ANIMAL KINGDOM

LEVEL OF ORGANISATION

Cellular (Sponges)	Tissue level (Coelenterates)	Organ level (Platyhelminthes)

Organ System (Annelids ---to--- Chordata)

Digestive System

- **Incomplete** (Single Opening) (Platyhelminthes) (Coelenterates)
- **Complete** (aschelminthis --to--chordates)

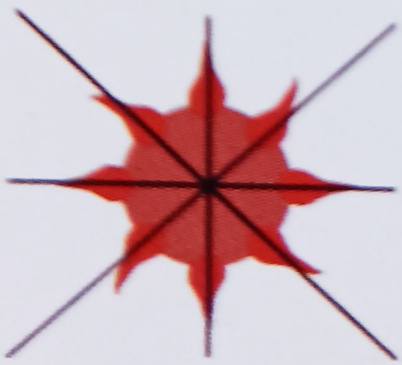
Circulatory System

- **Open** → blood vessel(-)
- **Closed** → blood vessel(+)

SYMMETRY

Asymmetric	Radial Symmetry	Bilateral Symmetry
Sponges	Coelenterates; Ctenophores; Echinoderms (adult)	Annelids--to--Chordates and Echinoderms (larvae)

NO symmetry of Sponges



Radial symmetry of Jellyfish

Bilateral symmetry of Butterfly

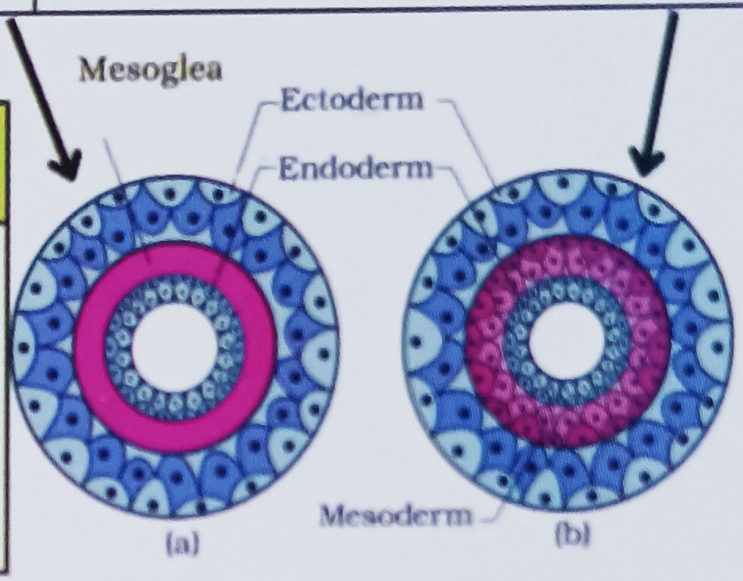
GERM LAYERS

Diploblastic	Triploblastic
(Ectoderm + Endoderm) E.g. Porifera, Coelenterata, Ctenophora	(Ectoderm + Endoderm+Mesoderm) E.g. Platyhelminthes--to--Chordata

SEGMENTATION

- Body divide externally/internally into segments.

e.g.-Metamerism in Earthworm



NOTOCHORD

Rod like structure formed on dorsal side during embryonic stages. Derived from mesoderm present in chordates.

Nonchordates - Porifera to Echinodermata

COELOM/BODY CAVITY

Acoelomate	Pseudocoelomates	Coelomates
Sponges, Platyhelminthes, Coelenterata	(mesoderm in scattered pouches) e.g.-Aschelminthes	e.g.-Annelids to Chordata

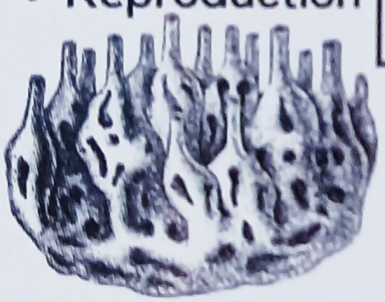
PHYLUM PORIFERA (SPONGES)

- Marine (generally)
- Canal system-for water transport

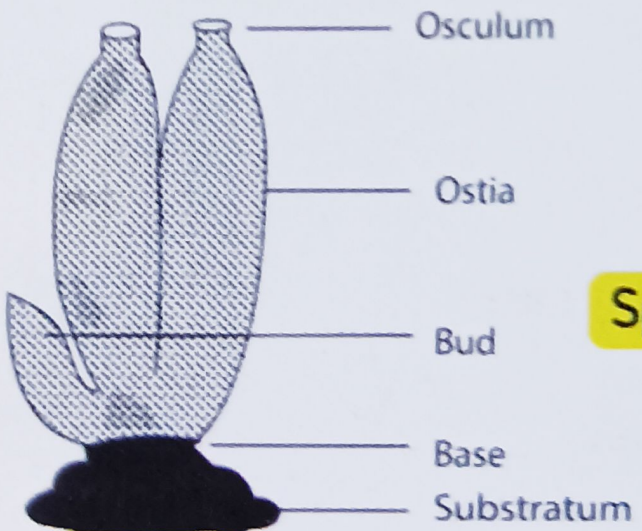
Water → Ostia (pores) → Spongocoel (cavity) → Osculum → Water

(only system for food intake, respiration & waste removal)

- Intracellular digestion
  -Coanocytes(collar cells)-Line spongocoel
- Hermaphrodite
- Reproduction → Asexual → fragmentation
  → Sexual → Internal fertilization
  → Indirect development
  ↓
  larval stage is distinct from adult



e.g.-*Sycon*(scypha), *Spongilla*(Fresh water sponge), *Euspongia* (Bath sponge)



Sycon

Spongilla

Euspongia

PHYLUM – COELENTERATA (CNIDARIA)

- Aquatic, mostly marine,sessile or free swimming
- Hypostome -single mouth of gastro-vascular cavity
- Digestion -Both extra & intra cellular
- Bodyforms → Polyp-sessile, cylindrical e.g.-*Hydra*
  → Medusa-umbrella like, free swimming e.g.-*Jellyfish*

Polyp $\underset{\text{sexually}}{\overset{\text{asexually}}{\rightleftharpoons}}$ Medusa(Alternation of Generation-Metagenesis)

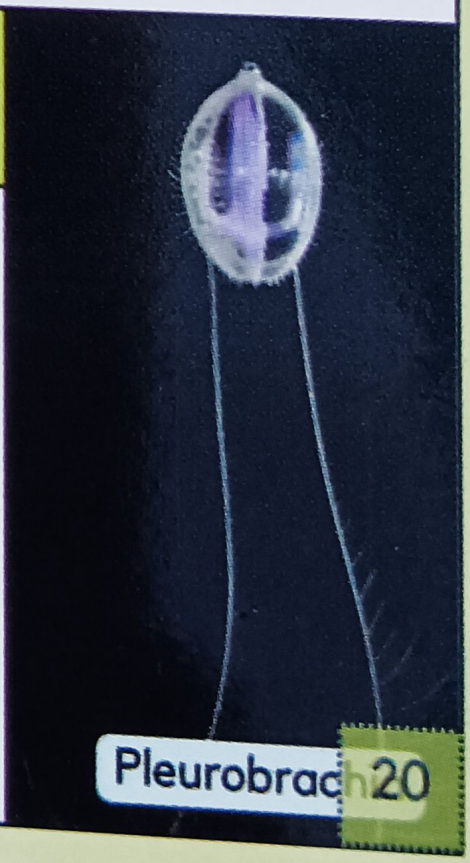
- Corals have skeleton of $CaCO_3$

e.g.-*Physalia* (Portugese man of war), *Adamsia* (Sea anemone), *Pennatula* (Sea pen), *Gorgonia* (Sea fa), *Meandrina* (Brain coral)

- Cnidoblasts/Cnidocytes- contain stinging capsule (for anchorage, defense, capturing prey)

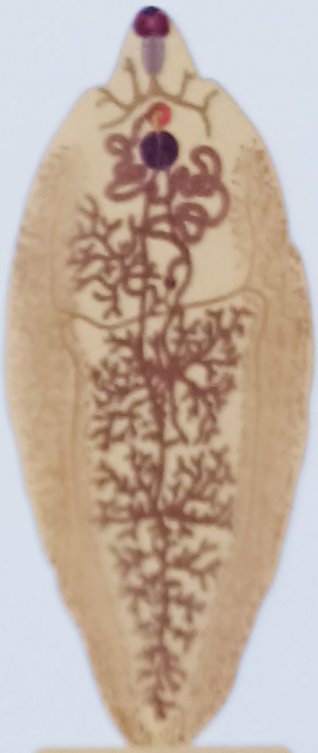
PHYLUM CTENOPHORA (SEA WALNUTS/COMB JELLIES)

-Marine
★8 rows of comb plates (Locomotion)
-Digestion-Both extra & intracellular
★Bioluminescence
-Hermaphrodite -Reproduction Sexual External fertilization Indirect development
e.g.-Pleurobrachia, Ctenoplana



PHYLUM -PLATYHELMINTHES (FLATWORMS)

-Mostly Endoparasites
(+)hooks, suckers (+)
★ Flame cell (osmoregulation, excretion)
-Hermaphrodite.
-Regeneration (+) in some e.g.-*Planaria*
-Internal fertilization, development by many larval stages.
e.g. - *Taenia* (Tapeworm), *Fasciola* (Liver fluke)



Liver fluke

PHYLUM ASCHELMINTHES (ROUNDWORMS)

-Circular Cross section
-Free living, aquatic/terrestrial, parasitic
-Alimentary canal - complete (muscular pharynx developed)
- Excretion - via tube, through pore.
- Hermaphrodite (sexual dimorphism)
- Internal fertilisation, direct/indirect development
e.g.-*Ascaris*(round worm), *Wucherria* (filarial worm), *Ancylostoma*(Hookworm)

PHYLUM-ANNELIDA

★ Body marked into metameres/segments.
-Aquatic, terrestrial, free-living, rarely parasitic.

-Locomotion → longitudinal + circular muscles (in body wall)
↳ Parapodia (+) e.g.-*Nereis*

★ Nephridia (osmoregulation, excretion)

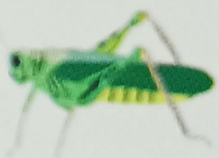
-Nervous system-paired ganglia, connected by lateral nerves to double ventral nerve cord

-Unisexual (e.g.-*Nereis*) / bisexual (Earthworm, Leeches)

e.g. *Nereis*, Pheretima (Earthworm), *Hirudinaria* (blood sucking leech)

PHYLUM-ARTHROPODA- LARGEST-2/3RD OF ALL SPECIES

- Includes insects
- Chitinous exoskeleton
- Body = head+ thorax + abdomen



★ Jointed appendages

- Respiration - gills, book gills, book lungs, tracheal system
- Sensory organs-antennae, eyes (compound/simple)

★ Statocyst (balance organs)

-Excretion - Malpighian tubules

-Oviparous (mostly)

-direct/indirect development e.g.-

Economically Important
- *Apis*(Honey bees)
- *Bombyx*(silkworm)
- *Laccifer*(Lac insect)

Vectors
- *Anopheles*
- *Culex*
- *Aedes*

Gregarious pest
- *Locusta* (Loust)

Living fossil
- *Limulus* (King crab)

(sea cucumber) Ophiura (Brittle star)

PHYLUM - MOLLUSCA (2ND LANGEST)

-Terrestrial/aquatic.
-Calcareous shells (+)
- **Body → unsegmented** →**head**
→**muscular foot**
→**Visceral hump**(mantle present)

-Mantle cavity has feather-like gills (respiration & excretion)
-Sensory tentacles (+) over anterior head Region.

.

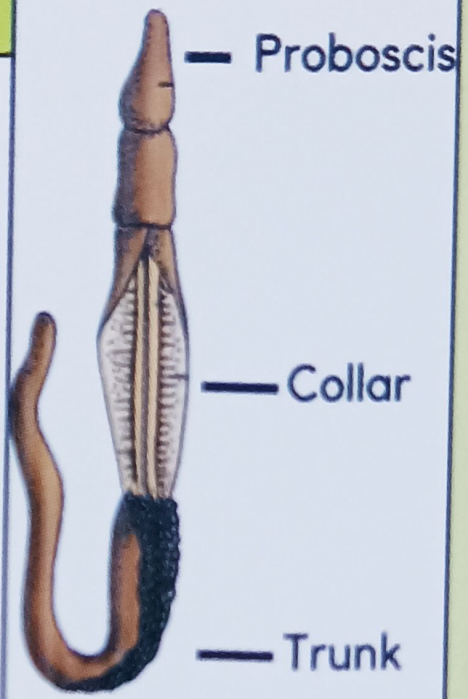
★ Radula -file-like feeding organ
-Dioecious, oviparous; indirect development
e.g.-*Pila* (Apple snail), *Pinctada* (Pearl oyster), *Sepia* (cuttle fish), *Loligo* (squid) *octopus* (Devil fish), *Aplysia* (Sea-hare), *Dentalium* (Tuskshell), *Chetopleura* (Chiton)

PHYLUM - ECHINODERMATA

-All marine
-Calcareous endoskeleton(ossicles)
★ Water vascular system - for locomotion, capture & transport of food, respiration
-Excretory system (-)
-Dioecious
-Ext. fertilization, indirect development (free swimming Larvae)
-e.g. - *Asterias* (starfish), *Echinus* (sea urchin), *Antedon* (sea lily), *Cucumaria* (sea cucumber) *Ophiura* (Brittle star)

PHYLUM - HEMICHORDATA

- worm like, marine organisms
- Body-Cylindrical → proboscis, collar, trunk
- ★Proboscis gland (+) (Excertion)
- Circulatory system-open
- Respiration-gills
- external fertilization, indirect development
- e.g- *Balanoglossus*, *Saccoglossus*



Chordates	Non Chordates
Notochord (+)	Notochord (-)
CNS-dorsal, hollow, single	CNS-Ventral, solid, double
Pharynx Perforated by gill slits	Gill slits (-)
Heart-ventral	Dorsal (if present)
Post-anal tail (+)	Post-anal tail (-)

Chordates Characteristic Features	
Notochord (+)	Post-anal tail
Dorsal hollow nerve cord	Paired pharyngeal gill slits