What is an animal?

Animals are "multicellular, heterotrophic, eukaryotes"...but so are fungi.

What makes animals different:

-Obtain nutrients via ingestion, the act of eating

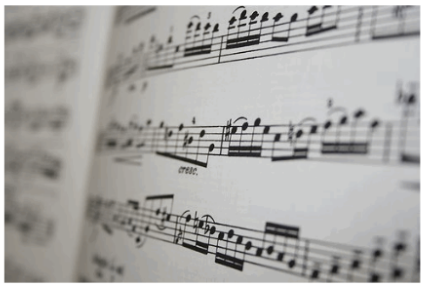
-Cells lack cell walls. Support is provided by extracellular matrix of proteins and intercellular junctions

-Most have muscle cells and nerve cells, for movement and conduction of impulses

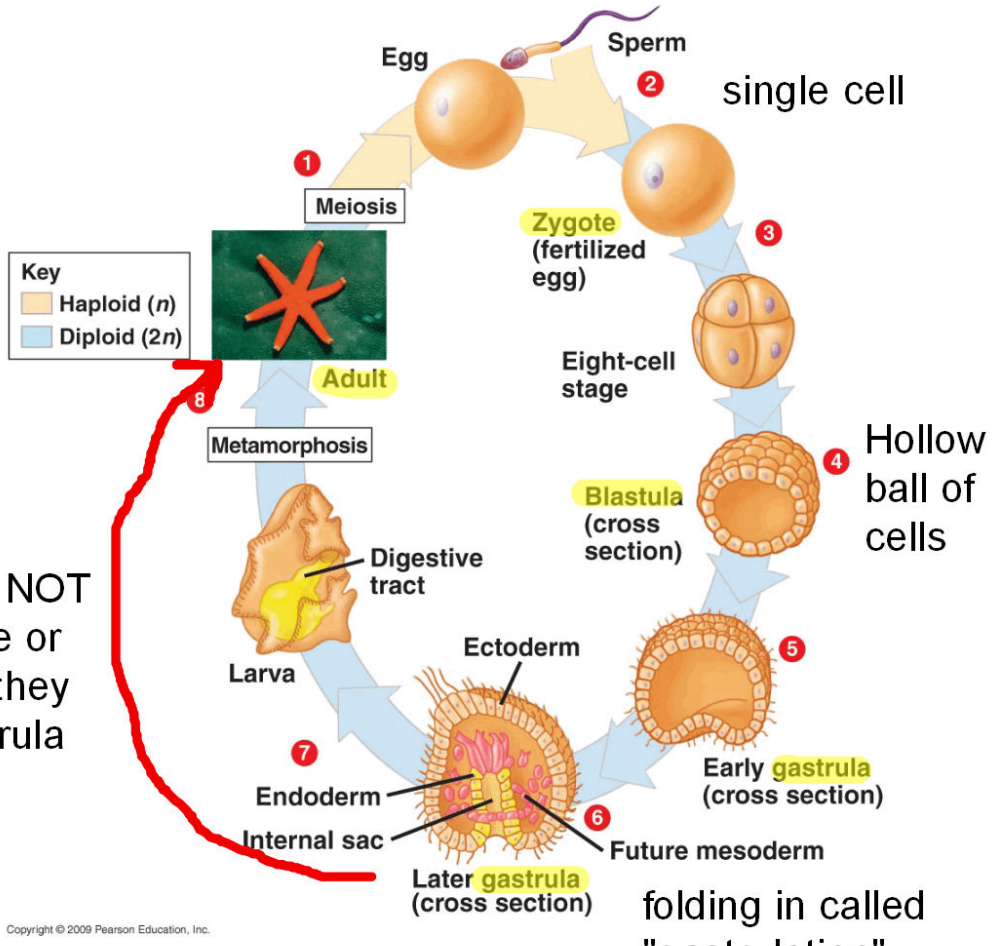
-Life cycle: most are diploid (some amphibians and reptiles are tetraploid) and reproduce sexually...sperm and eggs are the only haploid cells...cycle includes unique embryonic stages which are controlled by unique genes

Developmental Control Genes are called *Hox* genes...

Interestingly, humans are really not that complicated in terms of their genetic makeup...we, and all other animals, share many genes with fruit flies...these genes are used to build our basic anatomical structures...but the control of these genes differs markedly between different animals...



Animal Life Cycle:



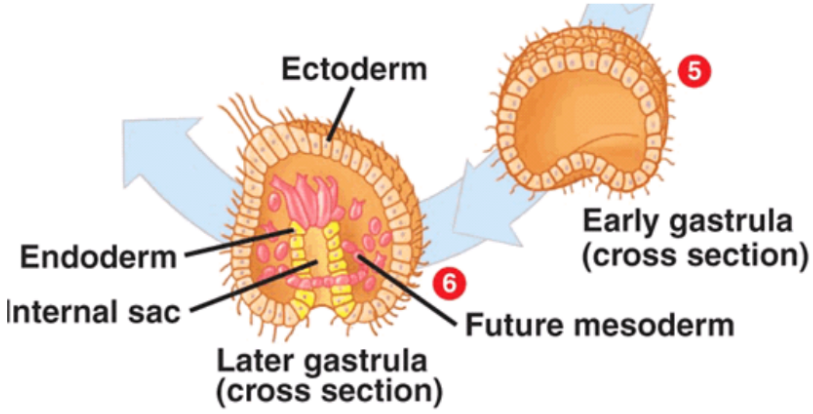
Some animals do NOT have a larva stage or metamorphosis...they go from later gastrula to adult

Gastrulation results in "layered" body plan, which includes:

Endoderm: Inner-most layer...becomes digestive tract and hollow organs

Ectoderm: "outer covering"...becomes epidermis and nervous system in most animals

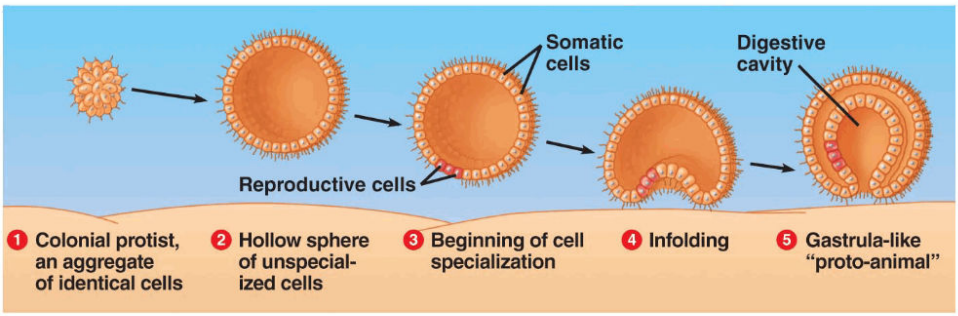
Mesoderm: "middle" layer...becomes muscles and most internal organs



Evolutionary Origin of animals...

-Common ancestor to present-day animals lived about a billion years ago and may have resembled a modern choanoflagellate...a colonial protist.

-Would this make sense? Compare:



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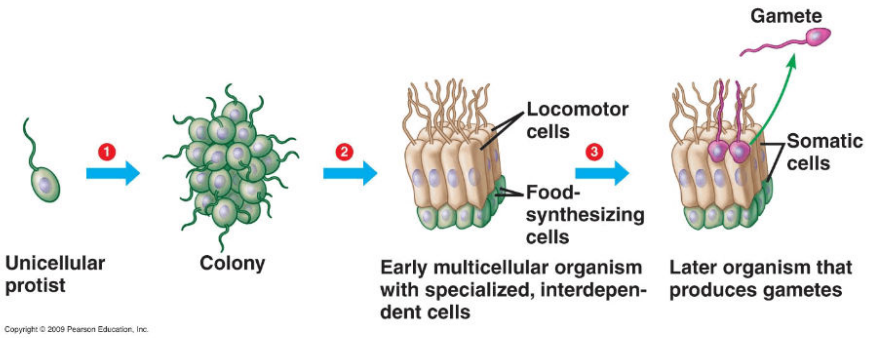

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Cambrian "Explosion"...

Layer in fossil record which documents a dramatic increase in animal diversity...occured during an approximately 15 million year span around 542 million years ago

Hypotheses for this event include:

-ecological causes...hard body coverings produced new predator-prey relationships and diverse adaptations for feeding, mobility, and protection

-geologic causes...atmospheric oxygen concentrations became higher, allowing for higher metabolic levels and more active, mobile animals

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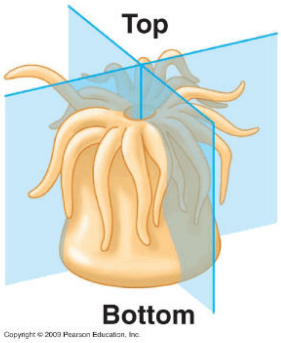
General Features of body structures are used to develop animal phylogeny...

symmetry: radial vs bilateral



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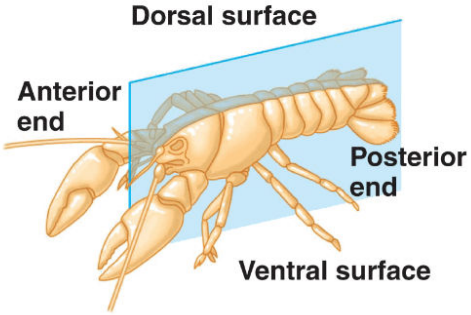
-more simple
-less motile, more passive
-meet environment equally on all sides

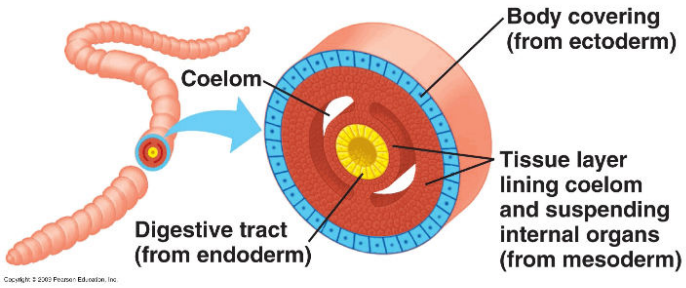


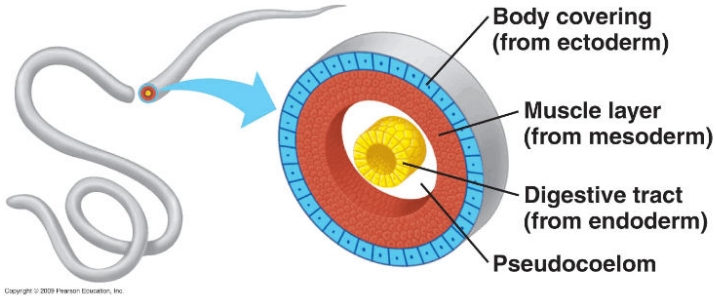
-more complex
-arrangement of brain, senses facilitate mobility
-meet environment "head-on"

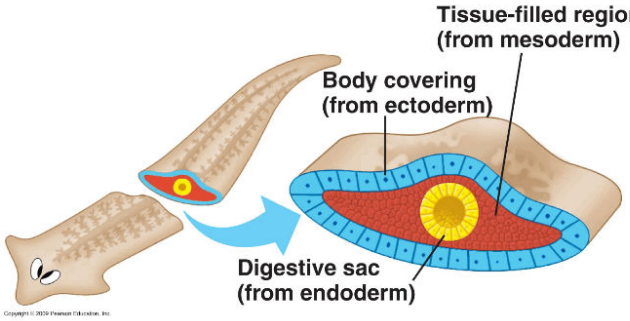
Body plans differ in organization of tissues, number of layers, and presence/absence of body "cavity" called a coelom...

-the simplest animals, sponges (phylum *Porifera*) lack true tissues, but most animals have specialized tissues that are separated by membranes and that perform specific functions.

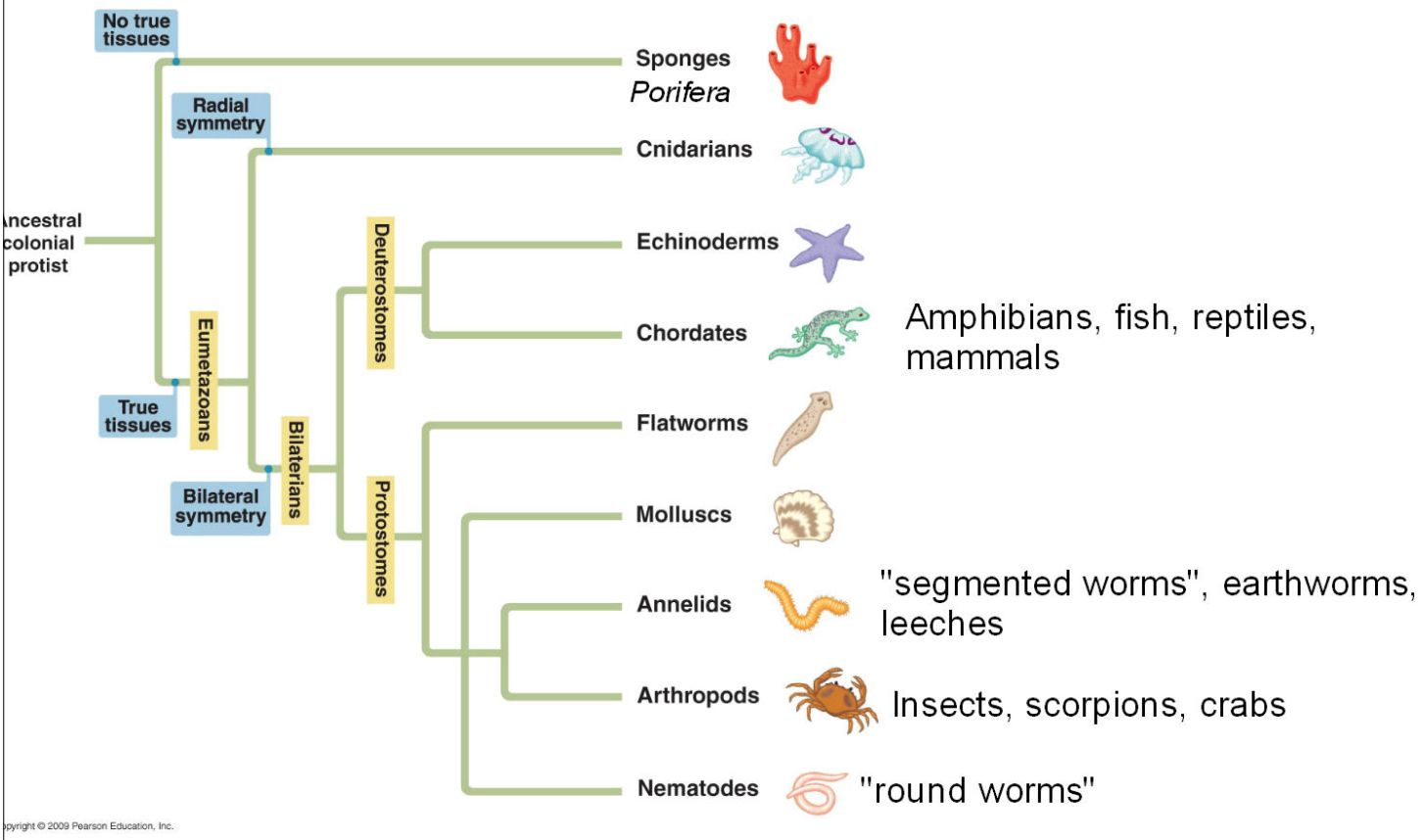
-These tissue layers form during gastrulation and the number can vary...either two or three layers usually







Major Phyla of Animal Kingdom:



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We will examine some of these Phyla via a "comparison of systems" approach