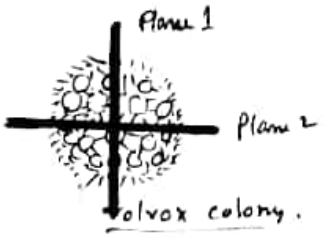
SYMMETRY

Symmetry means an arrangement of body parts into geographical designs. It refers to the division of body into equal parts by lines or planes. When a plan passing through its centre and divide into similar halves is called symmetrical animal and when an animal cannot be divided into like parts by a plane is called asymmetrical animals. All animals are either asymmetrical (sponge, protozoa) or symmetrical. Certain terms are often used when explaining symmetry. An axis is an immaginary line passing through the centre of body such as longitudinal axis, oral-aboral axis. Either end of the axis is termed a pole. So each axis has two poles. A plane of symmetry is straight line that divides organisms into corresponding halves. There about 4 types of symmetry in diverse body forms.

1) Spherical symmetry — It is found in animals whose body has the shape of a sphere. All planes that pass through the centre will cut it into similar halves. ex- some protozoa (volvox - Heliozaa) have spherical symmetry and it is adapted for free floating movements.



volvox colony.

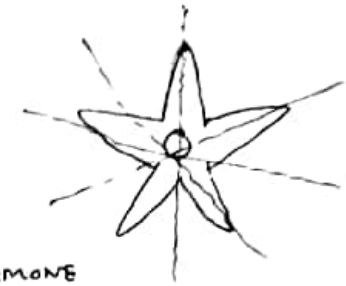
Heliozaa (~~Actinophrys~~)

2) Radial symmetry — The body is in the form of a flat or tall cylinder. Many similar body parts called antimeres, are arranged around one main central longitudinal axis in a circular or radiating manner like the spoke of a wheel. All the lines passing through this longitudinal axis →

in any plane, will divide the body into equal halves or antimeres. The surface having mouth is the oral surface and the opposite surface is called aboral surface.

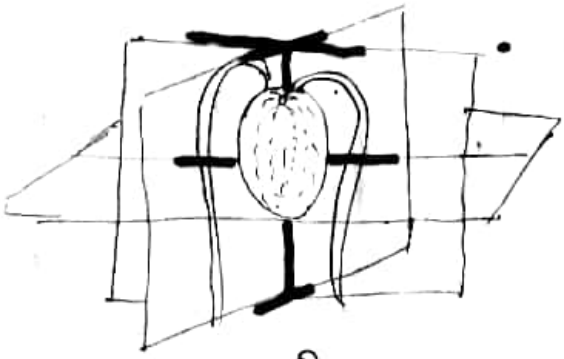
HYDRA

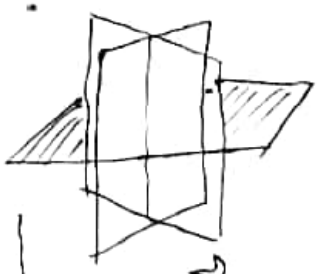
SEA-ANEMONE



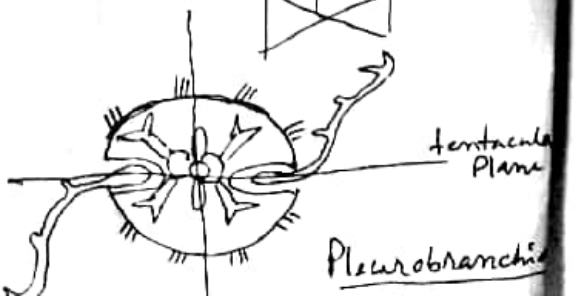
Radial symmetry is best suited for a sessile existance. Most of them are attached by the aboral surface. In the animal ~~kingdom~~ kingdom radially symmetrical phyla are porifera, coelenterata and ctenophora and echinodermata

3) Biradial symmetry. - It is a variant form of radial symmetry found in ctenophora and most Anthozaa ~~&~~ and is best fitted for a floating life. Such symmetry has only 2 pairs of symmetrical sides. There are only 2 planes of symmetry ~~a~~, one through the longitudinal and sagittal axis and other through the longitudinal and transverse axis, which will divide the animal into equal halves.





BIRADIAL.



4) Bilateral symmetry.

In most higher animals, the longitudinal axis of body runs from the anterior end (head) to the posterior end (tail). There is a single plane, the median longitudinal or sagittal plane, through which the body can be divided into two similar right and left halves. This is called bilateral symmetry. Besides right and left side and upper or dorsal surface and lower or ventral surface are also recognizable, which are outline because they are exposed to diffn conditions. Bilateral symmetry is characterised by successful and higher animals

BUTTERFLY

Definition of symmetry ??

Defn Symmetry. Arrangement of parts or organs on either side of an immaginary dividing line or around a common axis or radially around a point, so that opposite parts are mirror images of one another is called symmetry. There are two broad division of symmetry — a) Primary or embryonic
b) Secondary or adult.

The latter may or may not be the same as Primary one. For example, the larvae of starfish

(A)

bilaterally symmetrical but the adult starfish is radially symmetrical. The primary symmetry is bilateral secondary is radial.

Asymmetrical - No matter which way we try to divide them through the middle, no two halves would appear alike. In simple words, these are animals which cannot be cut into two identical halves through any plane or axis ex. - Amoeba.

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(1)

SEGMENTAL ORGANS IN ANNELIDA

⟨ EXCRETORY SYSTEM ⟩

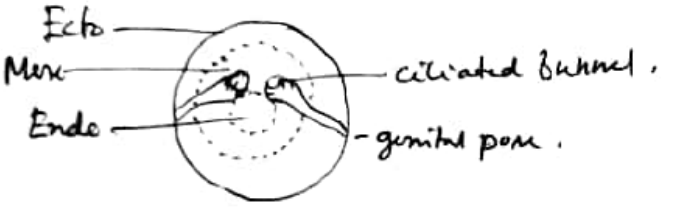
COELOM: Many triploblastic animals have a spacious body cavity or perivisceral cavity betn the body wall and the alimentary canal is called coelom. Coelom in the typical form is found in Polychaeta and Oligochaeta where the perivisceral cavity extending betn the body wall and alimentary canal from one end of the animal to the other. It is lined with coelomic epithelium (mesodermal), outer layer of which that line the body wall is called parietal/somatic mesoderm and inner layer that closely covers the alimentary canal is called visceral/splanchnic mesoderm. Coelom contain free mesenchyma cell or coelomic corpuscles floating in coelomic fluid. Coelom is divided into compartments by perforated coelosepta for the flow of coelomic fluid.

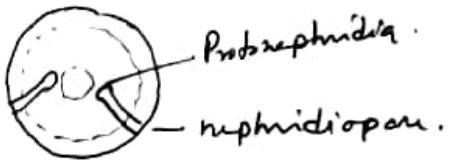
Fig- Cross section of coelome

Certain tubes like structure called segmental organs found in annelids and they are repeated in successive segments. These tubes serves to convey the excretory and reproductive products from the coelom to the exterior. These segmental organs are primarily divided into — A) Coelomoducts — derived from mesoderm
B) Nephridia — derived from ectoderm.

A) Coelomoducts.

Coelomoducts are normally wide tube of mesodermal origin, developed as ~~ino~~ evaginations from coelom to the exterior. Typically a coelomoduct opens to the exterior by a genital pore and into coelom by a relatively large ciliated funnel called coelomostome. It is easily distinguished from small ciliated funnel or nephrostomes of the nephridium.





Coelomoducts primarily functions as gonoducts and are confined to only a few reproductive segments. In oligochaeta (earthworm), the reproductive funnels and ducts, both male and female are coelomoducts. In some forms, the coelomoducts may secondarily functions as excretory organs.

B) Nephridia.

Nephridia are also segmentally arranged coiled tube of ectodermal origin developed as invagination from ectoderm to coelom. They communicate with exterior through laterally placed small aperture called nephridiopores. Internally they may end

blindly (Protonephridia) or open by a small ciliated funnel called nephrostomes into coelom called metanephridia. Nephrostomes may opens into coelom of the same segment in which nephridia lie or of the segments just infront. Nephridia are primarily excretory in functions but may secondarily serve as convey the genital product to the exterior.

Polychaete excretory organs are either Protonephridia or metanephridia.

i) <u>Protonephridia.</u> (closed type)

It is most primitive type. It terminates into coelom as a blind tube. Protonephridia made of a few syncytial cells with an intracellular blind ending tubules. The closed end or other parts of the tube are provided with excretory cells called solenocytes. The solenocytes may occur singly or in groups. Solenocytes is a rather rounded ciliated cell connected to the protonephridium by a thin tube, the lumen of which encloses a long, vibratile ~~cilium~~ flagellum. Excretory fluid enters through the wall of the nephridial tube. The fluid is driven ~~and~~ into the lumen of nephridium by flagellum and forced to the exterior via nephridiopore.

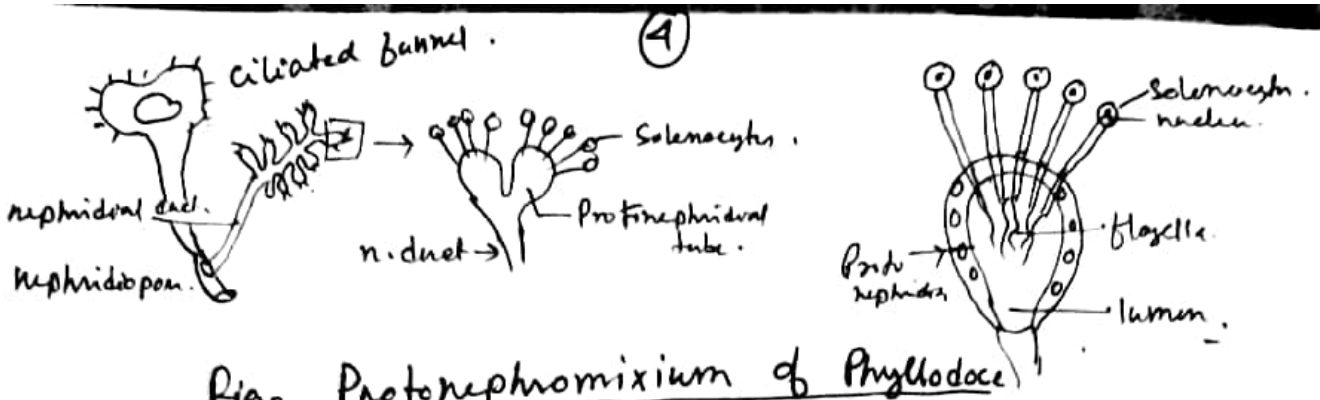
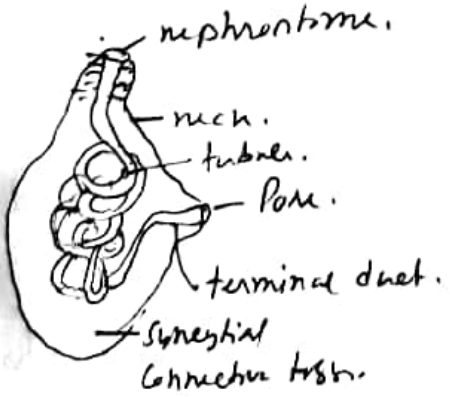


Fig. Protonephromixium of Phyllodoce

ii) Metanephridia – (Opened type)

Metanephridia are far advanced and found in the majority of Polychetes, all oligochetes and leeches. Instead of solenocytes, the inner end of the metanephridium opens into coelome by a ciliated funnel or nephrostome. The other end opens to the exterior through the nephridiopore. A metanephridium is thus opens at both ends. Each metanephridium (Nevis) is distinguished into a somewhat oval, curved body and a narrow neck. Body consist of a syncytial mass of connective tissue, containing a coiled excretory / nephridial tubules opens at both ends. One end of tubules runs through neck and opens into coelom and other ends opens to the exterior through nephridiopore.



Principal nitrogenous waste in Polychaetes is ammonia. Excretory waste diffuse from coelomic fluid or blood into the lumen of nephridial tubule and finally discharged to outside through nephridiopore.

On the basis of their size and number nephridia may be divided into Micro and Mega nephridia.

Micronephridia - or meronephridia are smaller in size, sometimes microscopic and are numerous in each segments. They are networks of fine tubes laying on the body wall and septa in each segments. ex(. Pheritima)

Meganephridia or holonephridia - are larger in size and generally one pair ~~on~~ per segments. They generally extend over two segments and their nephro-stomes opens into the segments next in front. (Hirudin)

Nephridia are termed exonephric or ectonephric when they are directly open to exterior through nephridiopore. Such as meganephridia of neris. In some cases termed enteronephric when they lack nephridiopore and open into the excretory canal or or alimentary canal as septal and pharyngeal nephridia of Pheritima.

Nephromixia.

In some annelida like oligochaeta, Hirudinea and the more primitive polychaeta, nephridia and coelomoducts are separate. Again, in some polychaeta, coelomoducts do not remain independant but become fused partially or wholly forming compound segmental organs called - nephromixia. They developed both of ectoderm and mesoderm and performed both →

functions not also excretory but also genital.

Depending upon the degrees of combinations there are 4 types of nephromixia —

a) Protonephromixium - Coelomoduct is united with a Protonephridium. It conveys both reproductive and excretory product to the exterior. ex - Phyllodoce.

fig - Protonephromixium.

fig. Metanephromixium

b) Metanephromixium. coelomoduct is attached to an open metanephridium. ex - Hesione

c) Mixonephridium. - coelomoduct and nephridium are intimately fused to form a simple composite organ. Its funnel is formed by coelomoduct and its duct by nephridium. ex - Arenicola

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Fig - mixonephridium.

Fig - ciliated organ

d) ciliated organs. In some forms, coelomoducts are reduced to ciliated organs. They are attach to the dorsolateral longitudinal muscles and are known to open externally. ex - Nais.