

Porifera

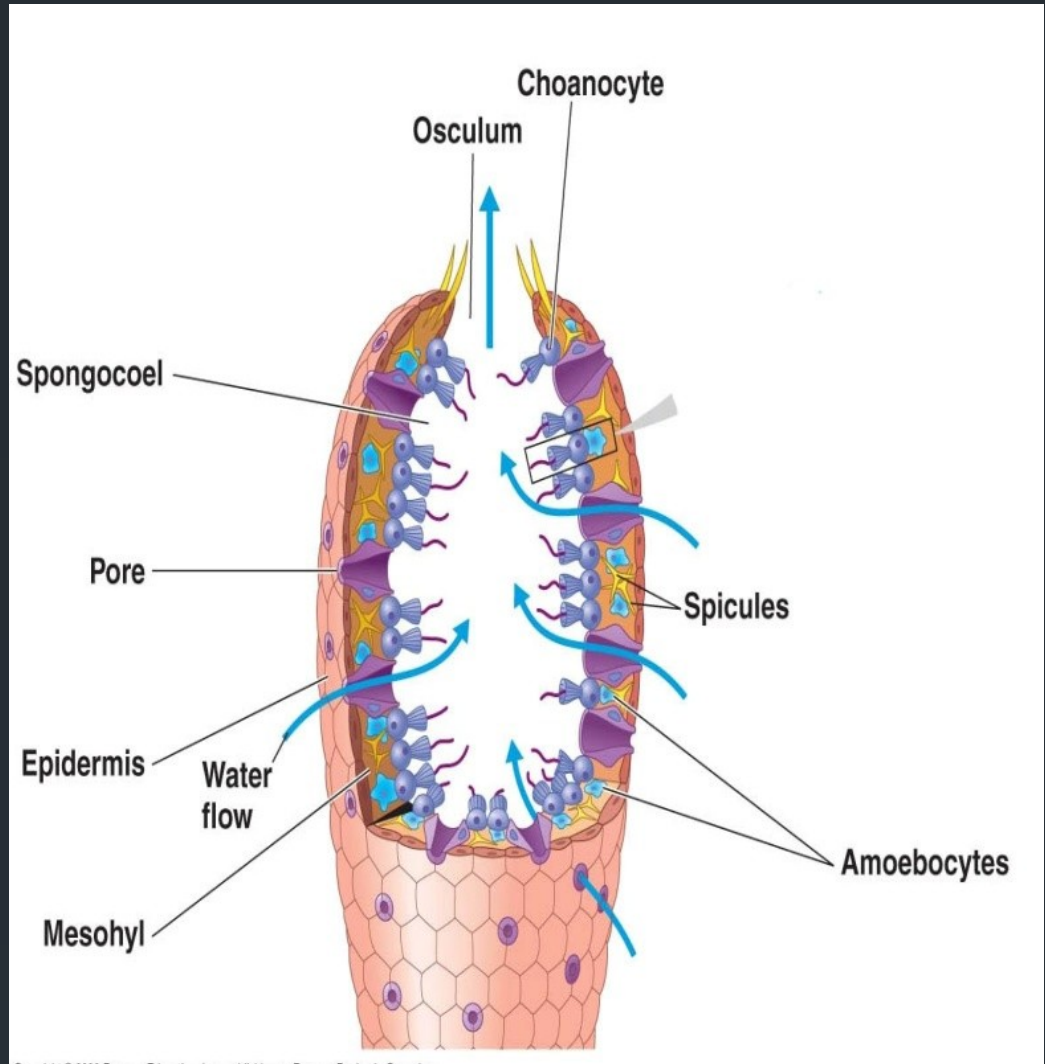


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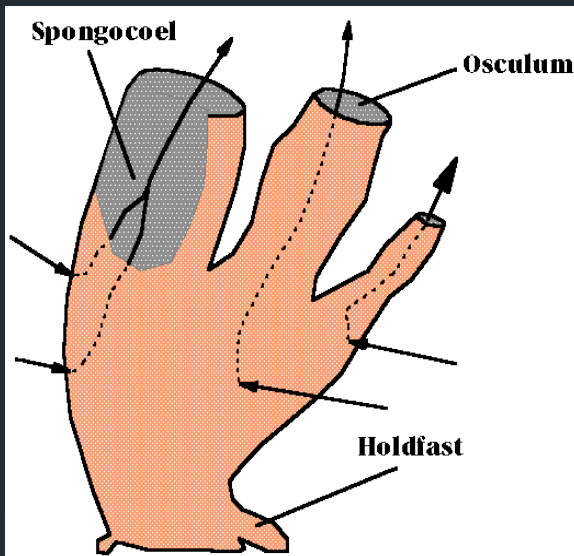
Goals of Topic:

- General characters of Porifera
- Sycon (Scypha):
- Morphology,
- Different types of cells in sycon,
- canal system in Porifera.

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Porifera



- These are the simplest metazoans
- Contain specialized cells but no other organization level
- Most are marine
- Saltwater sponges are brightly colored
- Freshwater sponges are small and dull green color
- Size - 2 meters to 2 cm

Characteristics of sponges are:



- Little or no tissue organization
 - Said to belong to the cellular level of organization.
 - No organs, no systems, no mouth, or digestive tract, only rudimentary nervous integrations.
 - No germ layers (so neither diplo or triploblastic)
 - Some have symmetry some don't
 - Pores and canal systems (asconoid, siconoid, and leuconoid)
- ☐ Porifera means pore-bearing
 - ☐ Water enters through pores bringing in food and oxygen
 - ☐ Filter feeders on plankton

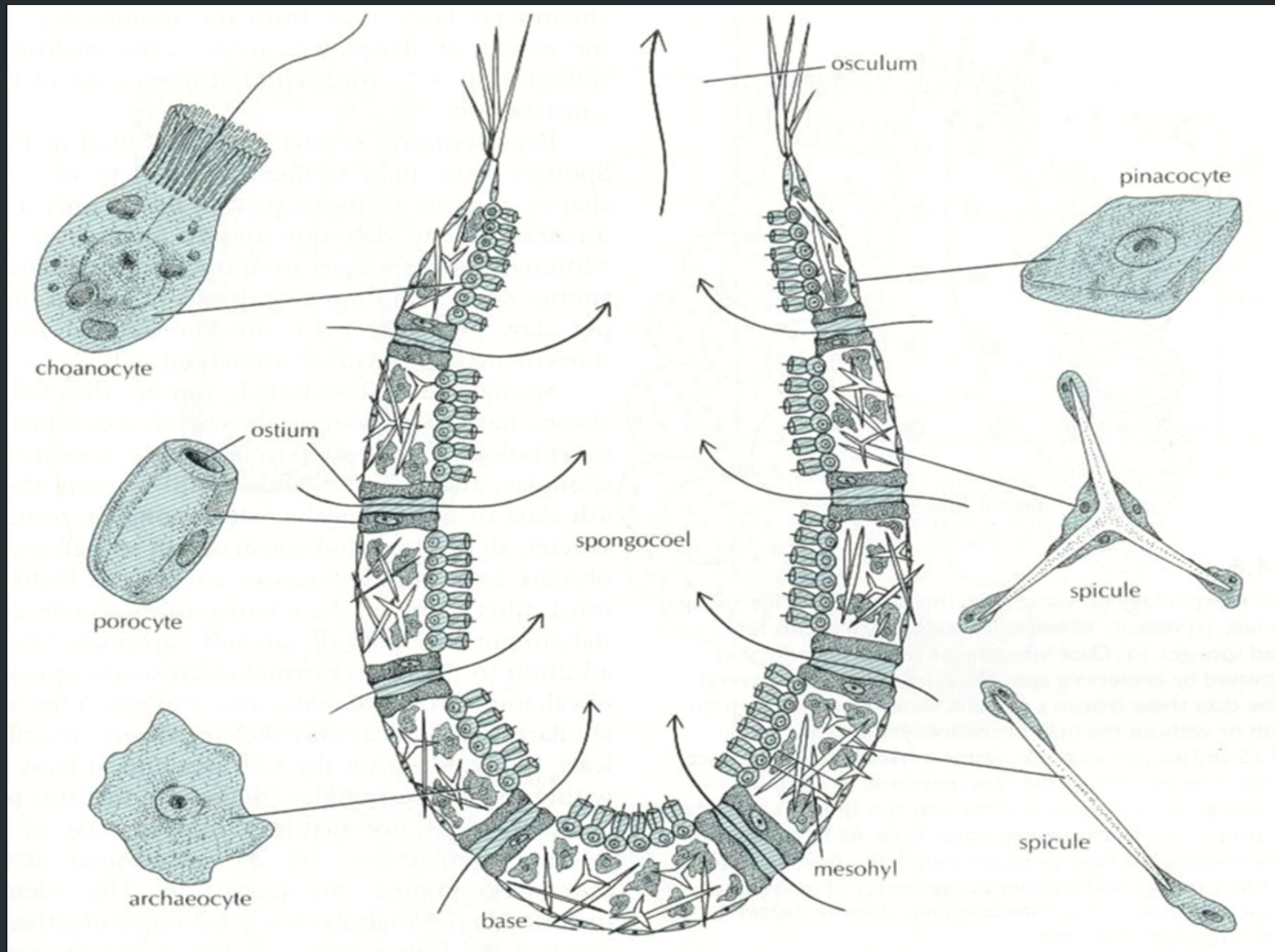
- Osculum – large opening at the top where excess water leaves
- Internal skeletons of spicules or organic fibers (spongin).
- Flagellated sponge feeding cells= choanocytes.
- Internal skeletons of spicules or organic fibers (spongin).
- Internal cavity= spongocoel that opens to an osculum
- Internal cavity= spongocoel that opens to an osculum



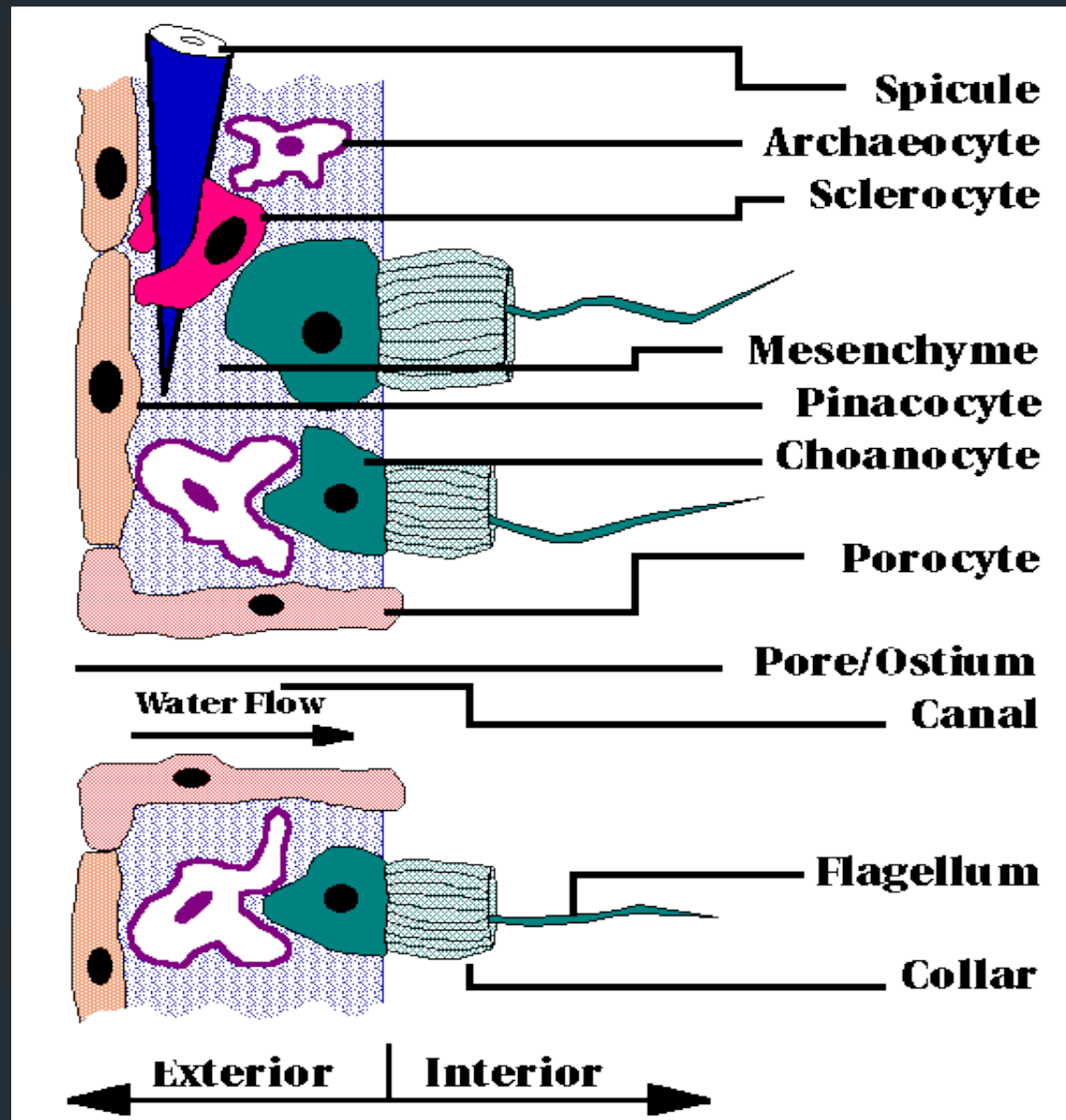
Cell Types, Body Wall, and Skeletons

- Pinacocytes – thin, flat cells that line the outer surface of a sponge; may be contractile vacuole; and their contraction may change the shape of some sponges.
- Porocytes – specialized pinacocytes that can regulate water circulation
- Mesohyl – jellylike layer found just below pinatocyte layer
- Mesenchyme cells – amoeboid cells that move about in the mesohyl and are specialized for reproduction, secreting skeletal elements, transporting and storing food, and forming contractile rings around openings in the sponge wall.

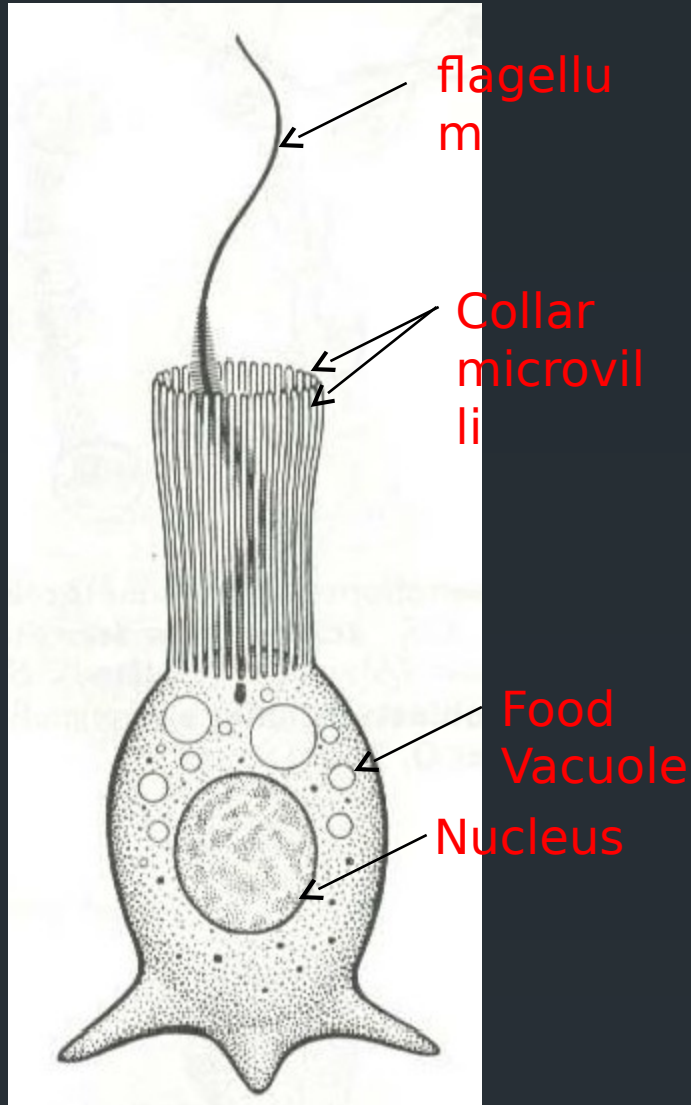
- Choanocytes – collar cells, found below the mesohyl and line the inner chamber(s); flagellated; the flagellum moves in a circular motion that creates a water current that moves through the sponge.
- Spicules – formed by amoeboid cells, made of calcium carbonate or silica



Microscopic view of Porifera cells



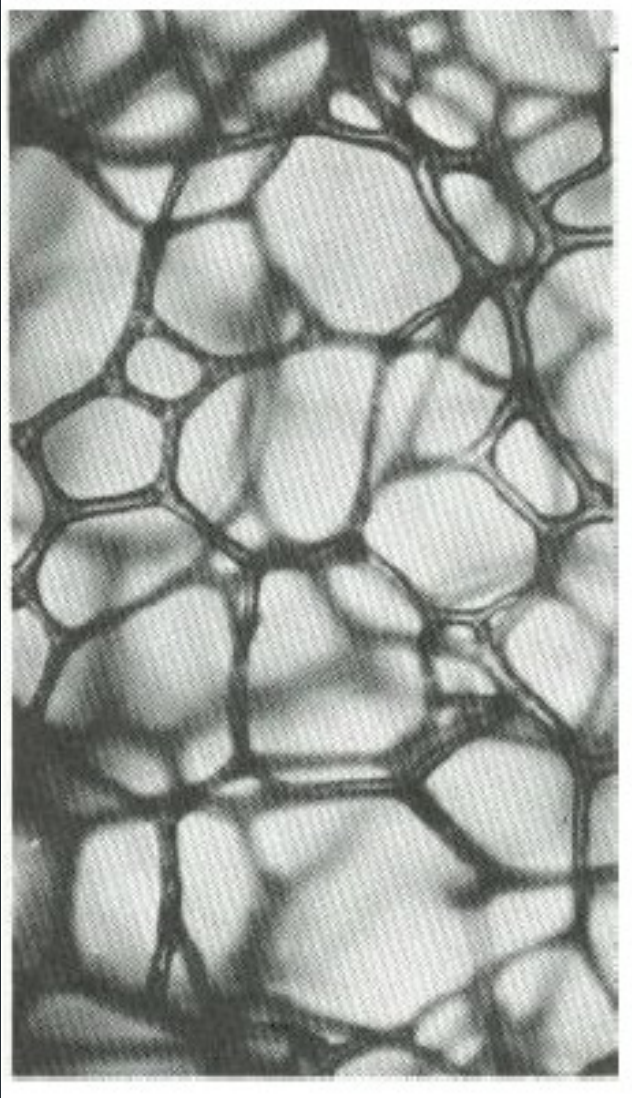
Choanocytes (collar cells)



- ❖ They line the flagellated canals and chambers
- ❖ They are ovoid with one end embedded in the mesohyl
- ❖ Adjacent Microvilli are connected to each other by microfibrils
- ❖ They act as a pump to bring water into the sponge
- ❖ Food engulfed is passed to archeocyte for digestion

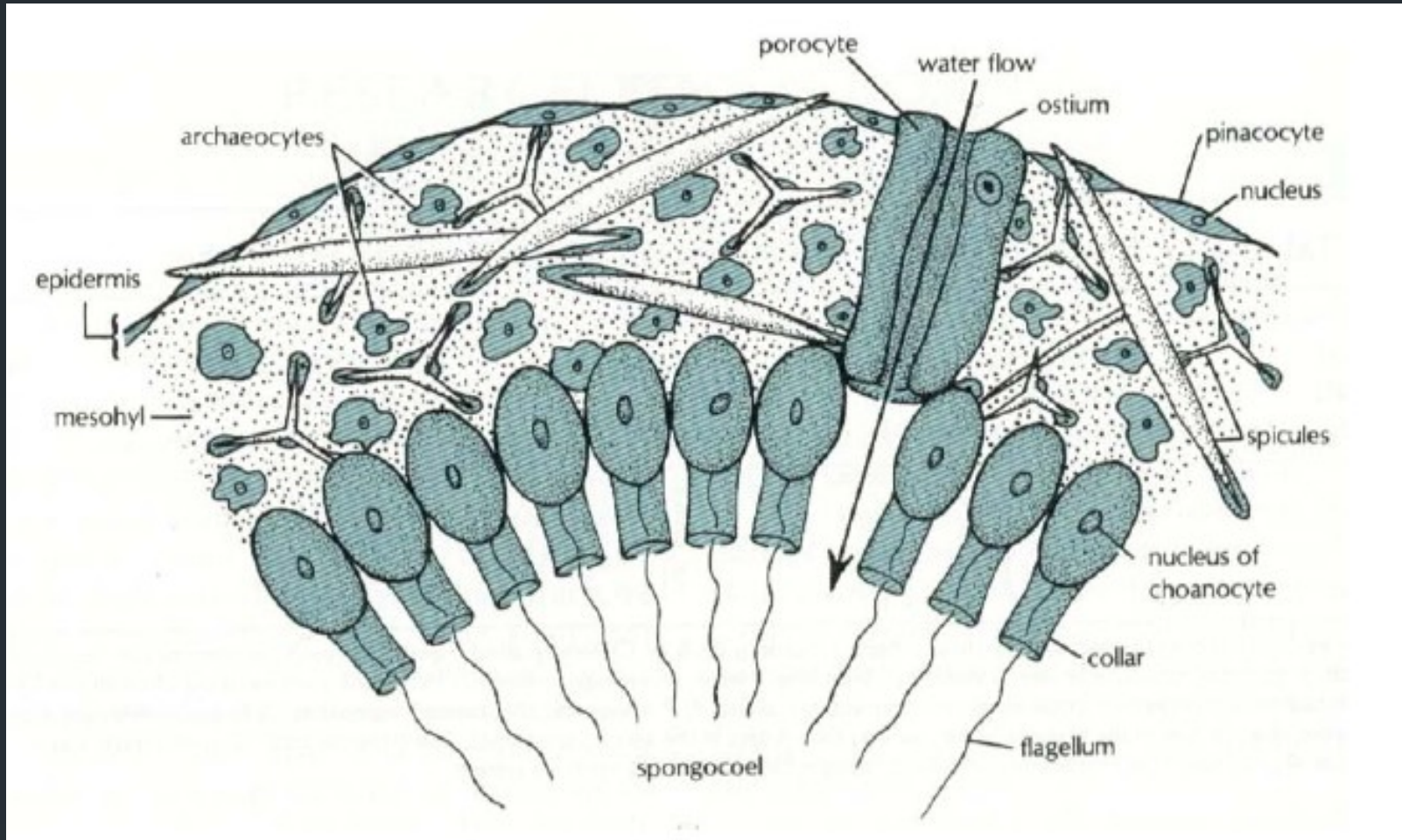


Collagen - Support



- Collagen is found between the inner canals and chambers
 - Mesohyl
- Amoeboid cells located in the mesohyl, have different roles:-
 1. Archeocytes: motile in the mesohyl:
 - Phagocytize particles in the pinacoderm,
 - Receives particles for digestion
 2. Sclerocytes: Specialized, secrete spicules
 3. Spongocytes: Secrete spongin fibres for skeleton
 4. Collencytes: Secrete fibrillar collagen
 5. Lophocytes: Secrete large quantities of Collagen distinguishable from collencytes

Body wall: Support



Small Section through Sponge wall

Types of Spicules



- Demospongiae & Sclerospongiae secrete siliceous spongin silicon dioxide (SiO_2).
- Calcareous sponges secrete crystalline calcium carbonate (CaCO_3) spicules with one to four rays

Collagen is stiffened by addition of microscopic mineral accretions or additional protein fibers (spongin) or both

Types of Spicules

4 general types

- Monaxon- needle-like or rod-like; straight or curved
- Tetragon- has 4 prongs
- Triaxon or Hexaxon- 3 or 6 rayed
- Polyaxon- multiple short rods radiating from a common center; burr shaped, star shaped or like a child's jack.
 - Some species have a mixture of types

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Types of sponge spicules

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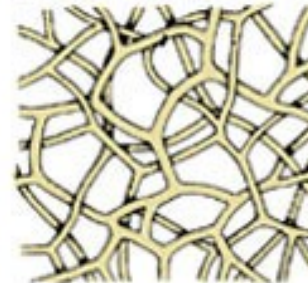


**Siliceous
spicules**

(Hexactinellida) (Demospongiae)



**Siliceous
spicules**



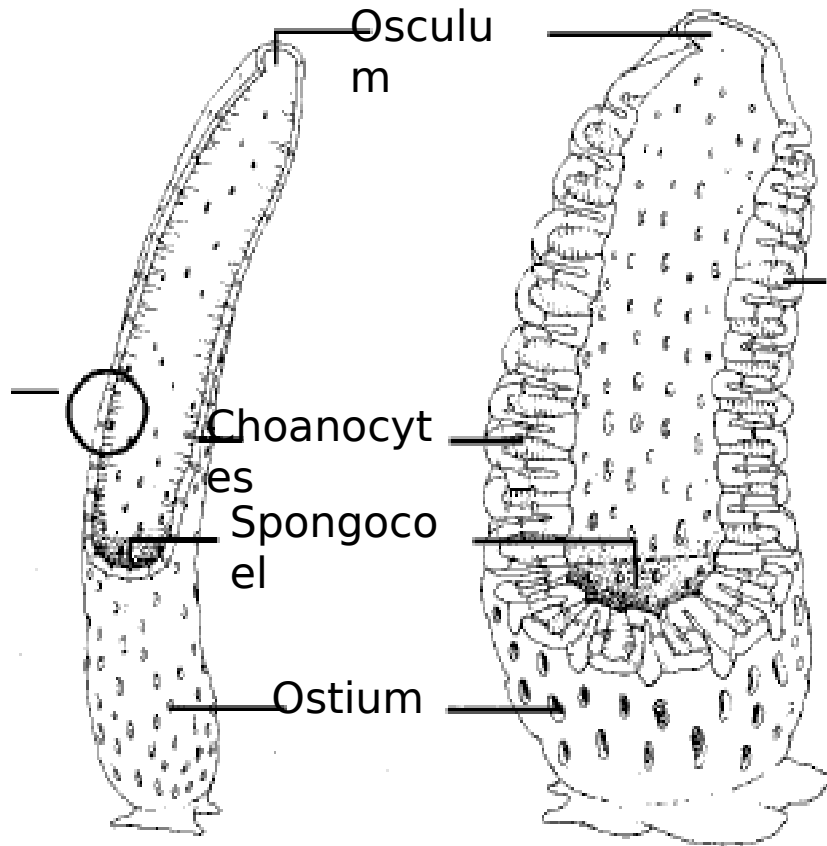
Spongin



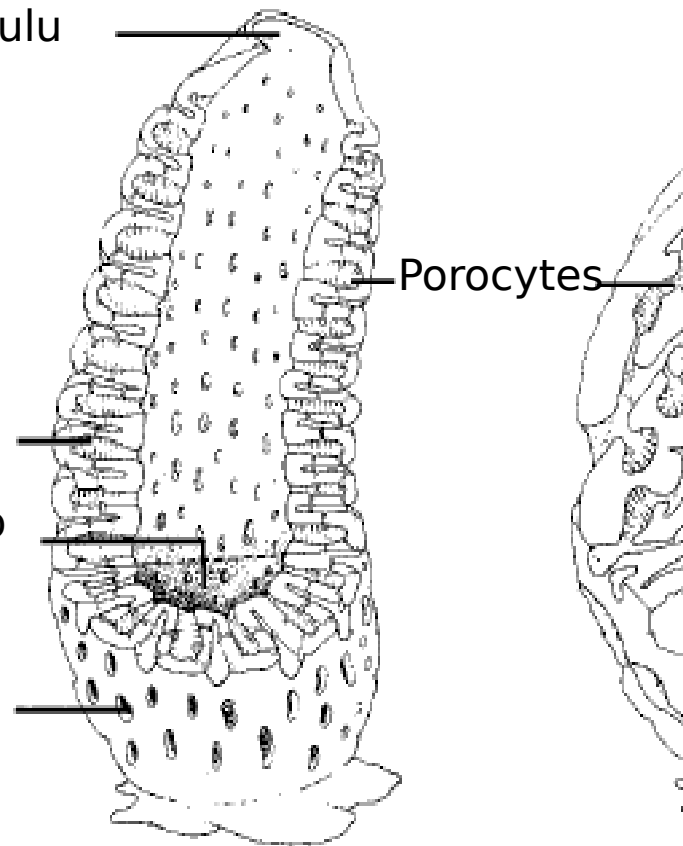
Calcareous



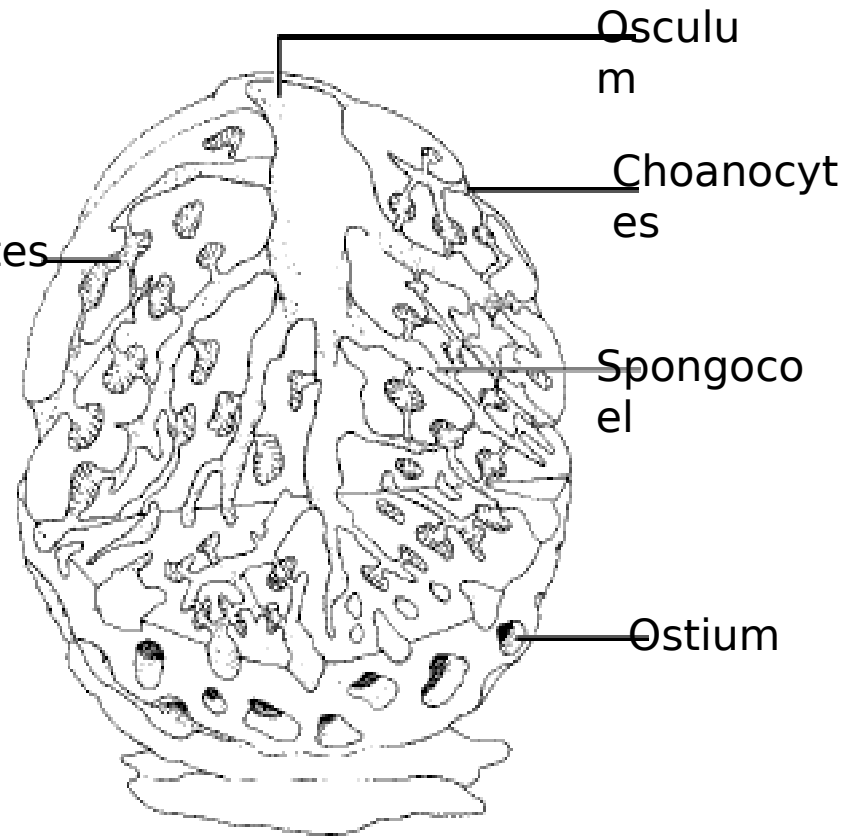
Types of Canal Systems



Ascon

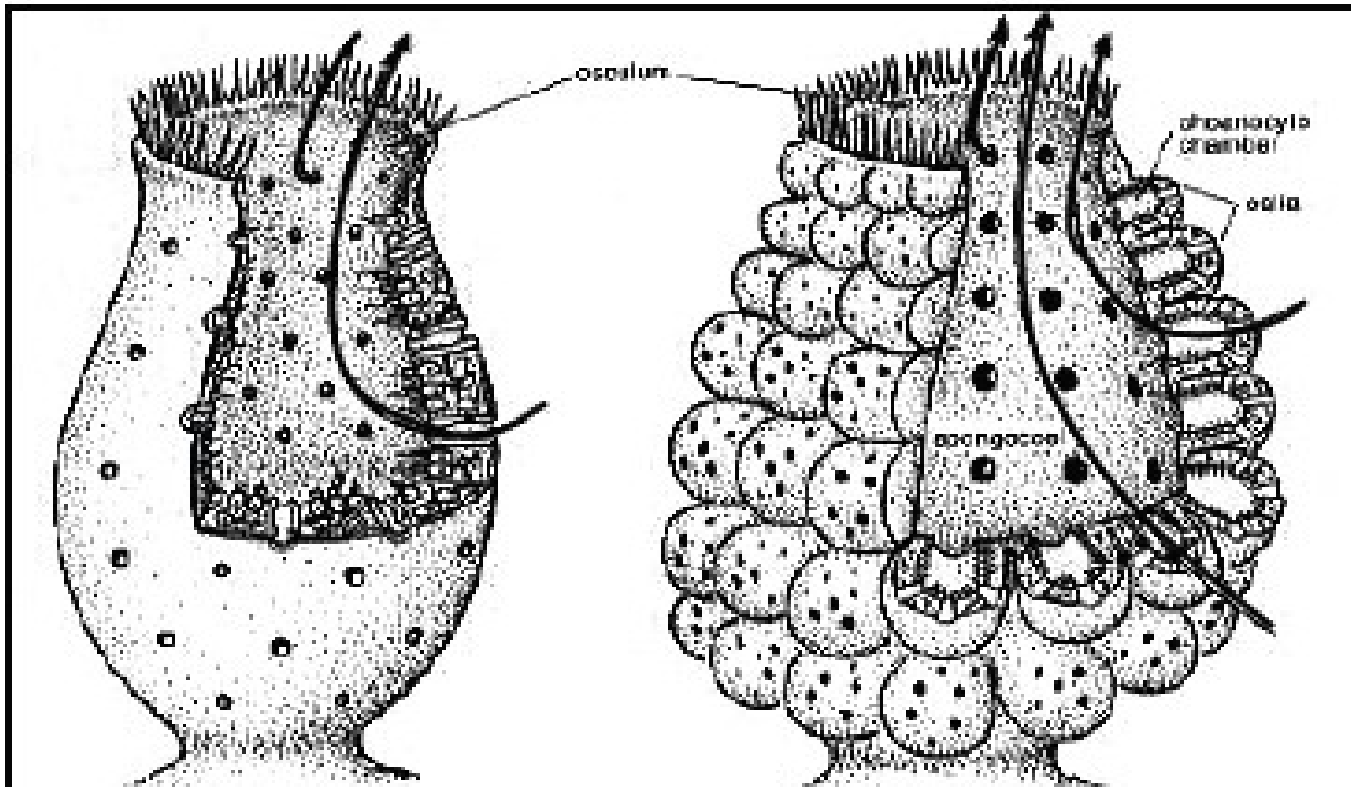


Sycon



Leucon

Anatomy of Ascon & Sycon



Asconoid Sponge

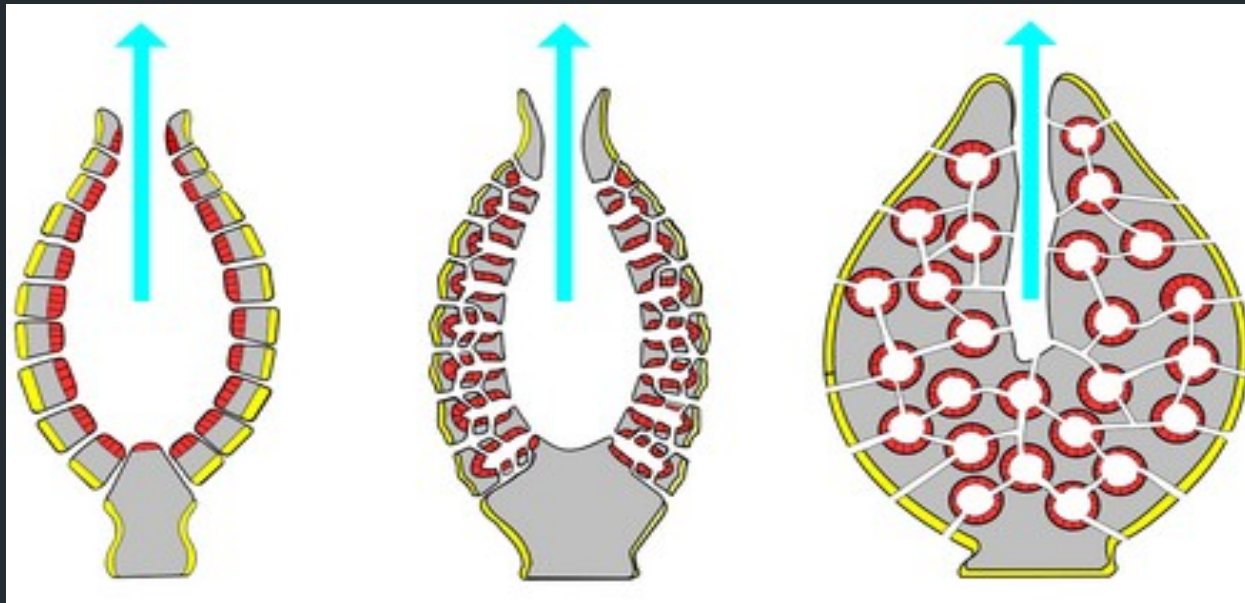
Syconoid Sponge

Ascon

- Simplest; least common; vasselike; Ostia are the outer openings of porocytes and lead directly to a chamber called the spongocoel; Water exits the sponge through the osculum (a single large opening at the top of the sponge.)

Sycon

Sponge body wall appears folded; folds into the sponge are called incurrent canals; folds out of the sponge are called radial canals; water enters through dermal pores; into the spongocoel and out the osculum



Asconoide

Siconoide

Leuconoide

Leucon

- Have extensively branched canal system; water enters the sponge through ostia, through branched incurrent canals, into choanocyte-lined chamber, into excurrent canals and eventually through oscula (multiple osculum)

Classification

Phylum Porifera

- Class Calcarea,
- Class Demospongiae,
- Class Hexactinellida,
- Sclerospongiae (no longer considered a class)



Classification

Class Calcarea (calcareous sponges):

- small, vase shaped, primitive group,
- mostly drab coloured; a few are yellow, red, green, lavender,
- all marine, especially shallow waters,
- show all 3 types of canal systems; mostly asconoid canals,
- spicules of CaCO_3 , needle shaped or 3-4 rayed, monaxons,
- Grows in colonies
- Straight spicules around the osculum that discourages small animals from entering



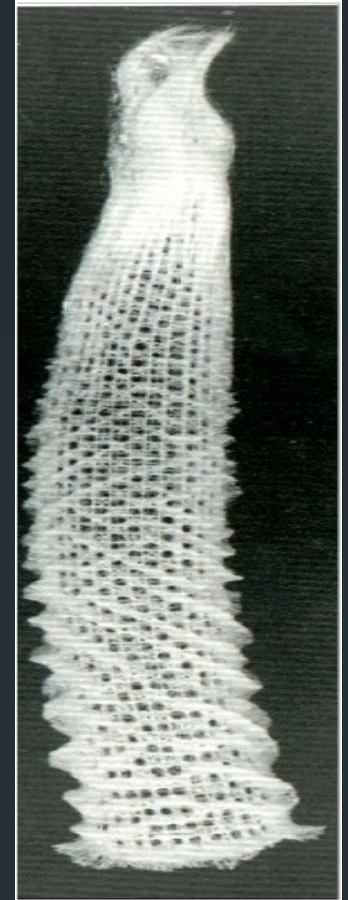
Class Demospongiae (Most sponges)

- Possess spicules made of silicon dioxide (SiO_2) or spongin or a combination of both
- Most sponges belong to this class (90%) Nearly all are leuconoid body type,
- 95% are living, encrusting plants
- Mostly found on the continental shelf in well oxygenated habitats
- *Spongilla spp.* (Bath sponge), present in midsummer and later form gemmules after disintegration



Class Hexactinellida (Glass sponges)

- Spicules are made of silica,
- Usually found in deep water on soft substrates in the tropics 200-1,000m.
- Spicules are six- rayed, pointed and have a lattice-like structure,
- Cup, vase or urn shape,
- Radially symmetrical,
- Formed as one by trabecular net of living tissues from fusion of pseudopodia of archaeocytes,
- E.g. *Euplectella* (Venus flower)



Reproduction in Sponges

ASEXUAL

Marine sponges

- Budding
- Fragmentation
- Regeneration

Freshwater sponges

- Gemmules
- Budding
- Fragmentation
- Regeneration

SEXUAL

- Male & female gametes are formed (monoecious).
- Archeocytes become eggs
- Choanocytes filter sperm out of the water
- Fertilization is involved.
- Planktonic larvae or mini flagellated colonies are released to colonize new areas

Porifera



Thank You