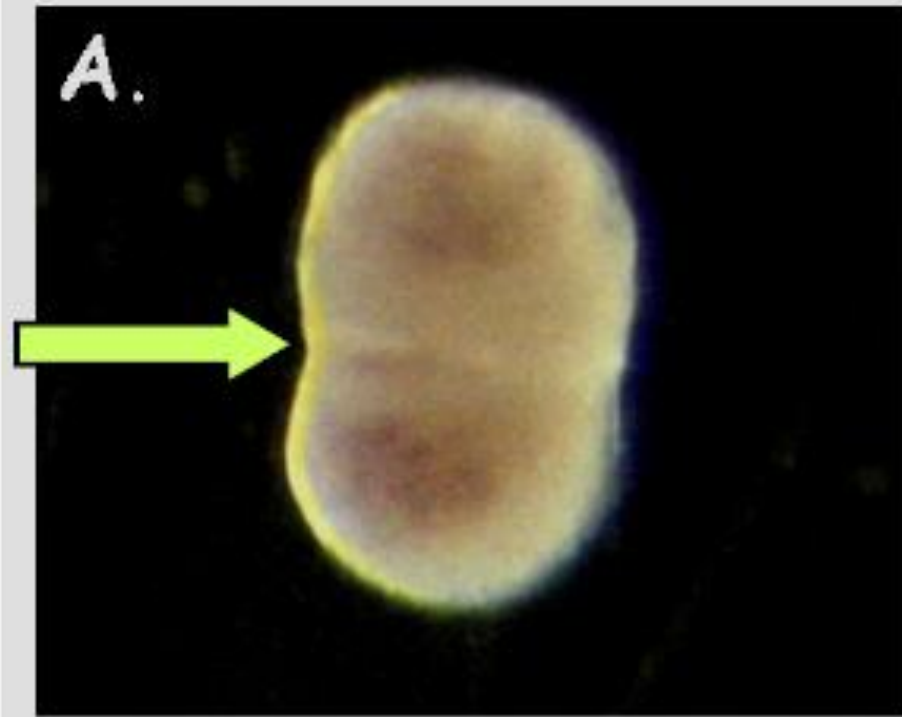
- A few species have male and female sexes
- Most are hermaphroditic, or monoecious
- Self-fertilization is rare



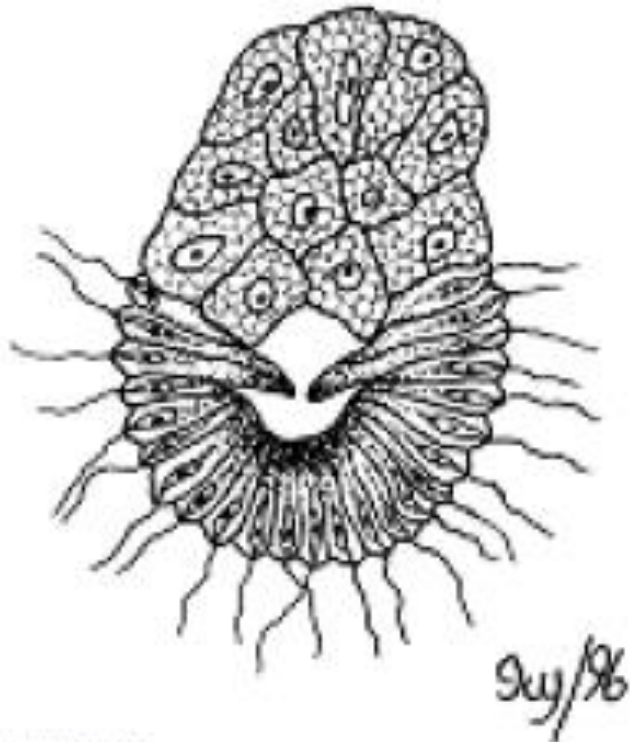
Some sponge larvae crawl along the bottom, whereas others are free swimming.



Some free-swimming larvae are capable of fusing with others!



250 μm



Larvae eventually settle and metamorphose into adults

