

**PHYLUM**

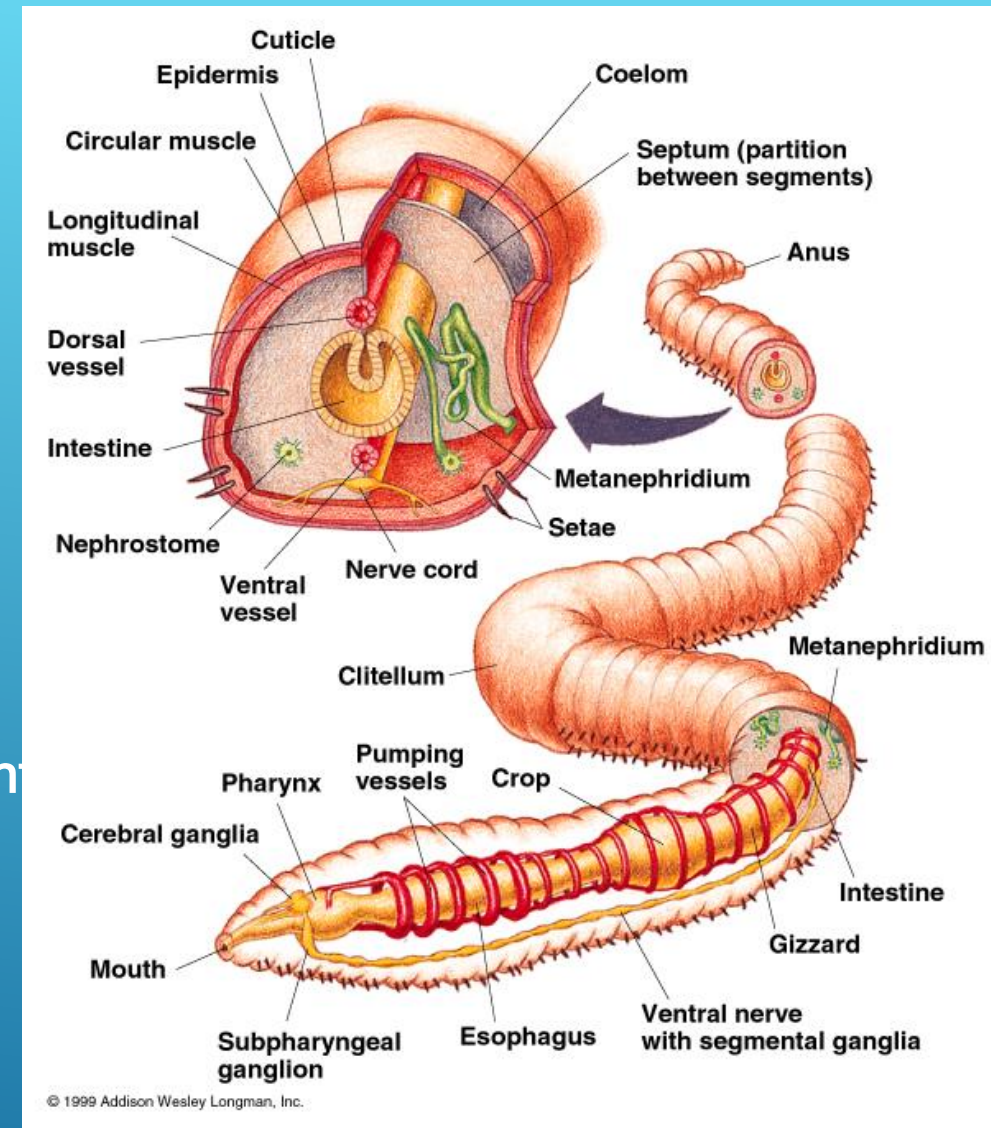
**ANNELIDA**



# CHARACTERISTICS:

## • BODY

- ▶ Bilaterally symmetrical
- ▶ Worm like
- ▶ Metameric
  - ▶ series of ring like segments
  - ▶ formation: *a.* splitting of mesoderm
  - ▶ *b.* enclosing gut parts
  - ▶ *c.* double membrane septum (ant, post, vent)
  - ▶ muscles: *a.* circular (btw epidermis)
  - ▶ *b.* longitudinal ( btw septa)
  - ▶ *c.* oblique (polychaete)
  - ▶ *d.* dorso-ventral (leeches)
- ▶ Influence: anatomical arrangement

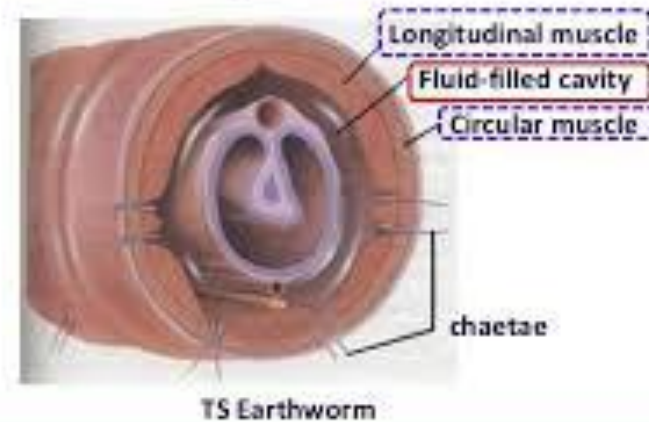


# ADVANTAGES

- a. Hydrostatic compartments
  - independently controlled
  - shape of segments change
  - (crawl ,swims ,burrow)
- b. Lessen injury (survives trauma)
- c. Tagmatization
  - specialization of diff parts
  - (best in arthropods)

A hydrostatic skeleton is :

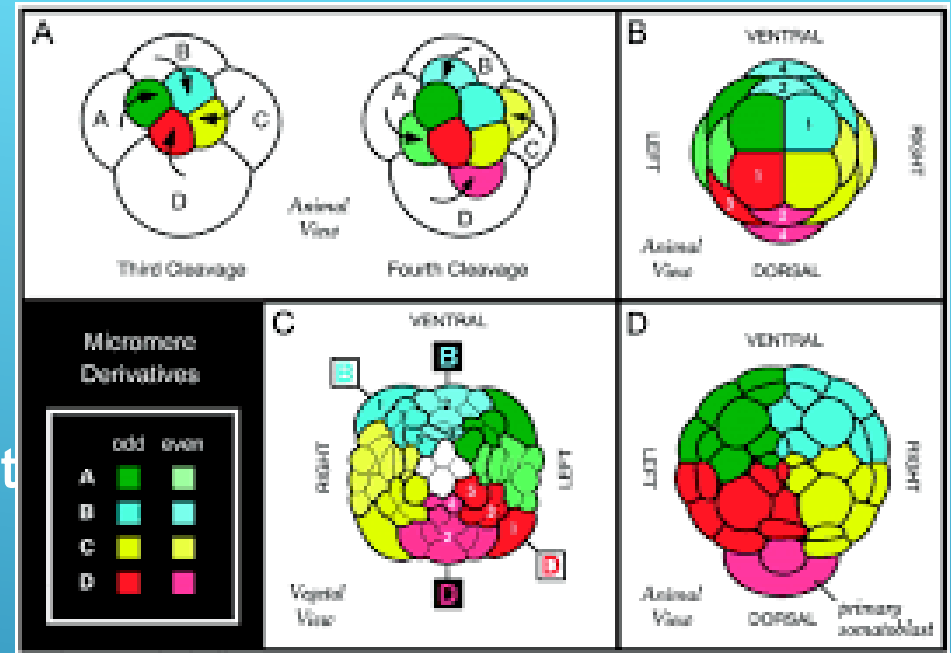
- a volume of fluid enclosed in a body cavity surrounded by muscle



# 2: PROTOSTOMES

- ▶ Mouth from blastopore
- ▶ Spiral cleavage
- ▶ Schizocoelous coelom formation

mesodermal mass (migrated cells from gut) splits  
 to form  
 pocket coelom



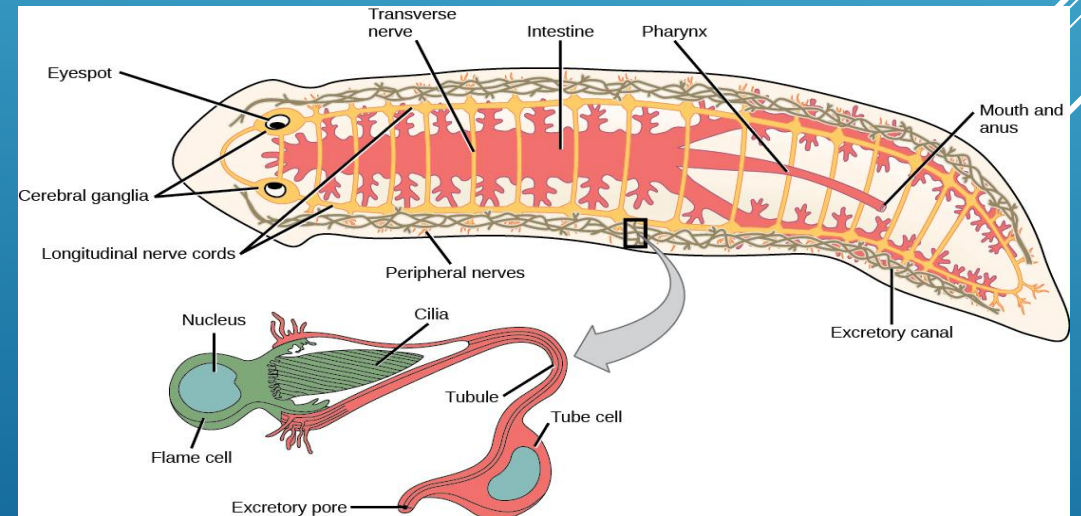
3: trochophore larva (free swimming cilia bands)

4: paired setae (epidermal)

5: circulatory system (closed)

6: nervous system

(dorsal suprapharyngeal ganglia \ ventral nerve cord)



# 7: METANEPHRIDIA

Excretory gland

Usually

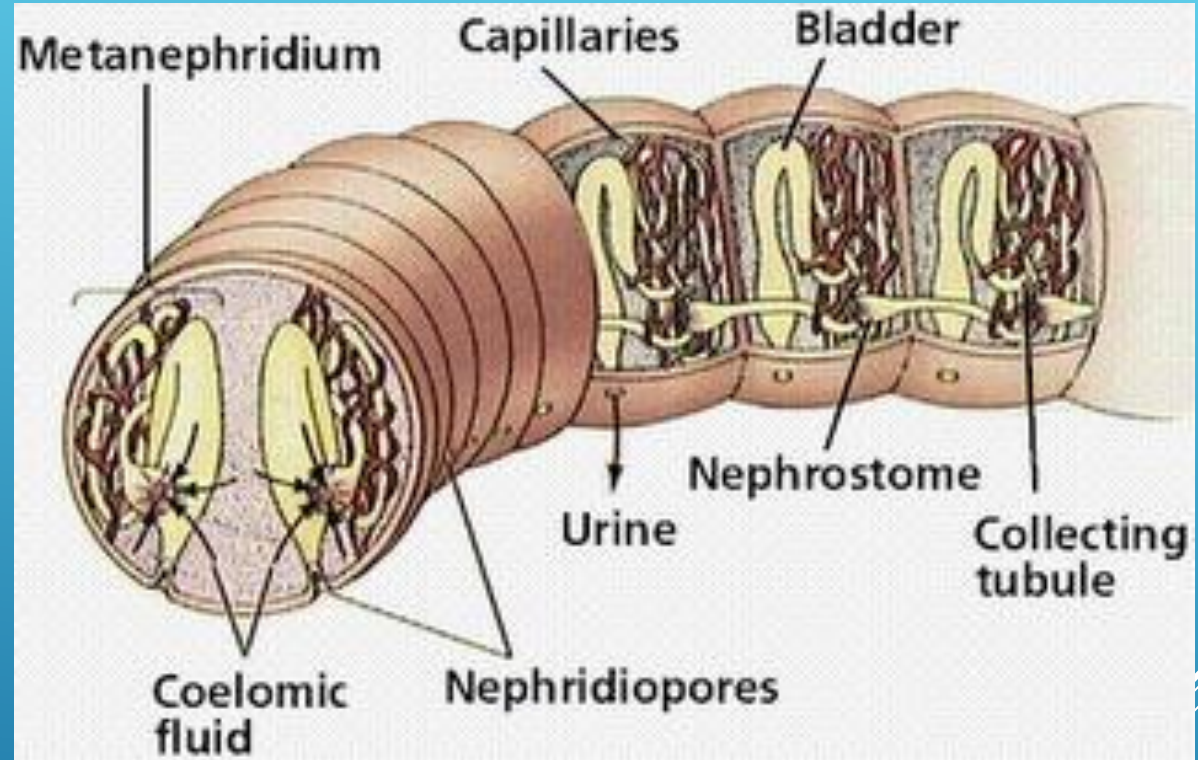
# 8: PROTONEPHRIDIA

osmotic and ionic regulation

Dead end tubules

Flame cells

Ciliated



# **ORIGIN:**

- ▶ 1:Schizocoelous origin
  - ▶ flatworm
- ▶ 2:enterocoelous origin
  - ▶ diploblastic ancestor
- ▶ 3:tribloblastic acoelomate
  - ▶ triploblastic ancestor



# LABATOCEREBRUM

- ▶ Annelid → flatworm
- ▶ segmental arranged excretory organs
- ▶ Annelid like body covering
- ▶ Complete digestive tract
- ▶ Annelid like nervous system
- ▶ Ciliated epidermis
- ▶ Acoelomate

▶ **It illustrates;**

- ▶ derivation of triploblastic acoelomate design from annelids lineage



# ***SAMOAN PALOLO WORM***

- ▶ Samoa island near south pacific
- ▶ Biggest yearly feast ( November , October )
- ▶ Vermicelli soup
- ▶ Lives in burrows at bottom
- ▶ Reproductive floating parts
- ▶ water discolored
- ▶ Indonesia , Fiji ,American Samoa , Vanuatu






# ***CLASS POLYCHAETA***

***POLY-MANY  
CHAETE-HAIR  
MANY HAIR ANIMALS***



***PRESENTED BY: RABIA ASGHAR  
ROLL NO: 1825138046***

# ***CONTENT***

- ▶ General characters
  - ▶ Examples
  - ▶ External structure
  - ▶ Locomotion
  - ▶ Feeding and digestive system
  - ▶ Gaseous exchange and circulation
- 
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# ***GENERAL CHARACTERS***

- Largest class of annelids
- More than 5,300 species
- Usually between 5 and 10cm long
- Mostly marine
- Some live on ocean floor, under rocks and shells, and within the crevices of coral reefs
- Other polychaetes are burrowers and move through their substrate peristaltic contraction of body wall
- other construct tubes of sand grains or secrete organic materials
- Mucus lines tubes
- Mucus is used for protective retreats and feeding

# ***EXAMPLES***

▶ Sabellidae



▶ Echiura



▶ Polynoidae



# ***EXTERNAL STRUCTURE***

## ➤ ***Parapodia and setae***

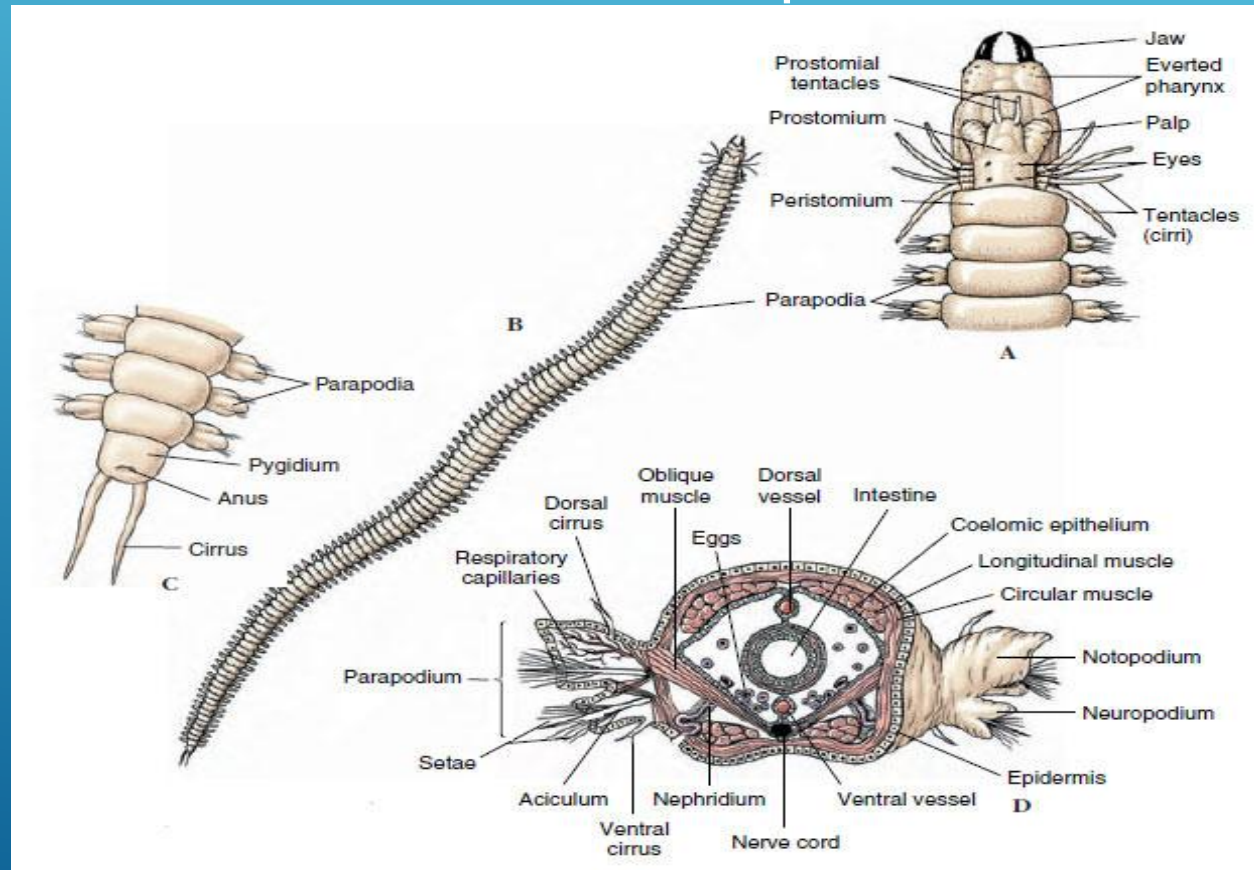
- ❑ Develop parapodia, lateral extensions of body wall, chitinous rods support it.
- ❑ Numerous setae project from parapodia, name of class derived from it, bristles structure, help in locomotion, holds a worm in its burrow

## ➤ ***Prostomium (pro, before+ stoma, mouth***

- ❑ Lobe like structure, projects dorsally and anteriorly from mouth, contains sensory structures like eyes, antennae, palps, ciliated pits called **nuchal organ**, first body segment is **peristomium**, surrounds mouth and it bears sensory tentacles or cirri.

# EPIDERMIS:

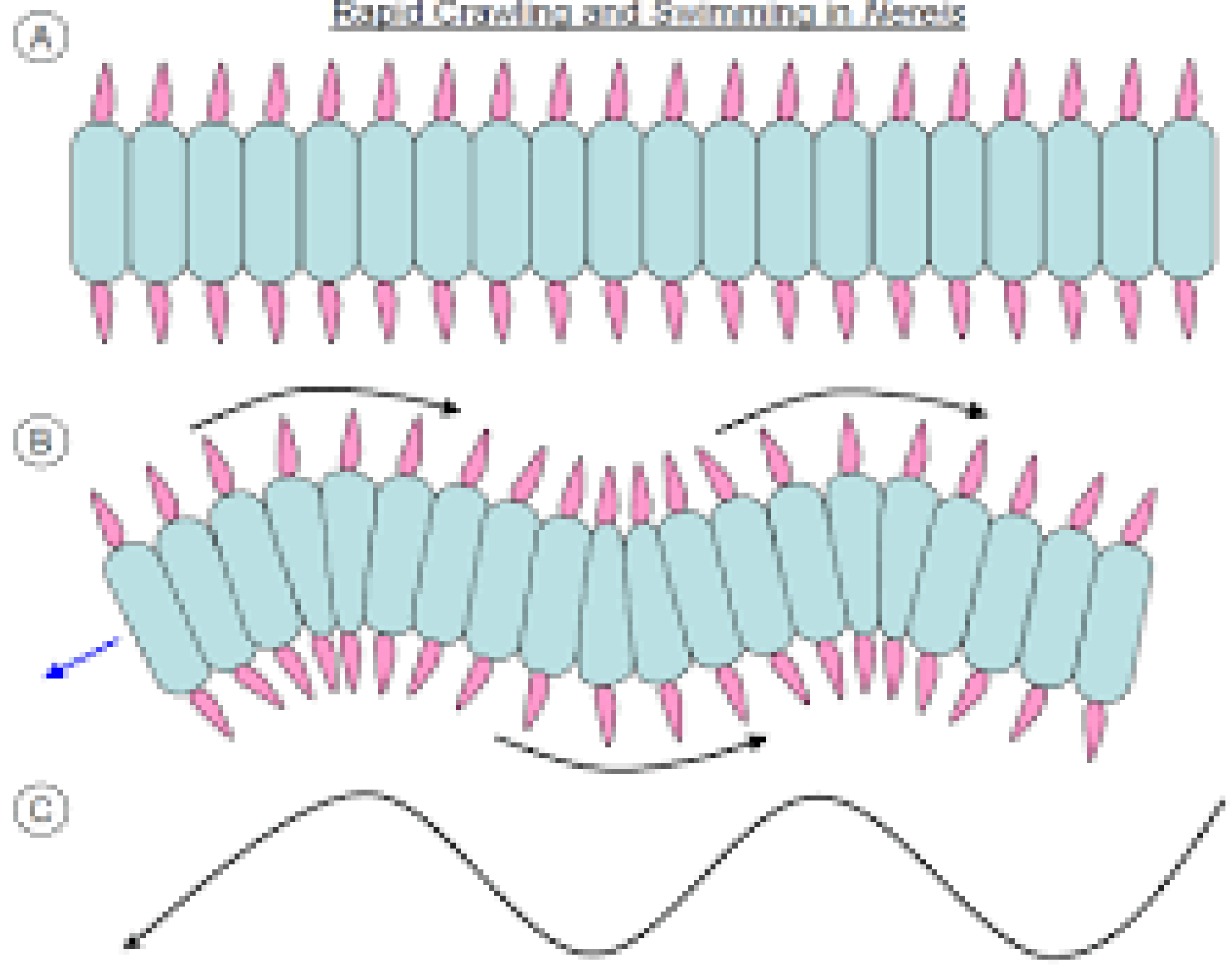
- ▶ Single layer of columnar cells
- ▶ Secretes protective , non-living cuticle
- ▶ Some have epidermal gland that secretes luminescent compounds.



# ***LOCOMOTION***

- ▶ Various species can walk, fast crawl or swim
- ▶ Longitudinal muscles of one side of body act antagonistically to the other side of body ,they produce undulatory waves, waves move along the length of the body from posterior end towards the head.
- ▶ Parapodia and setae act against the water and they produce propulsive force .
- ▶ Longitudinal muscles contract ,muscles of parapodia also contracts that stiffens it ,protrudes setae for power stroke.
- ▶ Period and amplitude of undulatory waves increases when species changes from a slow crawl to swimming .
- ▶ Burrowing species push through sand and mud by contraction of the body wall, make burrow during eating substrate .
- ▶ For this purpose they digest organic matter in the substrate, eliminates indigestible material through the anus .


### Rapid Crawling and Swimming in Nereis





# ***FEEDING AND DIGESTIVE SYSTEM***

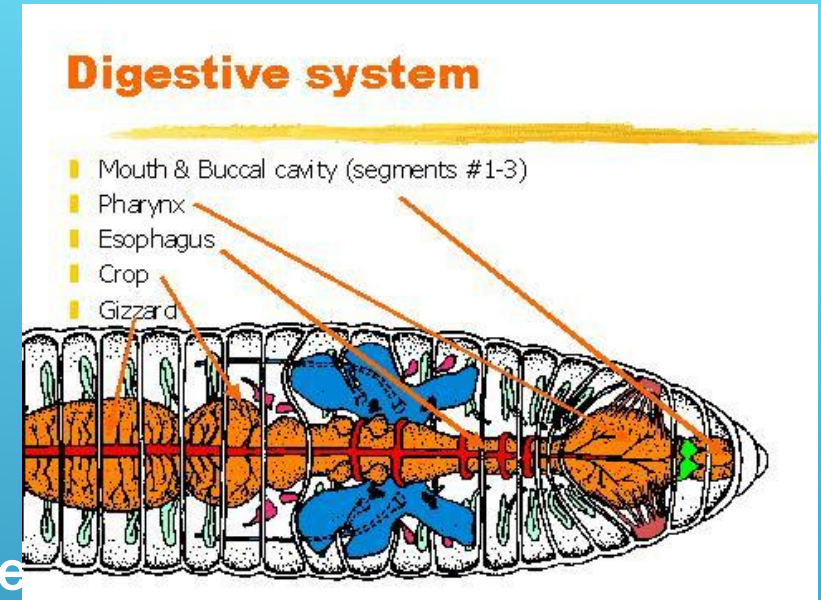
## ***INGESTION***

- ▶ Digestive tract  straight tube . Mesenteries and septa suspend the digestive tube in the body.
- ▶ Proboscis protrudes and pair jaws are open .Jaws are use for capturing prey.
- ▶ Predatory polychaetes donot leave their burrow. When prey approaches the burrow enterance , the worm quickly extends its anterior portion .Its pull the prey back into the burrow. Some polychaetes are herbivores and scavengers and use jaws for tearing food .



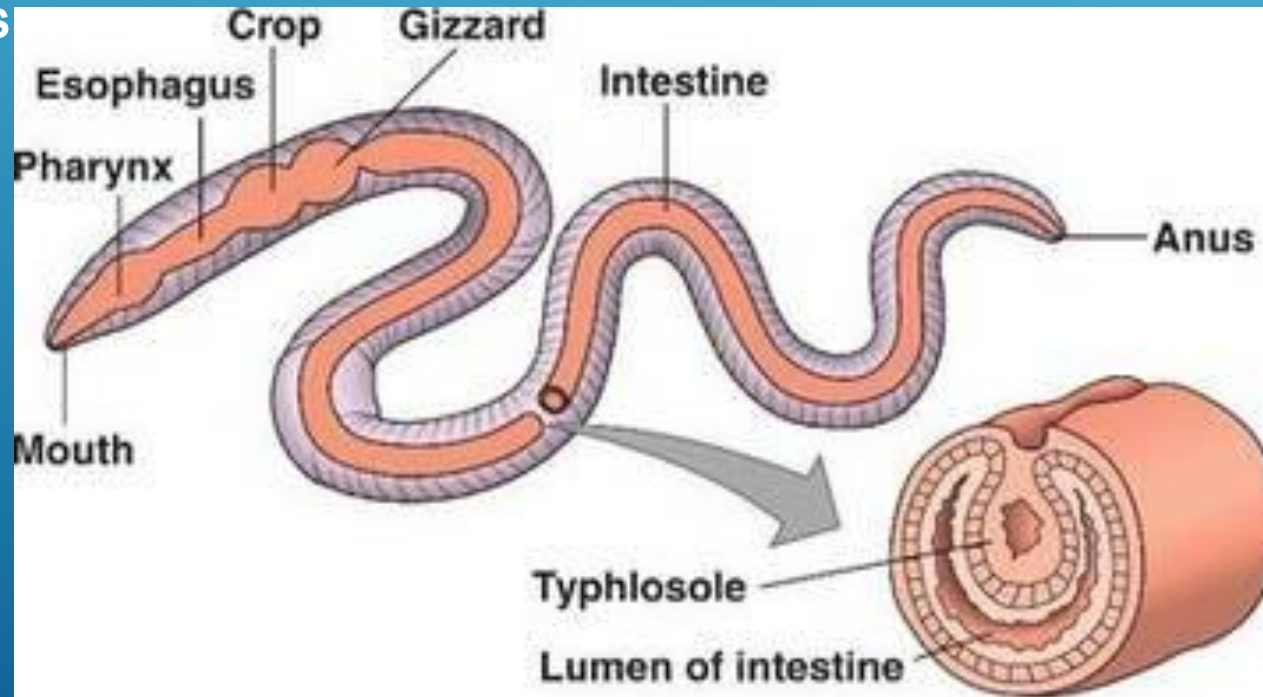
# DIGESTION

- ▶ Digestive track consist of
  - ❖ Pharynx
  - ❖ Crop
  - ❖ Grinding gizzard
  - ❖ Long , straight intestine
  - ❖ Similar to digestive organ of earth worms
- ▶ Organic matter is digested outside the cell , inorganic particles are released as castings .
- ▶ Many are filter feeders ,lack proboscis , *possess feeding structures.*
- ▶ *Some tube dwellers like fan worm possess radioles that's form a funnel shaped fan.*
- ▶ *Another filter feeders live in a U shaped tube that creates a mucous bag which collect food particles that are 1 pm small .*
- ▶ *The parapodia of segments 14 through 16 are modify into fans that create filtration currents and finely mucous bag is ingested.*



# EGSTION

- ▶ Elimination of digestive waste is a problem for tube dwelling polychaetes .
- ▶ Circulating water carry away the waste .
- ▶ Some use ciliary tract to carry feces to the tube opening .
- ▶ Some live in substrates rich in dissolve organic matter that can absorb 20 to 40 % of their energy requirements through their body wall in the form of sugars and another organic compounds



# ***GAS EXCHANGE AND CIRCULATION***

## ***RESPIRATION***

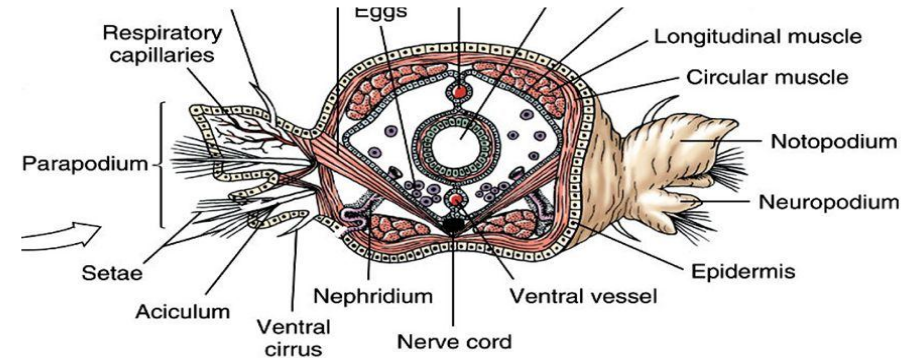
- Respiratory gasses diffuses through the body wall.
- Parapodia increases the surface area for gaseous exchange .
- In many , parapodial gills further increase the surface area for gaseous exchange .

## ***CIRCULATION***

- Close circulatory system.
- Oxygen is carried by respiratory pigments that are dissolve in the plasma as they are present in the other animals .
- Blood is colourless ,green ,red depending upon the respiratory pigment .

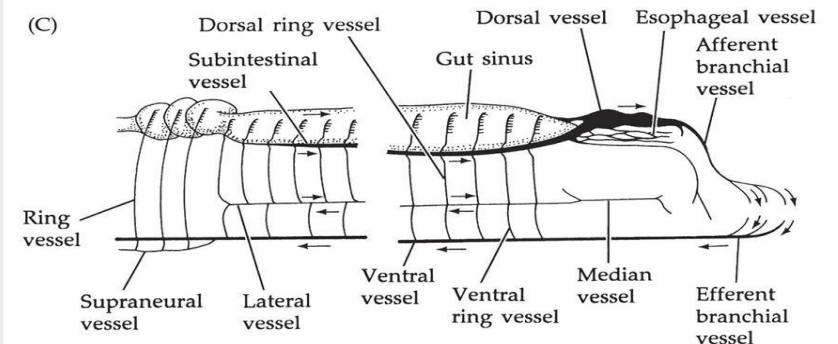
### **Class Polychaeta (cont'd)**

#### **• Gas exchange across parapodia**



### **Circulation/gas exchange: Class Polychaeta**

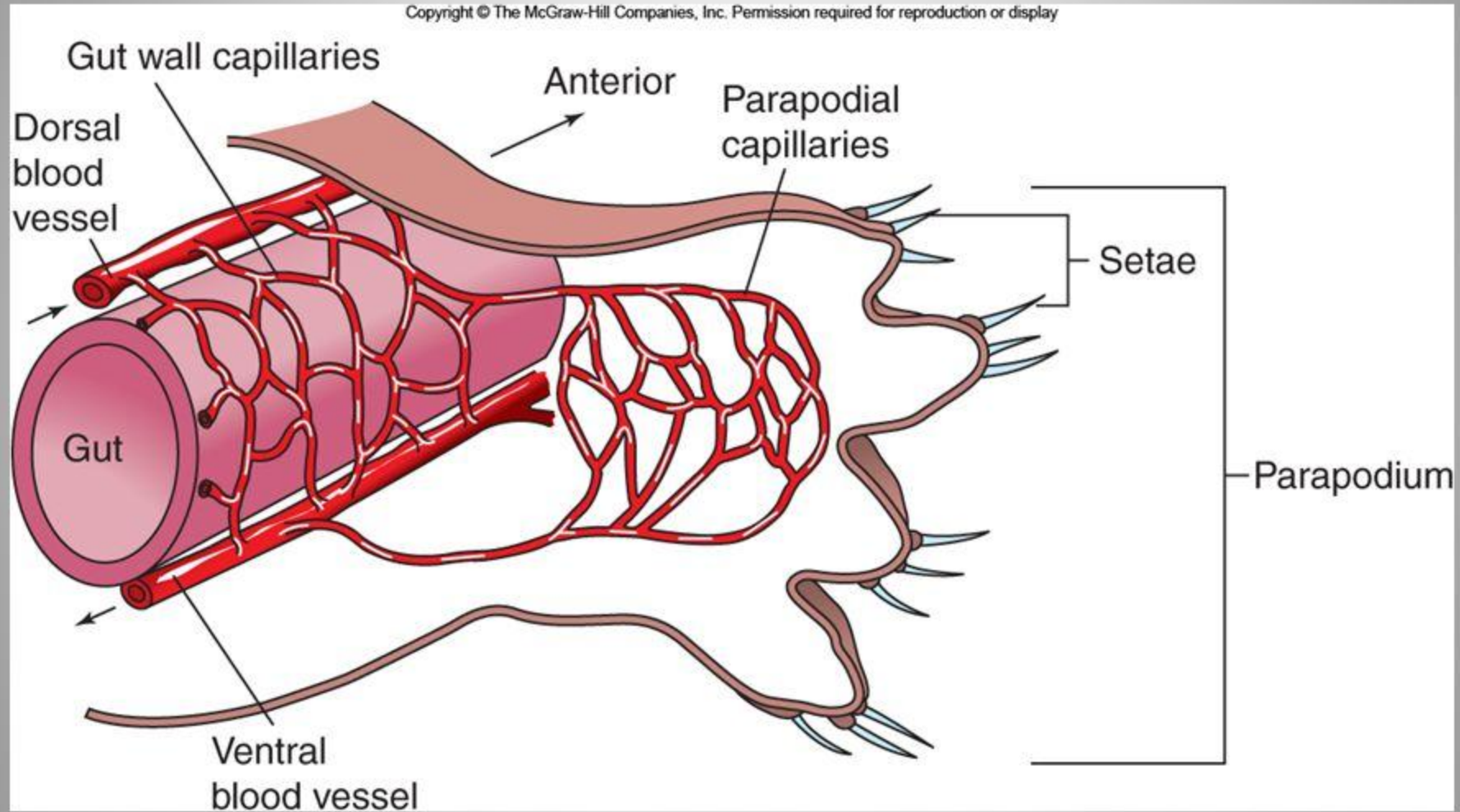
#### **▪ Terrellididae circulatory system**



# CIRCULATION PATTERN

- ▶ **DORSAL AORTA** : Dorsal aorta of polychaetes circulatory system act as contracting element . It lies just above the digestive tract .They propel blood from rear to front . In the front blood moves to the ventral aorta .
- ▶ **VENTRAL AORTA** : It is present ventral to the digestive tract . It propel blood from the front to rear.
- ▶ **SEGMENTAL VESSELS** : *Two or three sets are present . They received blood from the ventral aorta and break into capillary beds in the gut and body wall.*
- ▶ **CAPILLARIES** : *They unite again into segmented vessels that deliver blood to dorsal aorta .*

**Figure 12.6 Circulatory system of a polychaete.**

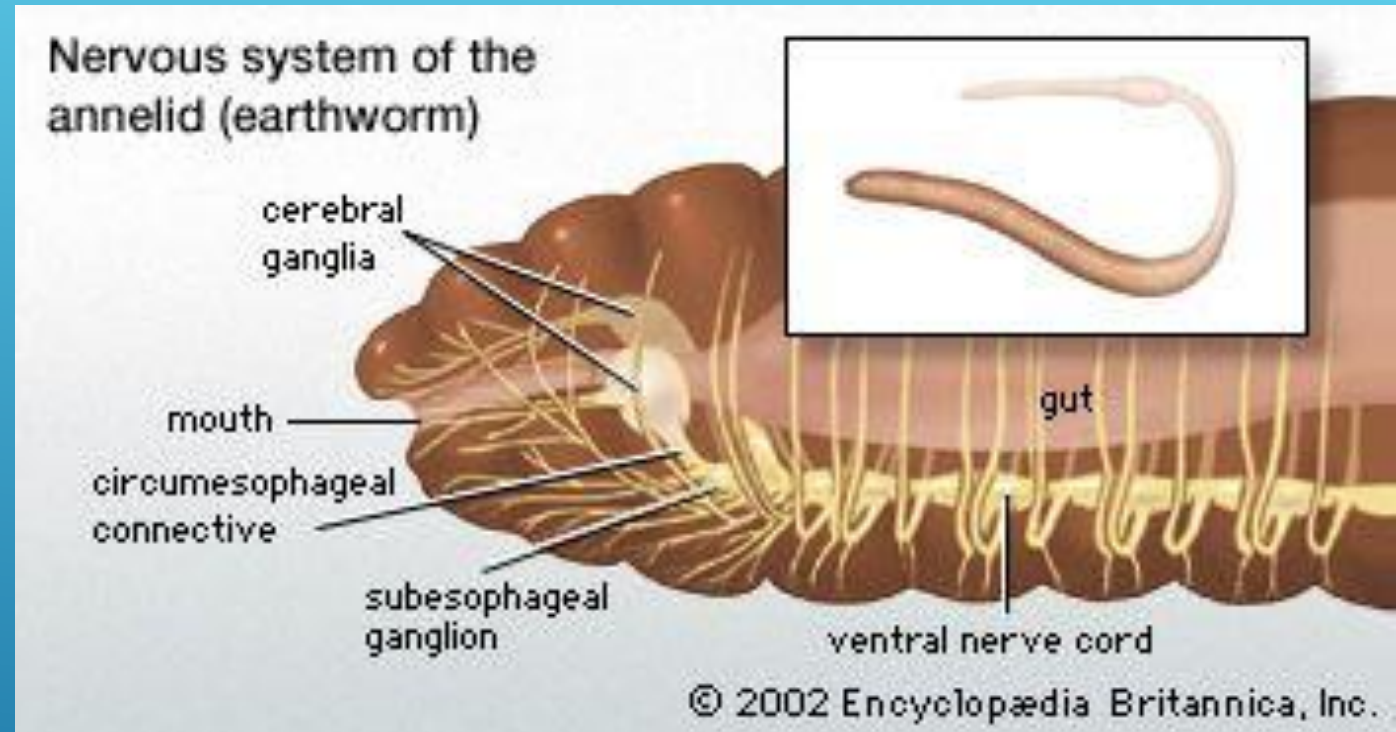


***CLASS***  
***POLYCHAETA***  
***(2ND HALF)***

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# ***NERVOUS SYSTEM OF CLASS POLYCHAETA***

- Similar in all three classes
- Parts of nervous system:
  1. segmented ganglia
  2. Subpharyngeal ganglia
  3. Suprapharyngeal ganglia
  4. Ventral nerve cord



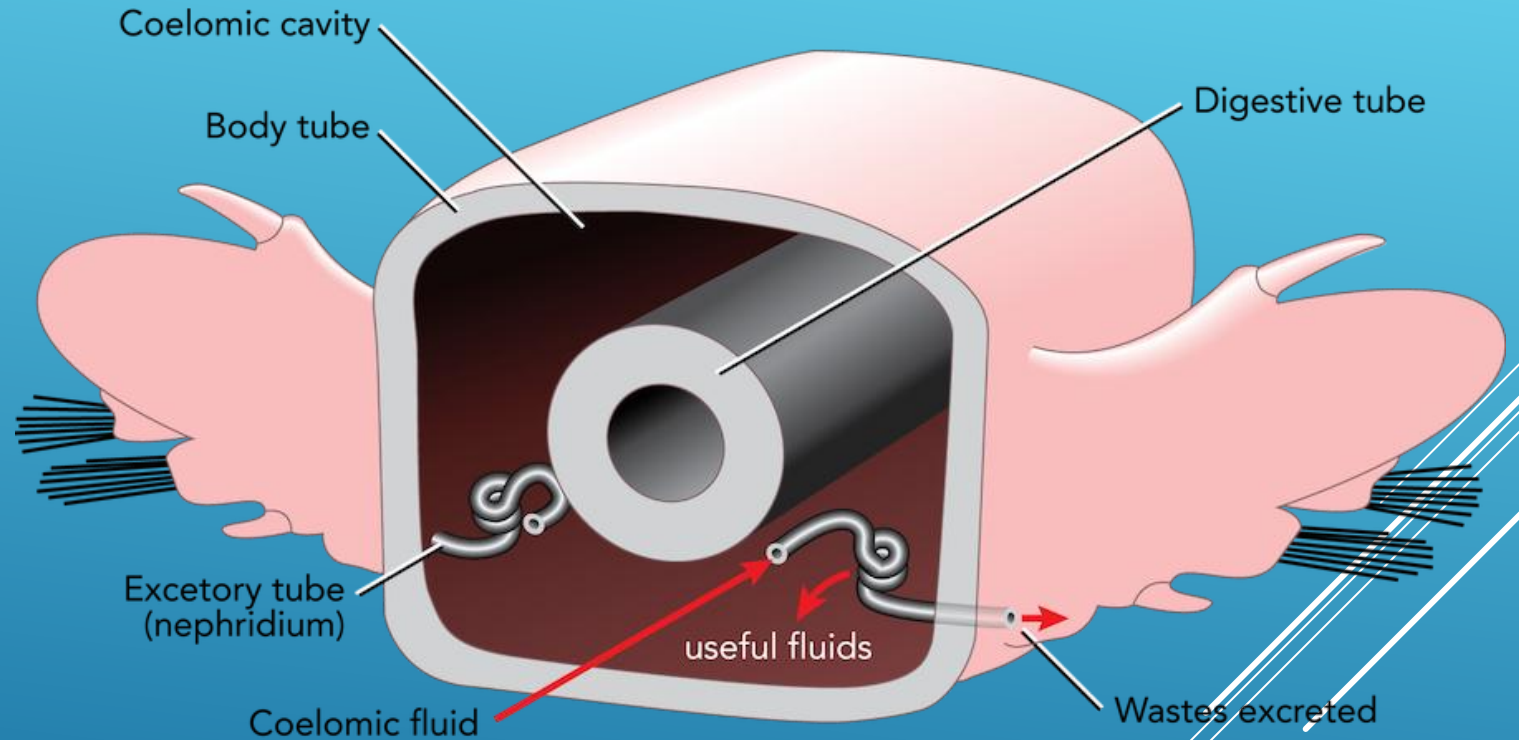


# ***SENSE ORGANS***


- Eyes: two to four pairs and vary in complexity
  - Nuchal organs: pair of sensory pits , chemoreceptors for food detection
  - Statocyst: present in head region of polychaetes
  - Tactile senses: ciliated tubercles, ridges and bands.
- 

# ***EXCRETION***

- Ammonia is an excretory product
- Excretory organ is called nephridia
- Types of nephridia:
  - ▶ 1. Protonephridium
  - ▶ 2. metanephridium
- Chloragogen tissue



# ***REPRODUCTION AND REGENERATION***

- Asexual reproduction: budding and fission
  - Sexual reproduction more common, dioecious
  - External fertilization
  - Epitoky: is a process in which sexually immature worm is modified or transformed into a sexually mature worm
  - Swarming of Epitokes
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***CLASS***

***OLIGOCHAETA***



# ***CLASS OLIGOCHAETA:***

## **CONTENT;**

1. INTRODUCTION AND EXAMPLES
  2. EXTERNAL STRUCTURE
  3. LOCOMOTION
  4. FEEDING AND DIGESTION
  5. CIRCULATION AND RESPIRATION
  6. NERVOUS SYSTEM AND SENSORY FUNCTION
  7. EXCRETION
  8. REPRODUCTION
- 
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# INTRODUCTION:

- 3000 Species
- Habitat
  - freshwater
  - marine
  - estuarine
- *Lumbricus terrestris*
- Common native species
  - *eisenia foetida*
  - *allolobophora*
- Examples:
  - earth worms
  - tubifex
- Giant Palouse earthworm



# ***EXTERNAL STRUCTURE:***

- Short setae
- Lack parapodia and long setae
- Prostomium
- Lack sensory appendages
- Series of segments
- Swollen Anterior half ,
- girdle like structure( clitellum)

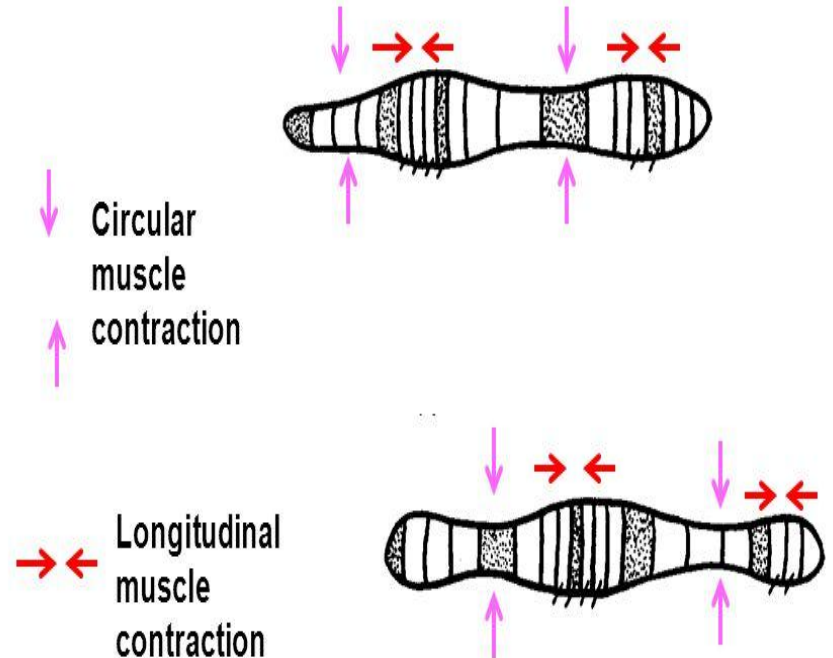


# LOCOMOTION

- Involves antagonism of circular and longitudinal muscles
- Longitudinal muscles contract and setae protruded
- Circular muscles contract and setae withdrawn
- Contraction of longitudinal muscles in segments behind bulging pulls it forward
- Segments move forward relative to the burrow as waves of muscle contraction move anteriorly
- Burrowing is a result of coelomic hydrostatic pressure
- Contraction of body walls muscles generates coelomic hydrostatic pressure that force the prostomium through the soil

## Class Oligochaeta

### Locomotion

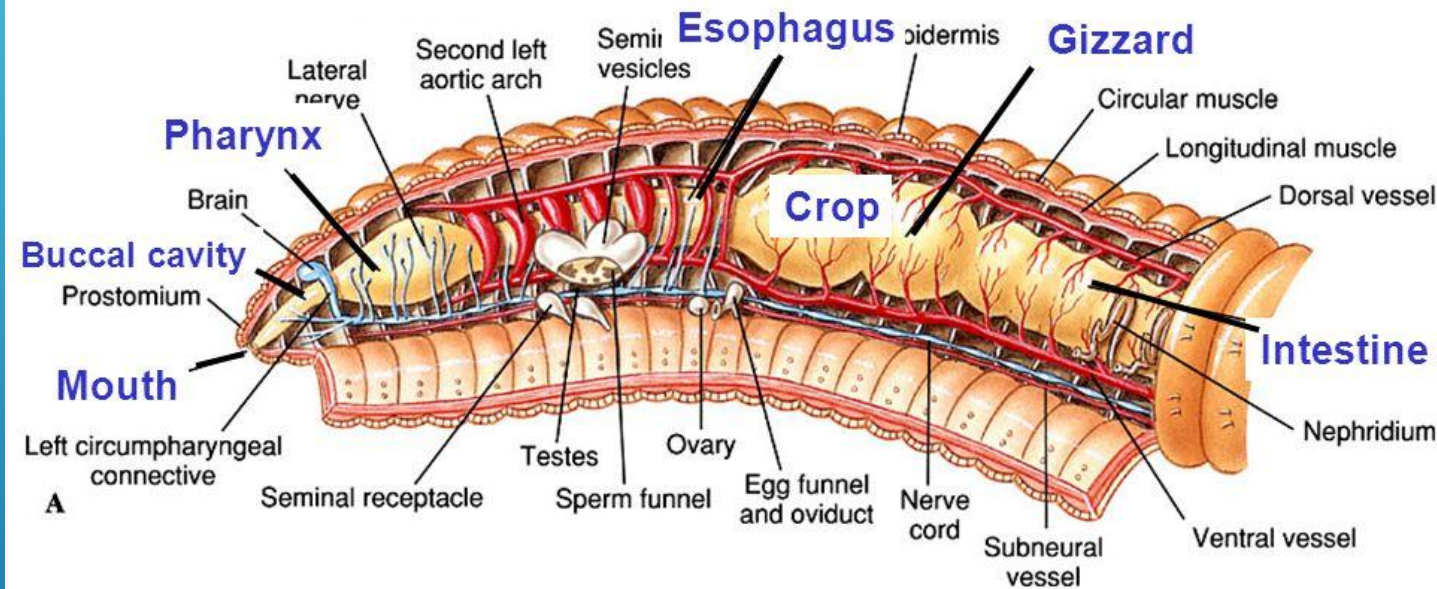




# FEEDING AND DIGESTION

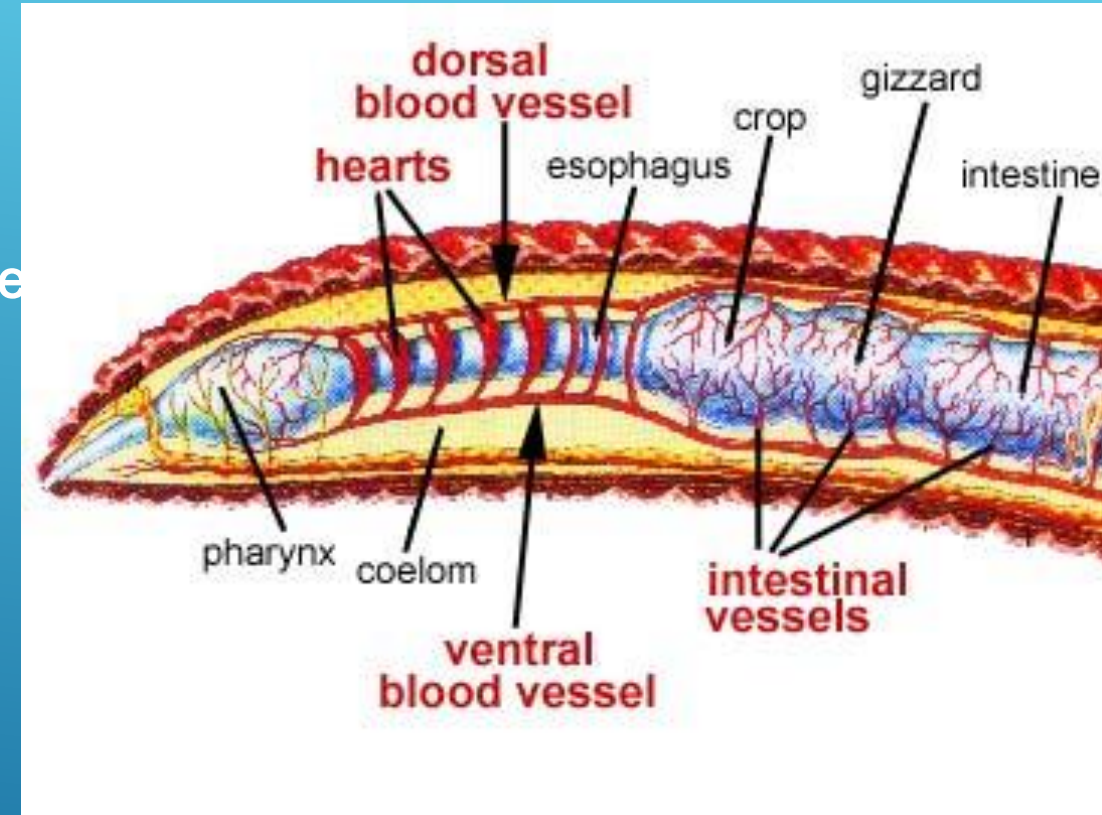
- Scavengers
- Digestive system is tubular and straight
  - mouth beneath prostomium
  - muscular pharynx
  - esophagus
  - stomach
  - crop
  - gizzard
  - calciferous glands
  - intestine with typhlosole
  - anus

## Digestive System



# CIRCULATION AND RESPIRATION

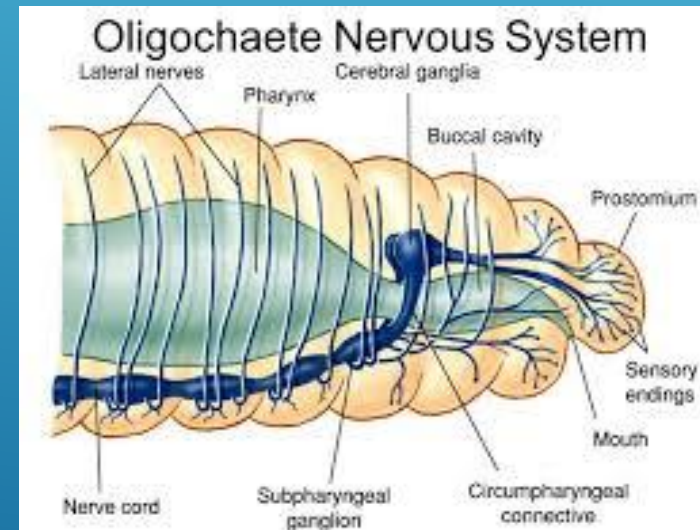
- Closed circulatory system
- Five pair of heart
- Dorsal and ventral vessels are main propulsive structure
- Diffusion across body walls
- No respiratory system like polychaeta
- Extensive system of capillaries
- 



# ***NERVOUS SYSTEM AND SENSORY***

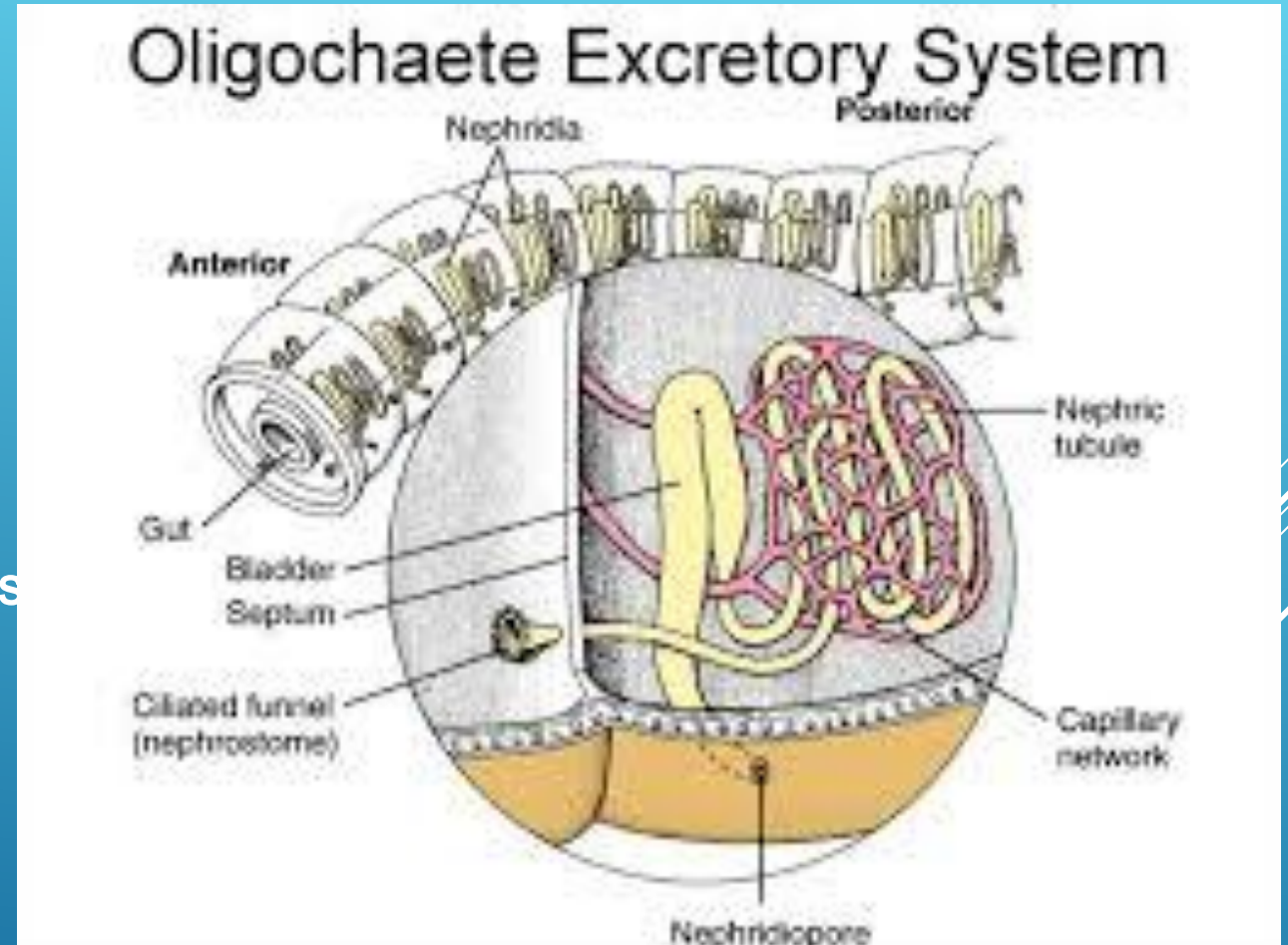
## ***FUNCTIONS***

- High degree of fusion
- Both CNS and PNS
- CNS: cerebral ganglia and ventral nerve cord with paired fused ganglia in each segment
- PNS: nerves branch of fused ganglia to supply body organs and wall
- Lack well developed eyes
- Have photo-receptors cells
- Photoreceptors cells mediate:
  - negative photo-taxis
  - positive photo-taxis
- Chemoreceptors and mechanoreceptors



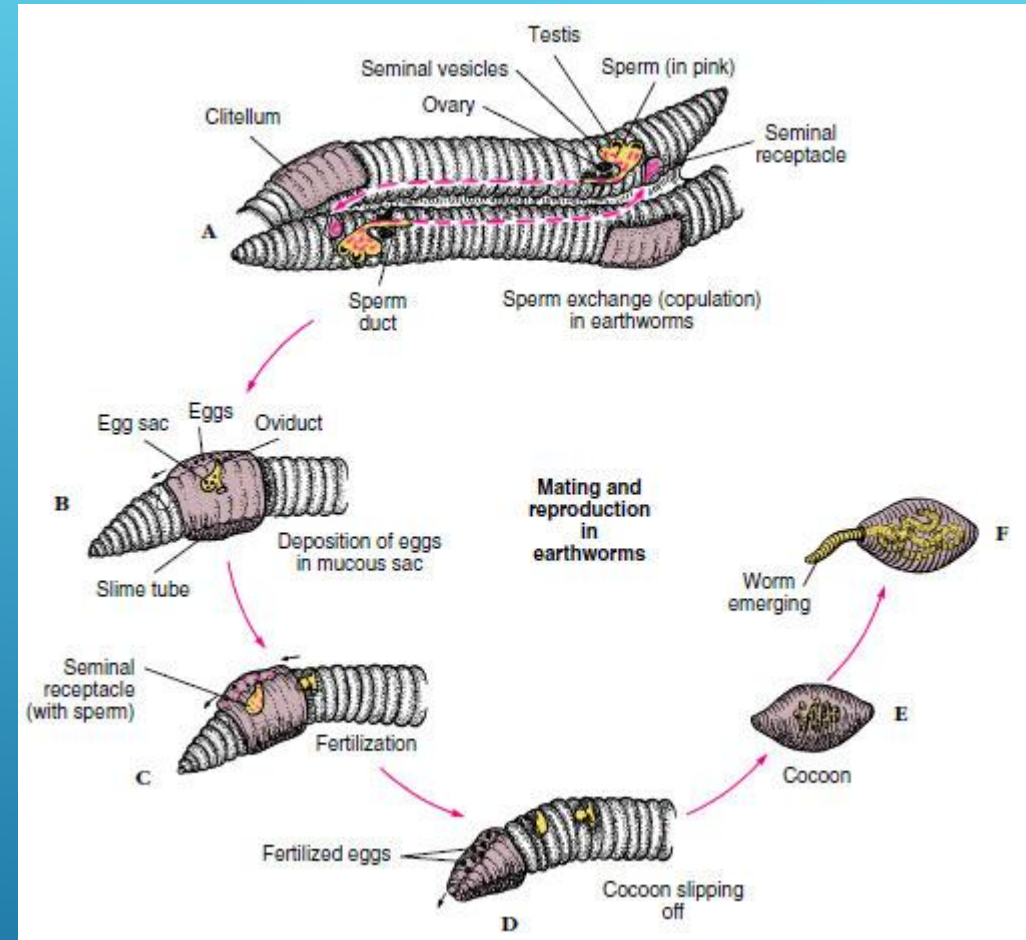
# ***EXCRETION***

- Meta-nephridia
- Ammonia in aquatic form
- Urea in terrestrial form
- Chloragogen tissue
- Function as a liver
- Amino acid metabolism
- Convert carbohydrates into glycogen and fats



# REPRODUCTION

- Monoecious ( hermaphrodite)
- Two pair of testes and one pair of ovaries
- Copulation involves double exchange of sperms
- Mucous from clitellum
- Last 2-3 hours
- Seminal receptacles
- Clitellum secretes nourishment for egg and food in tough chitin like cocoon
- Worm backs out cocoon
- Spiral cleavage
- Hatching in 2-3 weeks




# *CLASS HIRUDINEA*



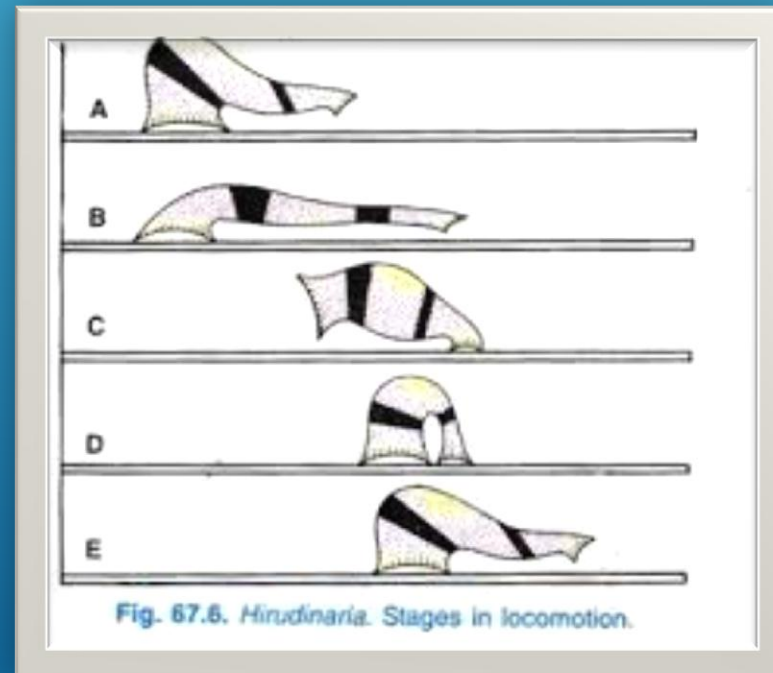
# ***CLASS HIRUDINEA***

## **INTRODUCTION**

- ▶ 500 Species of leeches
  - ▶ Marine, Freshwater, or terrestrial
  - ▶ Feed on small invertebrates or fluids of vertebrates
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# ***EXTERNAL STRUCTURE AND LOCOMOTION***

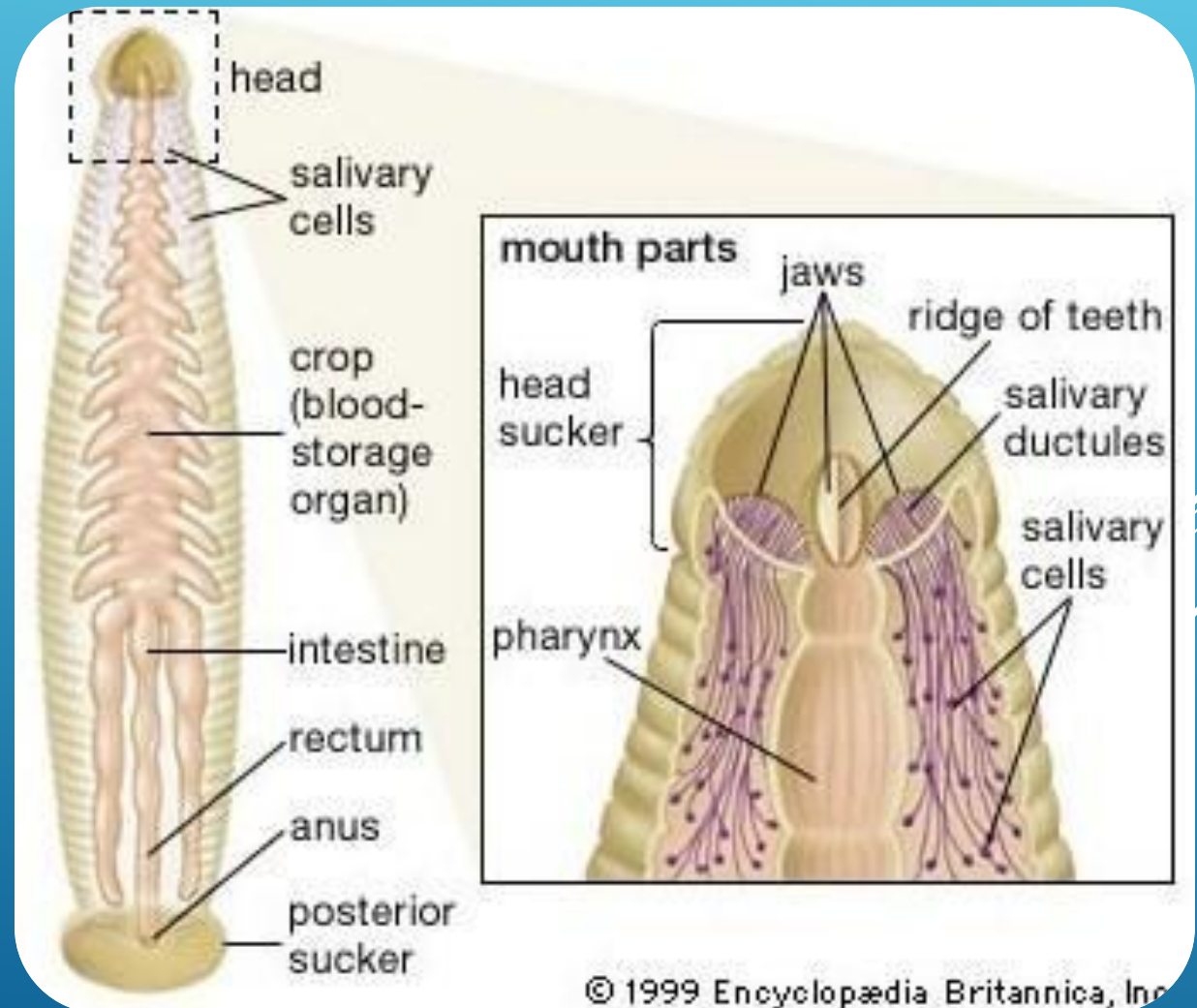
- Parapodia, head appendages
- Flattened and segmented body
- Annuli and suckers are present
- Body wall is muscular
- No septa
- Coelomic and Hydrostatic cavity
- Undulating movement






# FEEDING AND DIGESTIVE SYSTEM

- Parasitic and predatory mode
- Parts Of Digestive Tract:
  - Mouth
  - Sucker
  - Proboscis
  - Jaws
  - Salivary Glands
  - Pharynx
  - Esophagus
  - Stomach
  - Intestine
  - Anus




# ***GAS EXCHANGE AND CIRCULATION***

- Circulatory pattern
  - Coelomic sinuses
  - Coelomic Fluid
  - No respiratory pigments
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# MAINTAINANCE AND FUNCTIONS OF LEECH



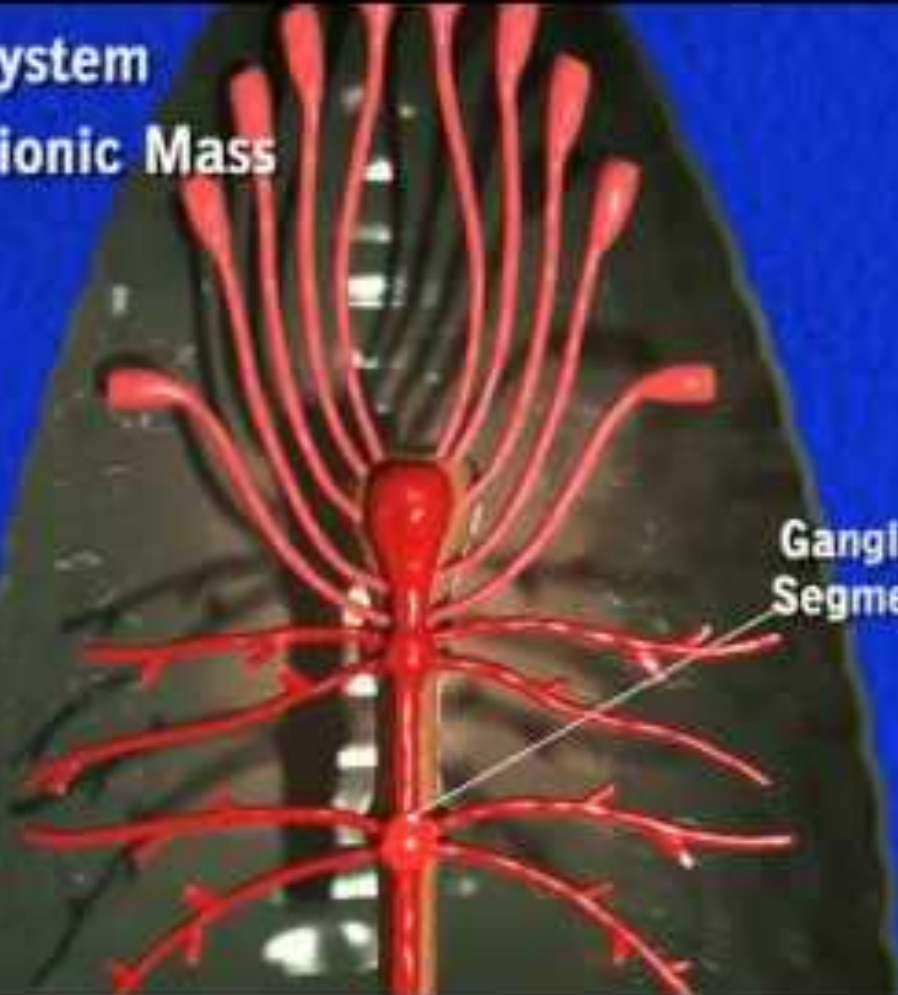
# ***TABLE OF CONTENTS***

- ▶ Nervous system of leech
  - ▶ Sensory functions of leech
  - ▶ Excretory system of leech
  - ▶ Reproduction in leech
  - ▶ Developmental stages of leech
  - ▶ Further phylogenetic considerations
- 
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# ***NERVOUS AND SENSORY FUNCTIONS***

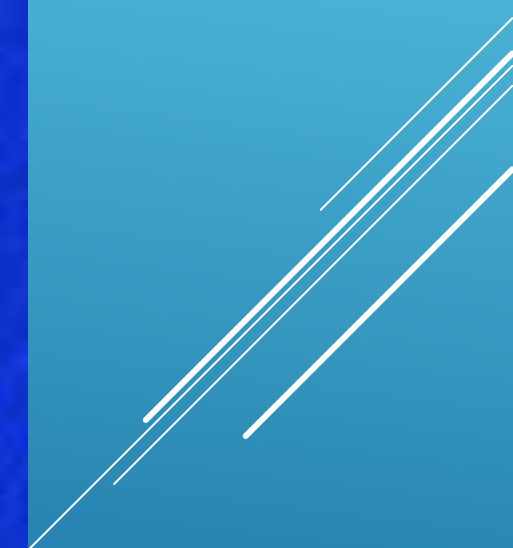
- ▶ Ventral and dorsal nerve cord
  - ▶ Ganglion
  - ▶ Pharyngeal, subpharyngeal and suprapharyngeal connectives
  - ▶ Sense organs
  - ▶ Photoreceptors
  - ▶ Positive and negative phototactic responses
- 
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**Central Nervous System**  
**(c) Terminal Ganglionic Mass**



**Ganglion Of Segment VII**

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MADRAS



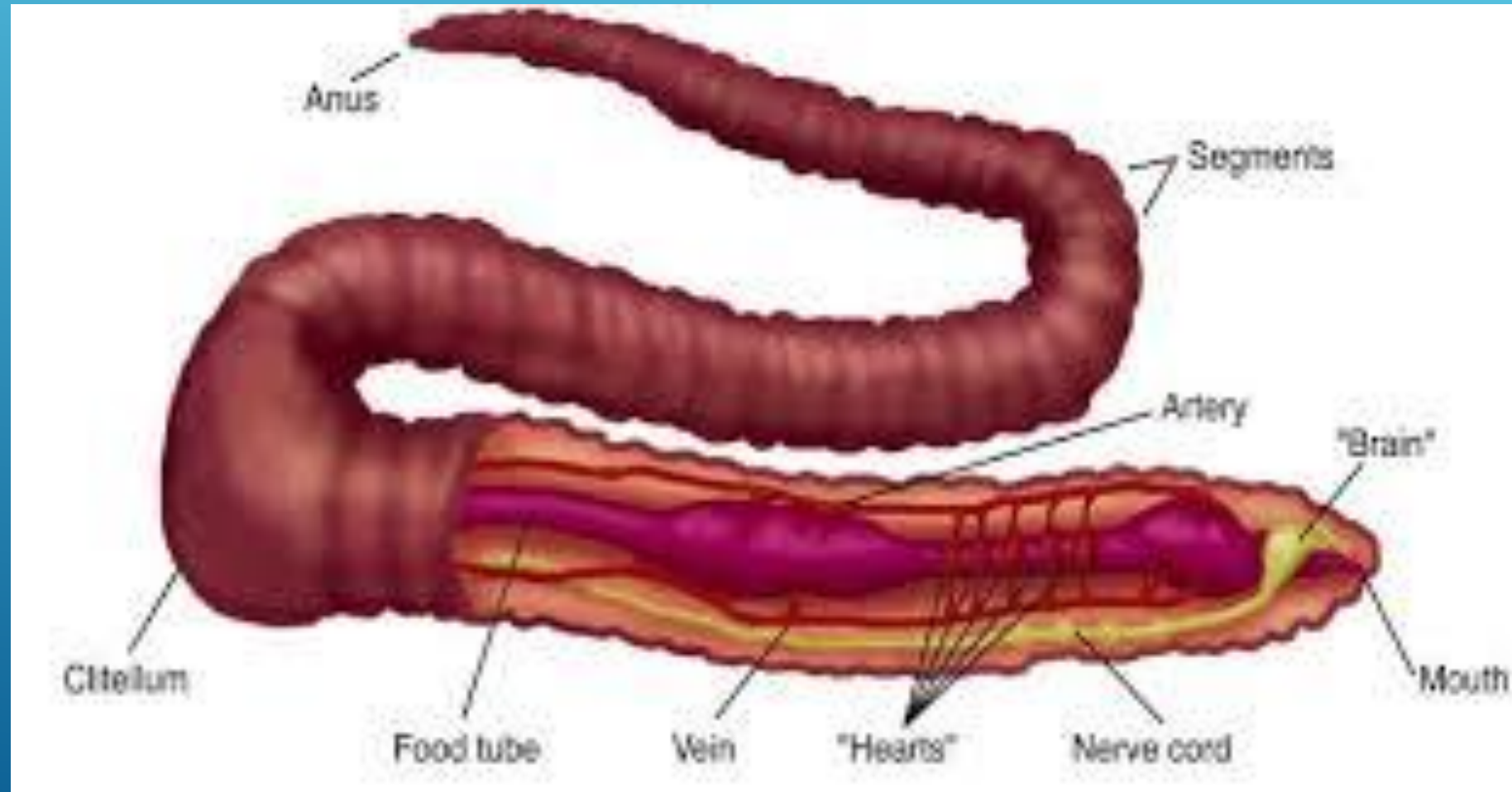
# ***HIRUDO MEDICINALIS***

- ▶ Medicinal leech
- ▶ High temperature sensor of prey



# ***EXCRETION***

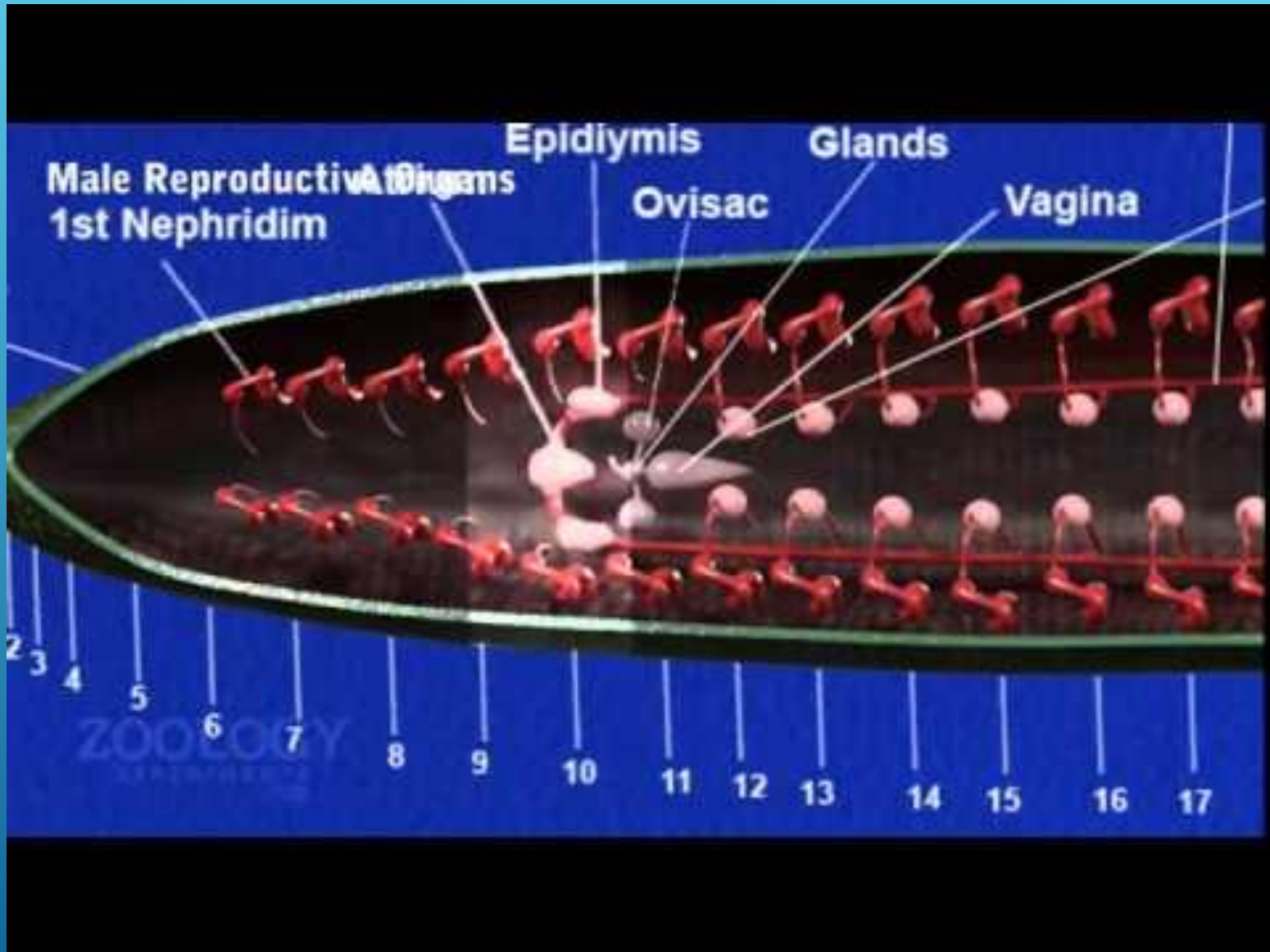
- ▶ Metanephridia
- ▶ Nephrostome, tubule, capsule
- ▶ chloragogen





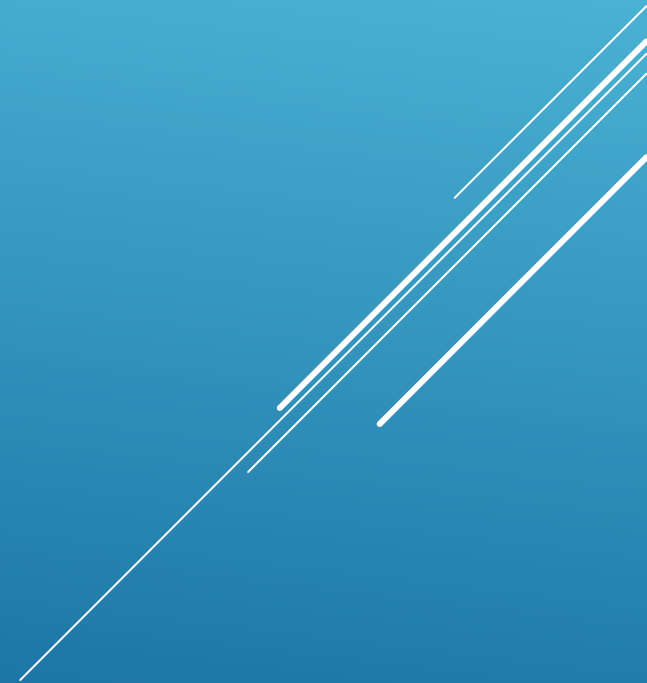
# ***REPRODUCTION AND DEVELOPMENT***

- ▶ Sexual reproduction
  - ▶ Monoecious
  - ▶ No asexual reproduction
  - ▶ No regeneration
  - ▶ Single pair of ovaries
  - ▶ 4 or more testes
  - ▶ Clitellum
  - ▶ Hypodermic impregnation
  - ▶ Cocoons formation
  - ▶ No larval stage
- 



# ***FURTHER PHYLOGENETIC CONSIDERATIONS***

- ▶ Oligochaetes evolve from annelids
- ▶ Oligochaetes give rise to hirudinae
- ▶ Oligochaetes and leeches belong to group clitellata
- ▶ Few polychaetes invade freshwater
- ▶ Oligochaetes invade terrestrial ,marine environments. This give rise to reptiles
- ▶ Freshwater oligochaetes **➡** leech (marine and terrestrial)



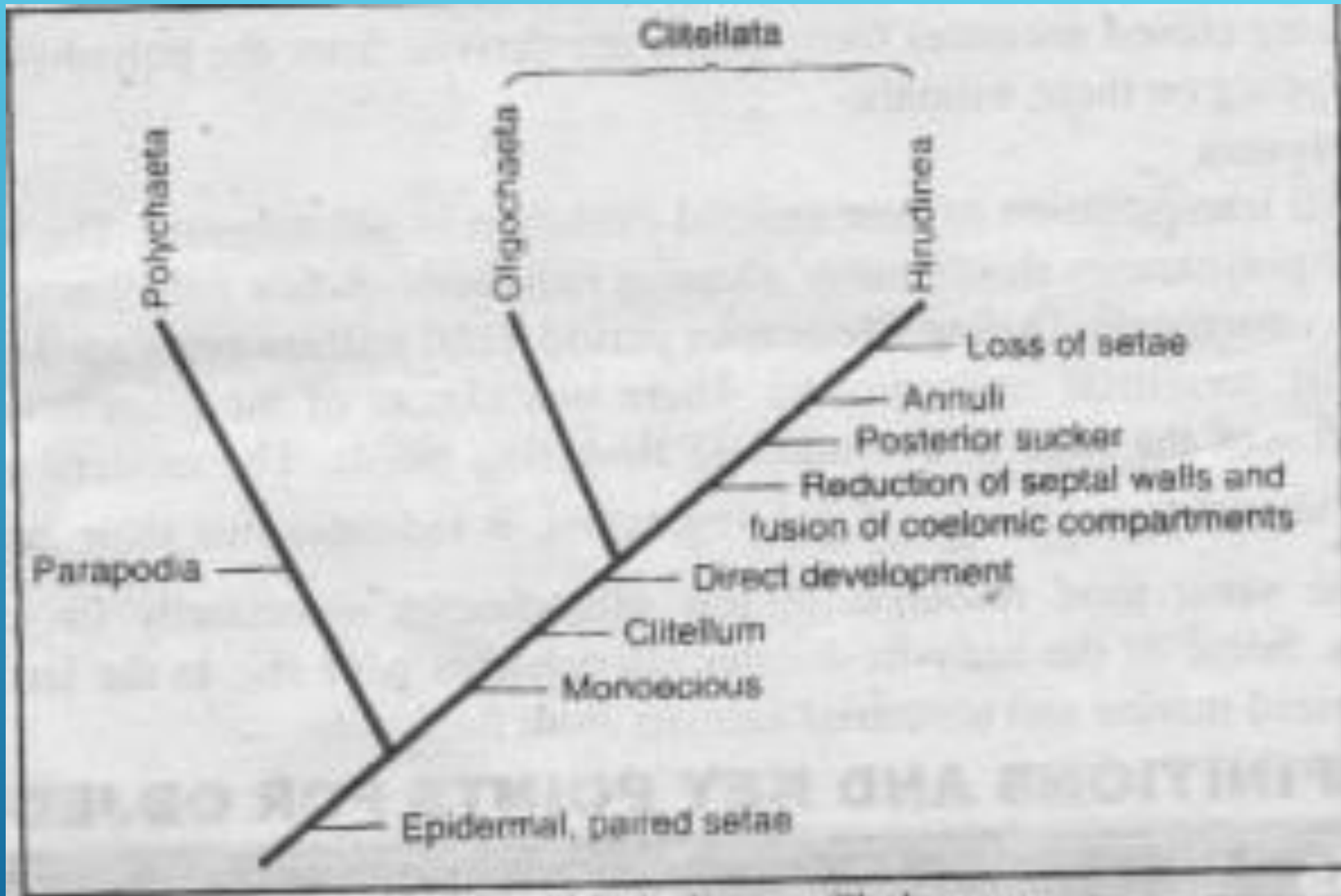


Fig: Annelid Phylogeny Cladogram

*THANK*

*YOU*

