Phylum Platyhelminthes
(the flatworms)

~1300 species
ie: Planarians, Tapeworms, Flukes
Some are free living and some are parasitic.
Soft, flattened worms with tissues and internal organ systems.
The simplest animals to have 3 germ layers, bilateral symmetry, and cephalization.
Bilaterally symmetrical: Most primitive bilaterally symmetrical organism
Acoelomate: but no coelom
Coelom- fluid filled body cavity, lined with tissue derived from mesoderm.
Size range:1 mm to several meters
More complex than porifera and cnidarians, but the least complex worm phylum.
Bodies are:
Flat
Thin
Solid
Show **Cephalization:** Have a clearly defined "head" region responsible for sensing and responding to changes in the environment. Concentration of nerves in the head area.
Tripoblastic: Have 3 germ layers
Mesoderm- gives rise to parenchyma and muscles
Endoderm- forms a digestive cavity (which is the organism's only body cavity)
Ectoderm-
Digestive cavity has one opening that serves as both a mouth and an anus (no true anus) therefore the digestive system is considered "incomplete."
No circulatory system
No respiratory system
No coelom

Respiration, Circulation and Excretion:
Rely on diffusion to transport O_2 and nutrients to tissues and remove CO_2 and wastes.
Flame Cells- specialized cells that remove excess water from the body.
These cells can also filter and remove metabolic wastes (ammonia, urea.)
These cells can join together to form a network of tubes to empty to the outside environment through pores in the animal's skin.
They are called flame cells because constant movement of the cilia inside the cells resemble the flickering of a candle flame.

Feeding:
Free Living-
Carnivores: Feed on tiny aquatic animals and protists.
or
Scavengers: Feed on recently dead animals.
Digestive cavity has a single opening (mouth) through which both food and wastes pass.
Process of:
1. Extend pharynx out of mouth

2. The pharynx secretes enzymes to begin digestion
3. The pharynx sucks the food into the mouth and into the digestive cavity. where digestion is completed and absorption occurs.
4. Digested food diffuses into other cells.

Parasitic:

Because they absorb food that has already been digested by the host and blood, tissue fluids etc. of the host, there is no need to have complex digestive system.
Some have a pharynx and dead end intestinal sacs.
Tapeworms have no digestive tract, they simply absorb digested nutrients from the host's intestine.

3 Classes of Platyhelminthes:

1. Class Cestoda- tapeworms
2. Class Trematoda- flukes
3. Class Turbellaria- planarians

Class Cestoda:

Long and ribbon-like
Live in intestines of meny different vertebrates
Have no sense organs

No respiratory or circulatory system
Highly developed reproductive system
Absorb nutrients directly through the body
Can grow up to 10 m in length
No mouth
No digestive tract
Scolex (head): knob-shaped, covered with hooks and suckers, used to attach to the intestinal walls of host.
Proglottids (body sections): detachable section of tapeworm containing muscles, nerves, flame cells, male and reproductive structures.

a.) oldest proglottids are at the posterior end of the worm
b.) each proglottid contains reproductive organs
c.) each contain up to 100,000 eggs
d.) each worm can have up to 2000 proglottids

Fertilization can be self or cross-polination
ie: Beef tapeworm, the *Taenia saginatum*, infects humans.

Life cycle of the *Taenia saginatum*:

i. cattle eats grass with contaminated proglottids and eggs
ii. larvae hatch and bore into cow's intestine into the blood.
iii. larvae burrow into muscle tissue and form cysts
iv. human infection from eating undercooked meat
v. cyst walls dissolve releasing worm
vi. worm attaches to intestine wall and matures
vii. sperm and eggs form in proglottids and produce fertilized eggs
viii. proglottids break off and are removed from the hostthrough feces
ix. the process begins again

ie: *Dipylidium caninum* (common cat/dog tapeworm)

i. fleas are the host for the larval stage
ii. children are infected if they swollow fleas while playing with cats/dogs
iii. have a scolex with 4 suckers and several rows of hooks

Class Trematoda:

Infect the internal organs of hosts.

Parasitic

Can be endoparasites (live in the host) or ectoparasites (attach to external surfaces of the host.

Size: ~ 1 cm to 10 cm

Covered in an unciliated cuticle.

Usually require 2 hosts to complete it's life cycle.

Invade the digestive system of vertebrates.

Embed themselves in tissues lining the intestines and feed on the cells, blood, and fluids of the host.

Lack an epidermis- have a thick integument that resists the enzymes of the host.

Have 1 or more "suckers" on the ventral surface that allow it to attach to the host.

Have a bilobed intestine (2 lobes.)

Much of the body is occupied by reproductive organs.

Hermaphroditic: Capable of self-fertilization, though cross-fertilization is more common.

ie: Liver Fluke:

a.) mouth is in the anterior oral sucker
b.) ventral sucker is 1/3 of the way back
c.) testes- in the posterior third of the body
d.) genital pore- just anterior to the ventral sucker
e.) uterus- long coiled, behind the ventral sucker
f.) ovary- single body ear the middle of the animal, connects to the seminal receptacle and yolk glands
g.) seminal receptacle- stores sperm after copulation
h.) yolk glands- connect to the ovary, small round bodies, lateral sides of the midpart ofhte body, supplies the fertilized eggs with yolk as they develop.
i.) Excretory pore- On posterior end, allows for removal of nitrogenous wastes.

Class Turbellaria:

~ 4500 species

Live in marine or freshwater (bottom dwellers)

Are more active at night

Not parasitic

Do not cause disease

Free-living

Sometimes called cross-eyed worms because of the eyespots

Size: Generally 1-3 cm, but can be 1 mm to 60 cm

Vary in color

Have true ventral and dorsal surfaces

Body's ventral surface is covered with cilia for swimming

Rhabdite cells- rod shaped cells that lie in the epidermis; contents are secreted into the water and form a gelatinous sheath around the animal.

Feeding:

i. feed on dead or slow moving organisms (including small planaria)

ii. can catch and digest protists
iii. eats by extending pharynx from mouth (a pharynx is a muscular tube that can extend outside the body and is used to suck food into its mouth, digestion begins when enzymes are released by the pharynx)
iv. pharynx is on the ventral surface
v. there is one opening in the digestive system
vi. undigested food is absorbed by the intestine and excreted back through the mouth

Nervous system:

i. Cephalized
ii. Have ganglia: 2 clusters of cells forming a simple "brain"
iii. Have 2 longitudinal nerves- from ganglia to posterior end
iv. Have transverse nerves

Response:

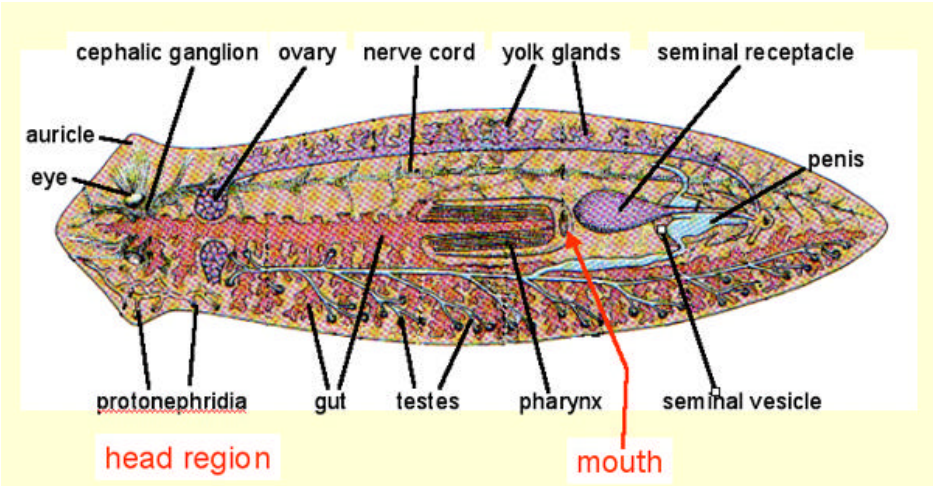
i. Ocelli (Eyespots)- help the animal find shaded areas and food; located on head; composed of photosensitive cells; can not form images like complex eyes; help the animal respond to the amount of light present in the environment.
ii. Sensory pitts- on sides of head; used to detect food, chemicals and movements in the environments.
iii. Research shows that planaria can master a 2 choice maze and responses to stimuli can be conditioned (behaviorists believe this means that they are the simplest animals that have the ability to learn in response to simple conditioning.)

Reproduction:

i. hermaphroditic, but do not fertilize their own eggs
ii. fertilized eggs hatch in 2-3 weeks
iii. *sexual:*
  a.) 2 worms join
  b.) sperm is exchanged
  c.) fertilization is internal (fertilized
  d.) zygotes are released in capsules in water and hatch.
iv. *asexual:*
  a.) reproduce asexually in the summer
  b.) Architomy- fission where the organism divides into 2 fragments without prior differentiation of new parts.
  c.) Catch posterior end to something sharp and stretch themselves until the body tears into 2 pieces; each half then regenerates the missing parts.
  d.) Almost any part can regenerate into a complete worm, though the closer to the posterior end, the more likely that the organism will not form a proper head.

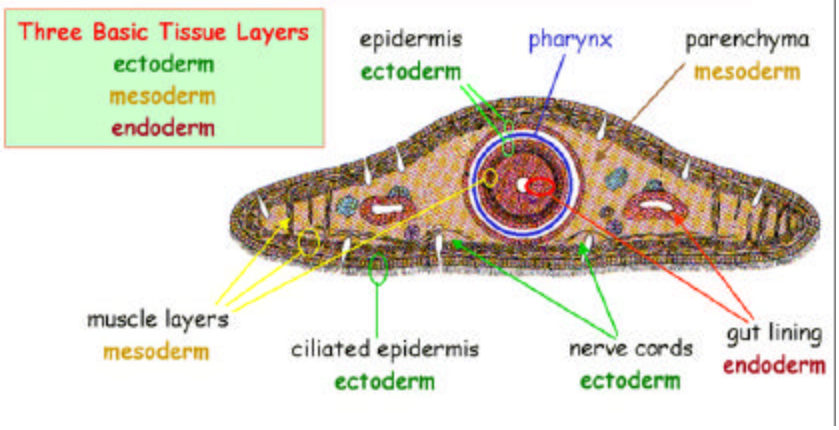
Movement:

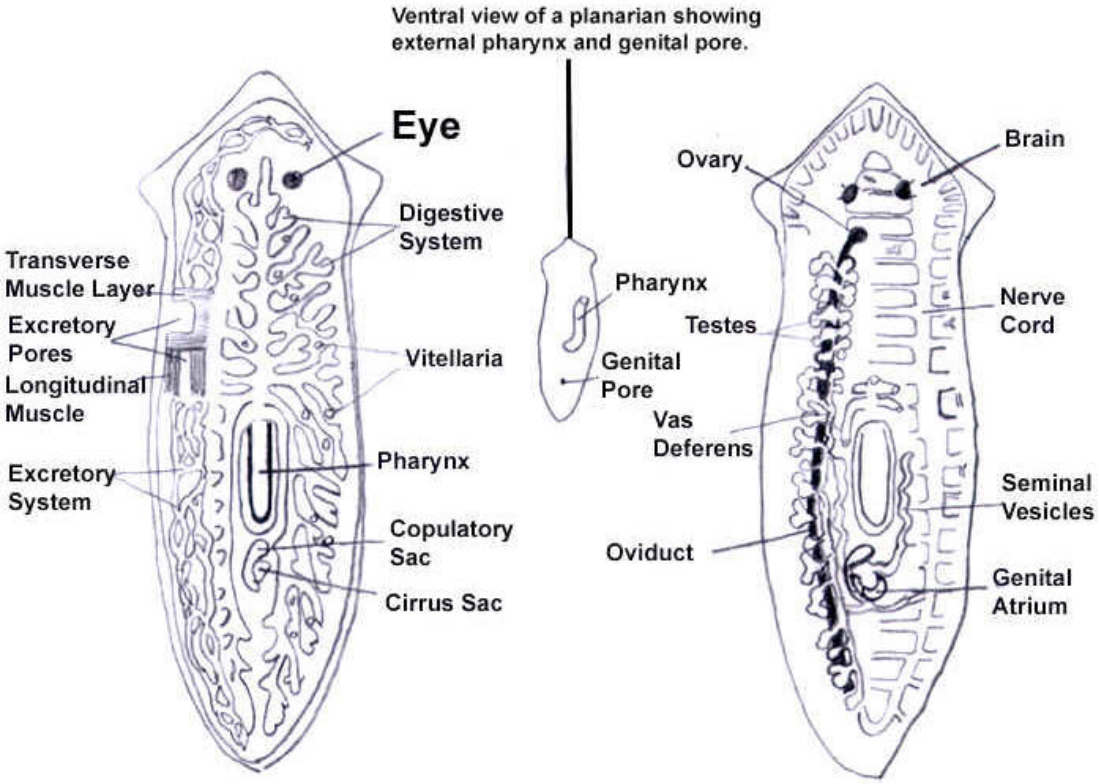
i. cilia help the organism glide through the water and over the bottom of ponds.
ii. Muscle cells allow the organism to twist and turn responding rapidly to environmental stimuli.



Triploblastic Body Design

compare Hickman Fig. 7-4





A dorsal dissection to the level of the excretory and digestive systems

A dorsal dissection to the level of reproductive and nervous system