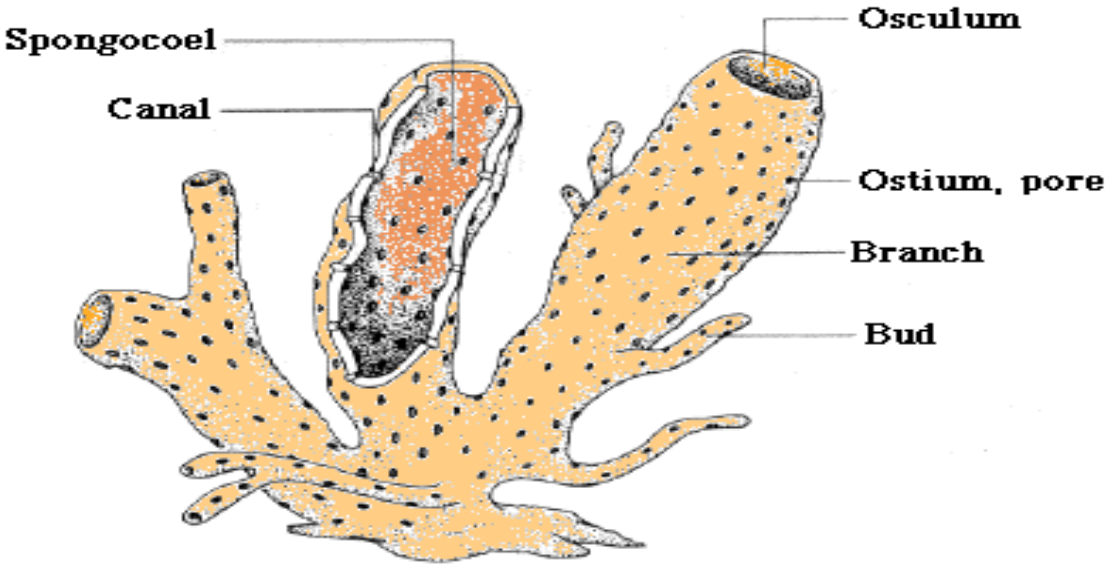
Phylum Porifera

General Characteristics of Porifera :

1. Multicellular organisms or animals .
2. The level of body organization is loose cell- aggregation .
3. Body wall with pores or Ostia (hence porifera) , canals , and chambers that serve for passage of water.
4. All aquatic and marine except one family, spongillidae which lives in freshwater
5. Sponges are asymmetrical , some are radially symmetrical .
6. Generally, the sponges possess a central cavity called spongocoel or paragastral cavity.
7. Digestion intracellular (not in paragastral cavity) .
8. Sponges have several types of cells , Choanocytes are found in the inner surfaces .
9. Excretion and respiration by diffusion .
10. Lack of nerve cells and sensory cells. Reaction to stimuli , local & independent .
11. Skeleton is composed of spicules or sponging fibers or both together or none of them.
12. Canal systems are of three main types : Ascon , sycon, and leucon.
13. Reproduction is two types :
    a. Sexual by the union of sperm and ovum.
    b. Asexual by the formation of buds, or gemmules or reduction bodies or regeneration .
14. All adults are sessile (sedentary), attached and fixed, but larvae are free- swimming and ciliated .



Classification of Phylum Porifera

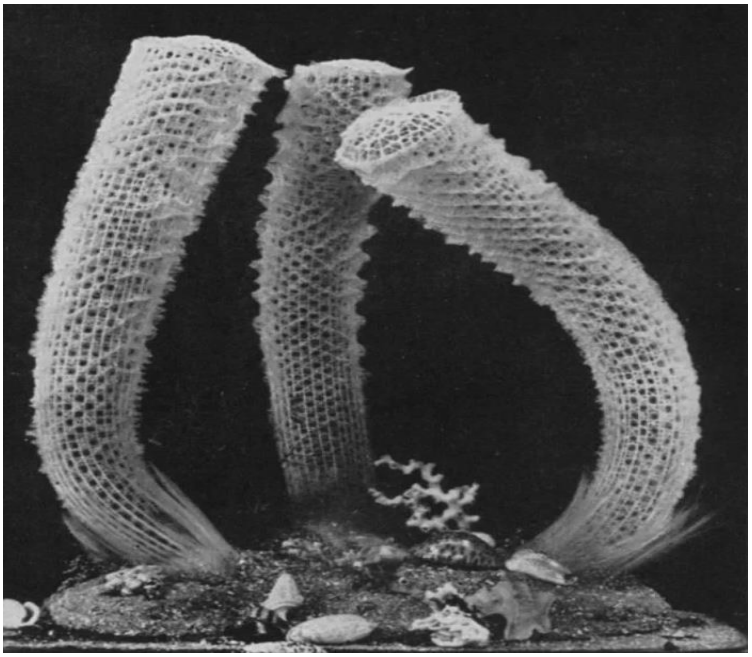
1 - Class Calcarea or Calcispongiae

1. Have spicules of calcium carbonate $CaCO_3$.
2. Spicules needle- shaped or three or four rayed.
3. All are marine. Ex: *Leucosolenia, Sycon.*

Leucosolenia

2 - Class Hexactinellida or Hyalospongiae:

1. Have siliceous spicules.
2. Spicules six- rayed .
3. All are marine. Ex: *Euplectella, (Hyalonema)*.



3 - Class Demospongiae

1. Have siliceous spicules.
2. Spicules not six- rayed.
3. All marine except family Spongillidae which lives in freshwater.

Ex: *Spongilla.* *Cliona, (Euspongia)*

Types of Cells in Sponges

1. **Pinacocytes**.
2. **Porocyte**.

Amoebocytes : a - Chromocytes . b - Thesocytes . c - Archaeocytes . d - Sclerocytes : Calcoblasts , Silicoblasts , Spongeoblasts .

3. **Gland cells .** 5. **Desmacytes :** a - Lophocytes . b- Collencytes .

6-**Myocytes .** 7- **Choanocytes** .

1-Pinacocytes

1. Thin , flat , polygonal , discoid with a central swelling area where the nucleus is logged (may be T- shaped).
2. Cover the exterior surfaces and some interior ones.
3. Protective and contractile and help regulate the surface of the sponges.

2- Porocytes

1.Tubular with intracellular channels through which water currents pass into the paragastral cavity or internal body spaces.

2.Help regulate water currents entering the sponge body via the (pore diaphragm).

Amoebocytes

1. Amoeboid in shape .
2. (4) types :-

a. Chromocytes : Contain pigment granules , thus are mostly responsible for sponge colour .

b. Thesocytes : Act as storage cells . They are filled with food reserves.

c. Archaeocytes : Embryonic undifferentiated cells with blunt pseudopodia and large nucleus. **carry out a number of functions :**

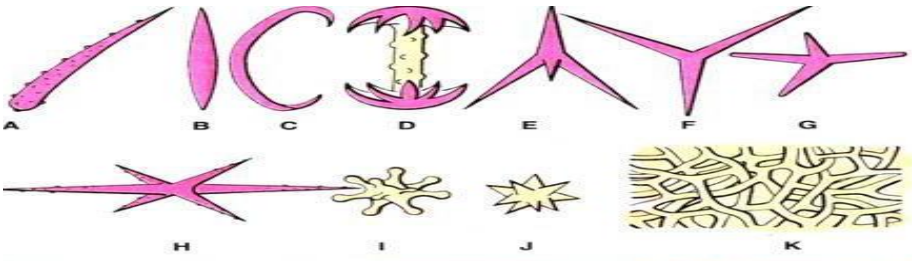
1- Phagocytize food particles. **2-** Digest food particles which they receive from choanocytes. **3-** Produce other cell types and sex cells , and play an important role in regeneration , therefore, called pluripotent or (totipotent cells) .

d. Sclerocytes : manufacture the skeleton of the sponges (the spicules and sponging fibres) . **differentiated into 3 subtypes :**

a. Calcoblasts: from calcium carbonate spicules.

b. Silicoblasts : produce siliceous spicules.

c. Spongioblasts: produce sponging fibres.



1.9. Spicules and spongin. A—Monactinal monaxon; B—Diactinal monaxon; C—Curved monaxon; D—Monaxon with hooked ends; E—Tetraxon; F—Triradiate; G—Calthrops; H—Hexactinal triaxon; I and J—Polyaxon; K—Spongin fibres.

3- Gland cells

Secrete an adhesive substance to attach the sponge to a substratum.

4- Desmacytes (Lophocytes) and Collencytes

1- Secrete fibrillar collagen . similar to connective tissue cells.
2- Lophocytes have two extensions , whereas collencytes have several extension

5- Myocytes

1-They are spindle- shaped or almost T-shaped modified pinacocytes.

2-They from sphincters around oscula to regulate water flow rate out of the sponge.

3-They are responsible for the clearly noticed contraction of the oscula when touched strongly.

6- Choanocytes or Collared Flagellated Cells

1- Round to oval in shape, each with a flagellum and a collar.

2- Line the whole spongocoel in ascon type of canal system, radial canals in sycon types, and flagellated chambers in leucon types.

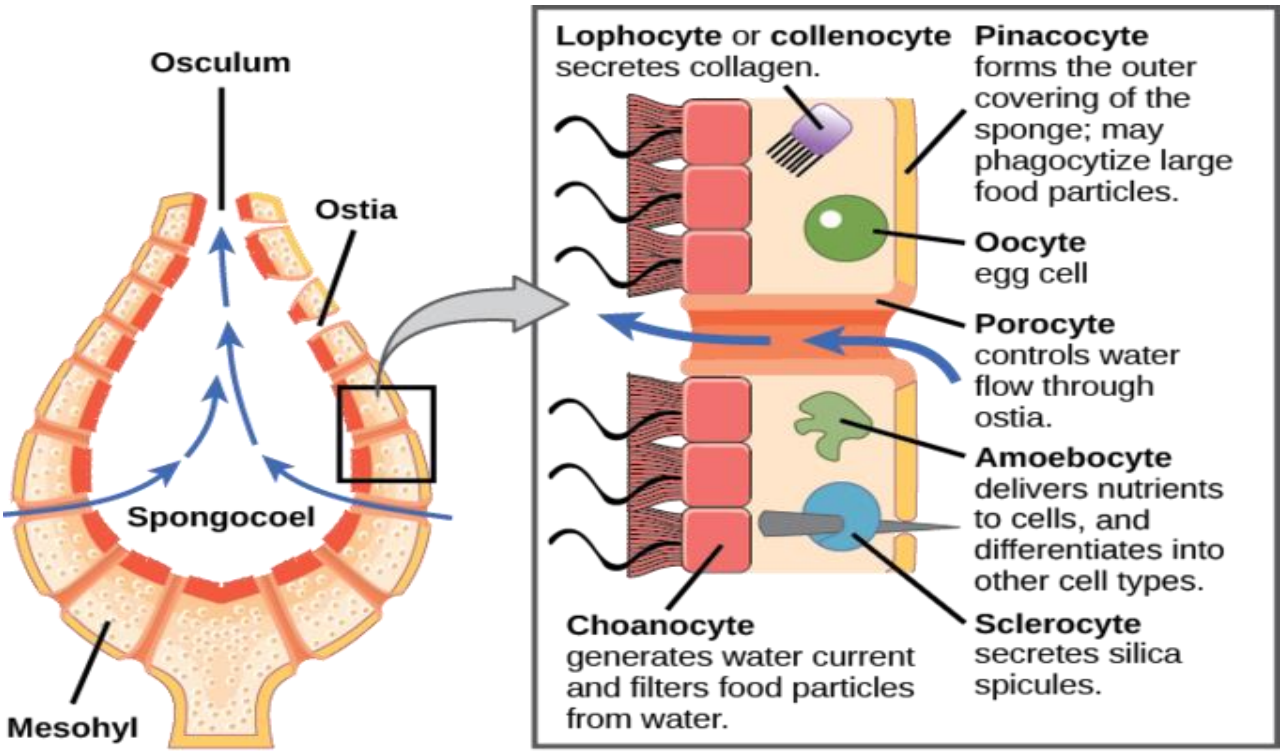
3- one of the most important characteristics features of the sponges.

4- Perform several functions:

1- Create water currents and cause water current to flow in and out of the sponge, thus, help in nutrition, respiration, excretion and reproduction.

2- Engulf food particles. **3 -** Convey sperms to ova. **4-** Form sperms and ova.

5- Participate in the formation of reduction bodies.



(a) Basic sponge body plan (b) Some sponge cell types

Canal Systems in Sponges

1- Is a system of channels, canals, spaces, chambers, cavities and pores through which water currents pass or course since they enter the sponge body via pores or ostia till they leave the sponge body via osculum. 2- There are 3 main types of canal systems and 5 subtypes which are based on the arrangement, and complexity of the internal channels and passages in the sponge body, they are :

1. Ascon Type. 2. Sycon type : Two subtypes : a. Without cortex b. With cortex

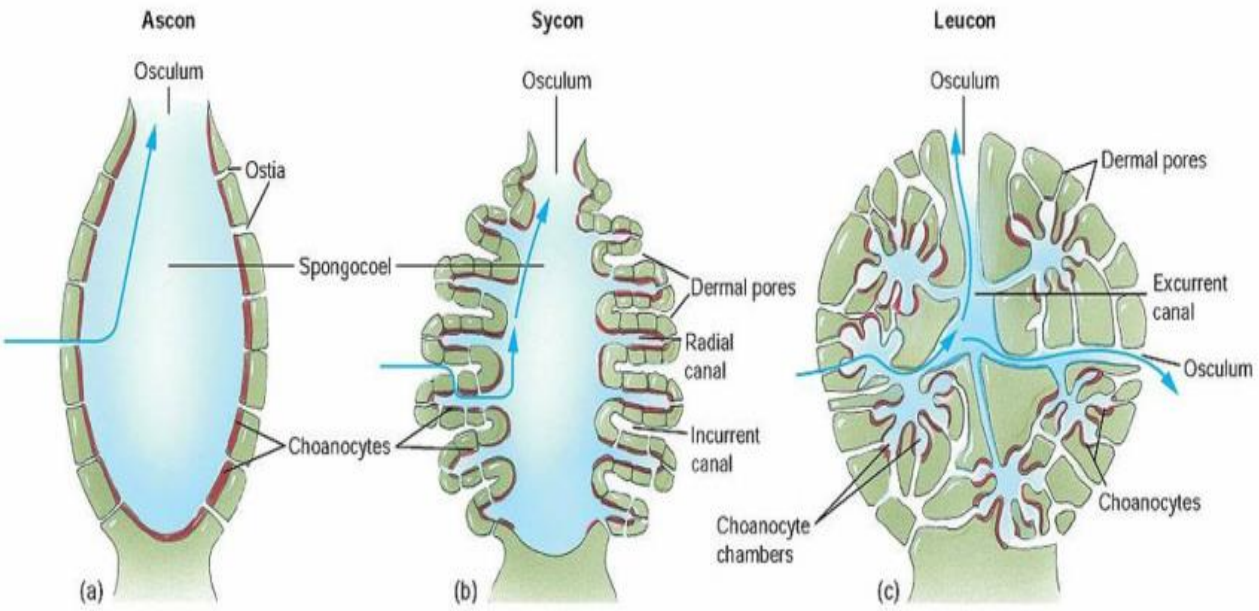
3. Leucon type : Three subtypes : a. Eurypylous b. Aphodal c. Diplodal

Canal system	Ascon	Sycon	Leucon
Body Wall	Simple , thin , straight	Folded, thicker, more complex, with incurrent canals and radial canals	Most complex type, thickest, irregular, with flagellated chambers
Choanocytes distribution	Line the whole spongocoel except a small area near osculum which is lined with pinacocytes	Line only the radial canals	Line only the flagellated chambers
Mesohyl or mesoglea	Relatively thin	Relatively thicker	Extremely thick or Thickest
Spongocoel	Relatively large	Relatively small	Very small or entirely Absent
Course taken by water currents	Dermal or incurrent or inhalant pores (Ostia) ↓ Spongocoel ↓ Osculum	Ostia ↓ Incurrnt canal ↓ Prosopyles ↓ Radial canals ↓ Apopyles ↓ Excurrent canals ↓ Spongocoel ↓ Osculum	Ostia ↓ Incurrent canals ↓ Prospyles ↓ Flagellatedchambers ↓ Apopyles ↓ Excurrent canals ↓ Spogocoel ↓ Osculum

Functions of Canal Systems

Canal systems have several important functions:

The water currents entering through the canal systems bring (carry) food particles (nutrition), oxygen (respiration), sperms (reproduction), and take out the excretory products or waste products.



Types of canal systems in sponge