



Animals (cont.)

Origins and Early Diversification of Animals

- Four basic features vary in different animal body plans, and are the basis for grouping animals into different phyla:
 - Presence of tissues
 - Parazoa, no presence
 - Eumatozoa, presence

Origins and Early Diversification of Animals

- Four basic features vary in different animal body plans, and are the basis for grouping animals into different phyla:
 - Body symmetry
 - Animals with radially symmetrical bodies tend to be sessile aquatic organisms that can react to predators or food from any direction.
 - Embryonic tissues
 - Diploblasts have only ectoderm and endoderm in the embryo.
 - Bilaterally symmetrical animals are adapted for forward motion: sense organs concentrated in a head, limbs for locomotion at the rear.
 - Embryonic tissues
 - Triploblasts have a third tissue: mesoderm, which gives rise to bone, circulatory systems, muscle, and tissues for locomotion.

Origins and Early Diversification of Animals

- Four basic features vary in different animal body plans, and are the basis for grouping animals into different phyla:
 - Fluid-filled body cavities
 - Acoelomates: no body cavity.
 - Coelomates: organisms with body cavity enclosed by mesoderm.
 - Pseudocoelomates, organisms with body cavity not enclosed by mesoderm.

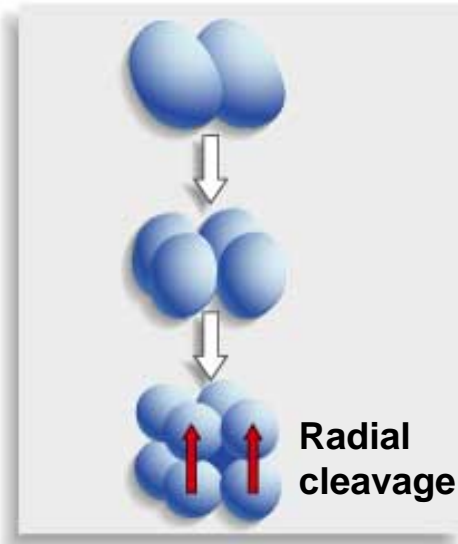
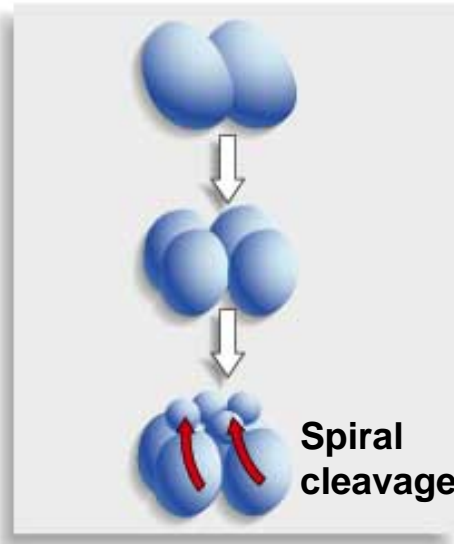
Origins and Early Diversification of Animals

- Four basic features vary in different animal body plans, and are the basis for grouping animals into different phyla:
 - Early events in embryogenesis
 - Protostomes: spiral cleavage, mouth develops first, coelom develops within blocks of mesoderm.
 - Deuterostomes: radial cleavage, mouth develops second, coelom develops from mesoderm cells that bud off the endoderm.

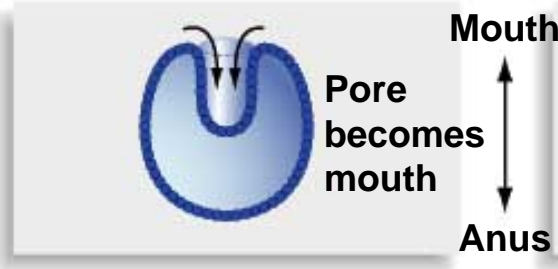
PROTOSTOMES

DEUTEROSTOMES

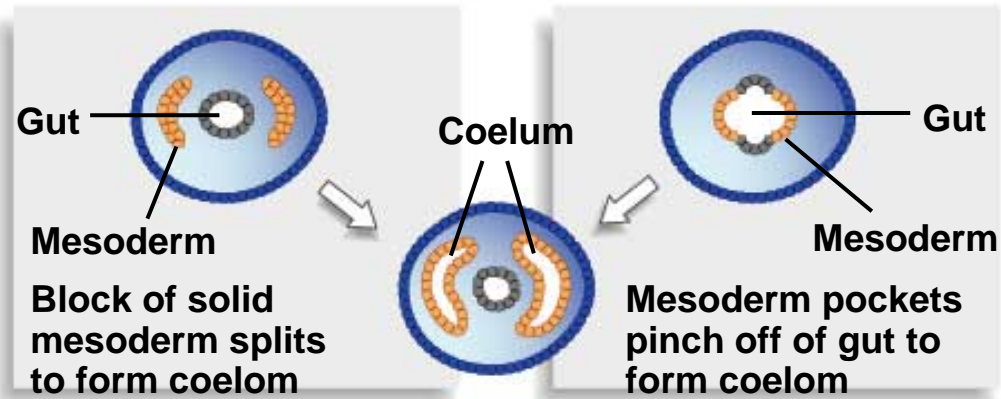
(a) Cleavage
(zygote divides
into ball of cells)

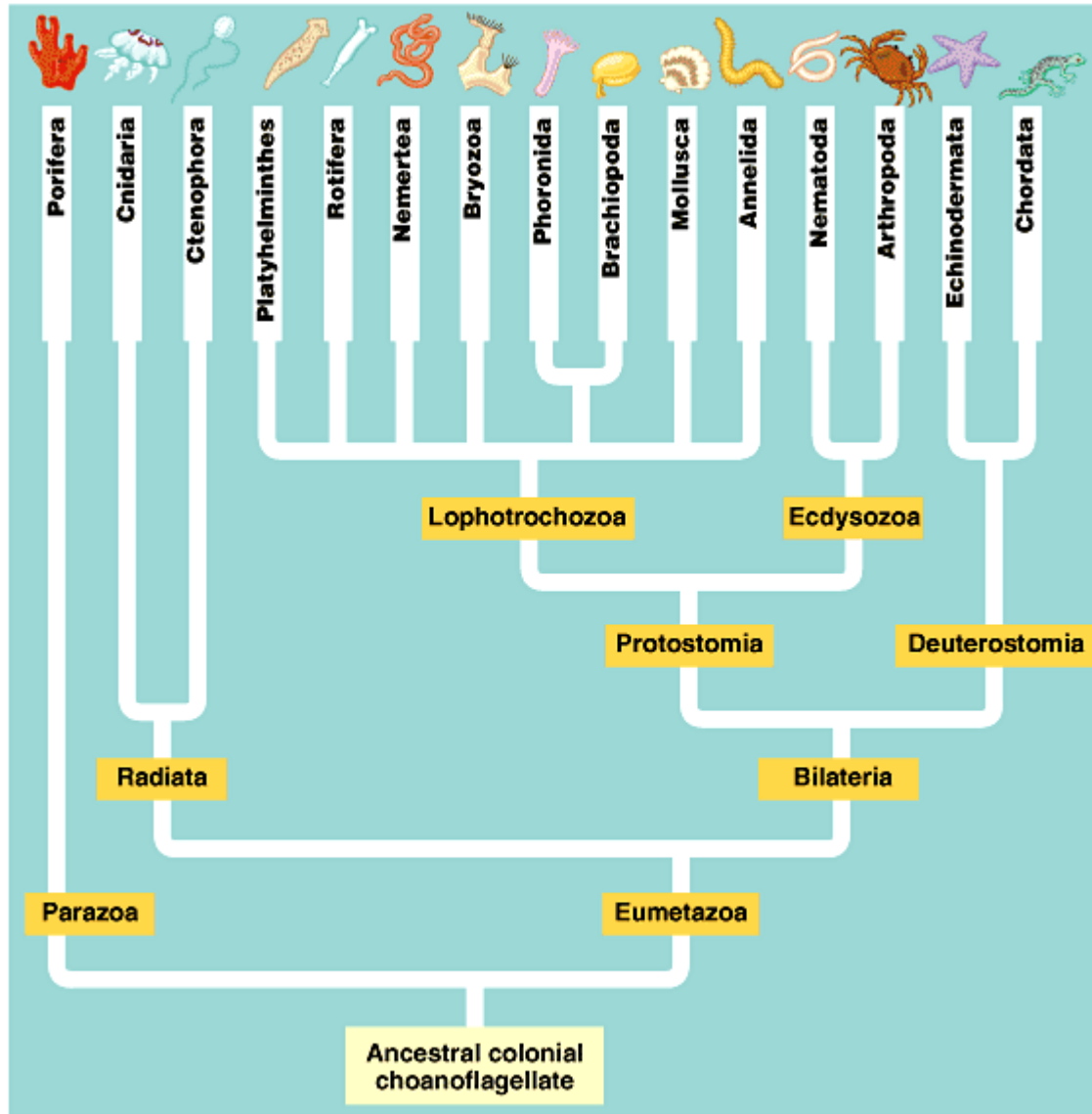


(b) Gastrulation
(cells invaginate
to form gut)



(c) Coelom
formation





Vertebrates

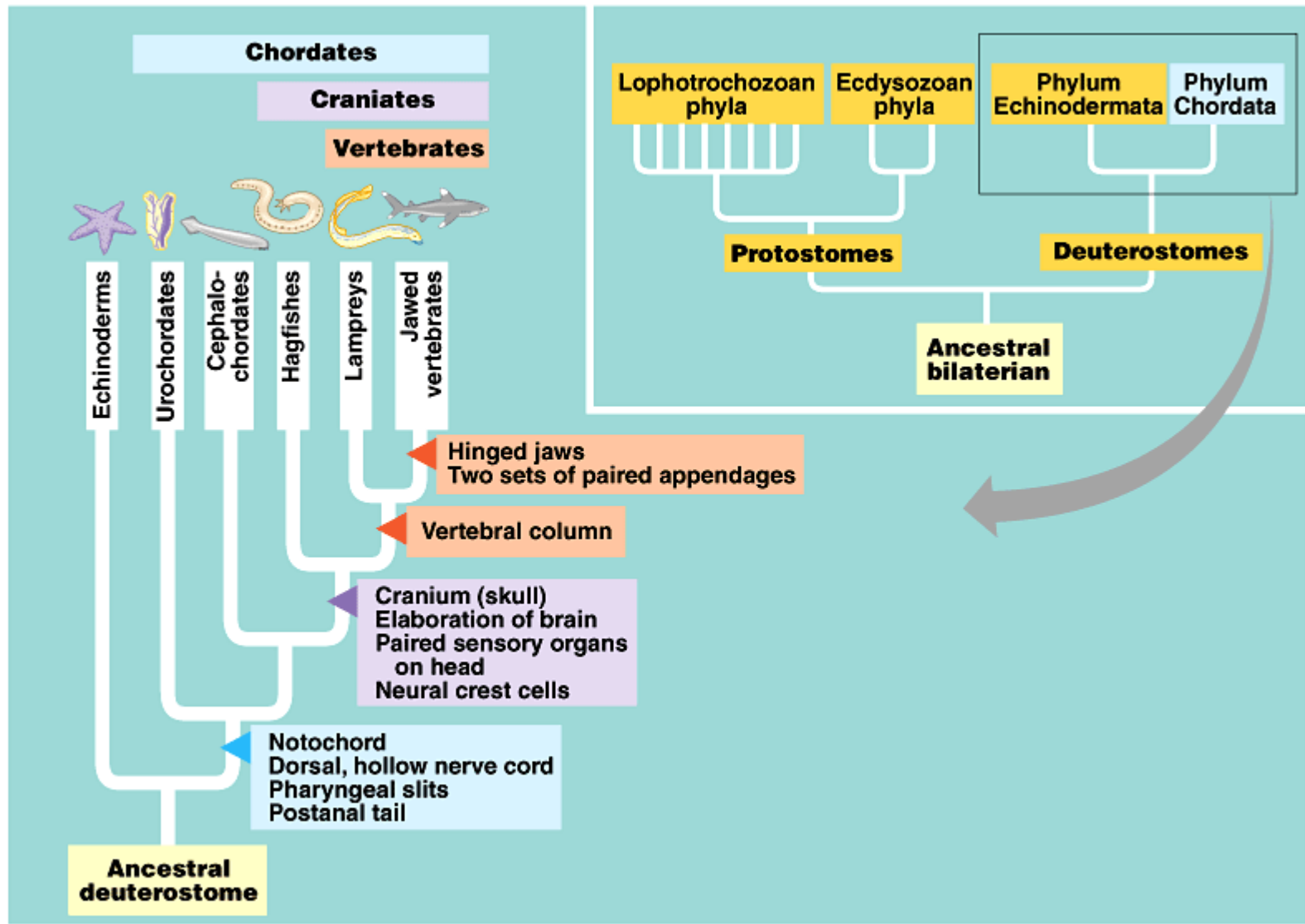
Key Innovations in the Radiation of Vertebrates

- Vertebrates have a unique bony endoskeleton, which protects organs and serves as an attachment site for muscles.
- Vertebrates' form and function demonstrates a trend for a more active lifestyle.

The subphylum Vertebrata belongs to the Phylum Chordata

■ Chordata characteristics

- Notochord: longitudinal flexible chord located between the digestive tube and nerve cord composed of fluid-filled cells. The notochord provides support throughout most of the animal body
- Dorsal hollow nerve cord that develops into the central nervous system
- Pharyngeal slits: openings in the pharynx that allow communication between internal and outside areas in an animal. Functions as suspension-feeding devices in invertebrate chordates. In vertebrates, the slits and structures supporting them have been modified through evolution
- Muscular, postanal tail. Made out of skeletal and muscle elements. Provides propulsive force in many aquatic vertebrates



Organization

- Presence of neural crest: group of embryonic cells that develop near the dorsal margin of neural tube contribute to formation of bone, cartilage and cranium
- Large body size and capacity for strong, fast movement

Homeostasis

- High degree of cephalization
 - Enlargement of the anterior end of the dorsal, hollow nerve cord (brain), presence of eyes, ears, nose
- Cranium and vertebrate column (except in hagfishes)
- Skin tissue for protection (barrier)

Metabolism

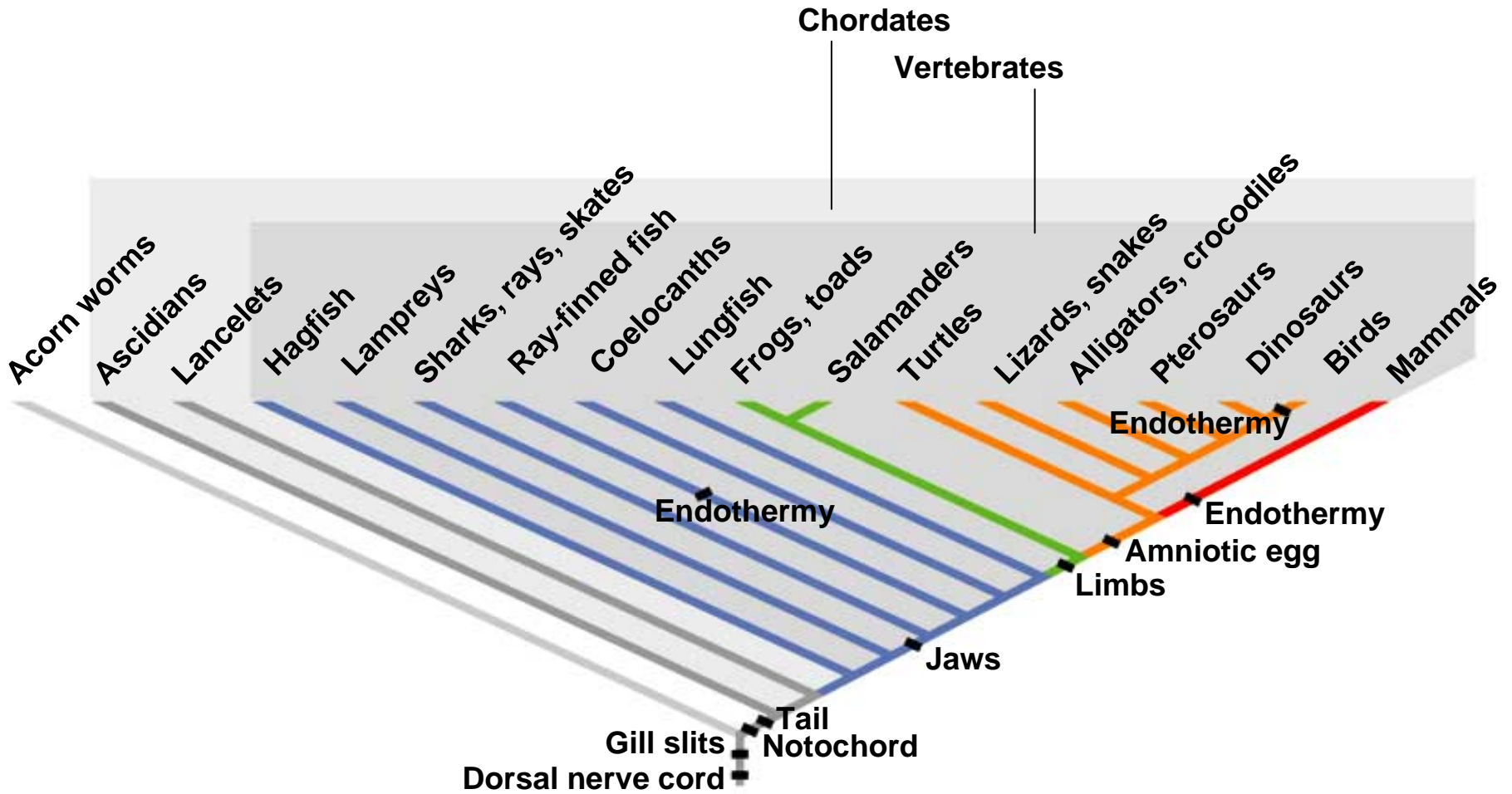
- Respiratory and circulatory adaptations for rapid movement
 - Closed circulatory system with a ventral chambered heart; gills or lungs
- Adaptations for feeding, digestion and nutrient absorption help support active behavior
 - Muscles in the walls of digestive tract propel food from organ to organ along the tract

Ecology

- Inhabit great variety of both terrestrial and aquatic habitats (freshwater, marine)
- Hagfishes: 30 spp
- Lampreys: 35 spp
- Chondrichthyes (sharks, rays): 750 spp
- Osteichthyes (bony fishes: ray-finned fishes, lobe-finned fishes, lung fishes): 30,000 spp
- Amphibia (amphibians): 4,800 spp
- Reptilia (reptiles): 6,500 spp
- Aves (birds): 8,600 spp
- Mammalia (mammals): 4,500 spp

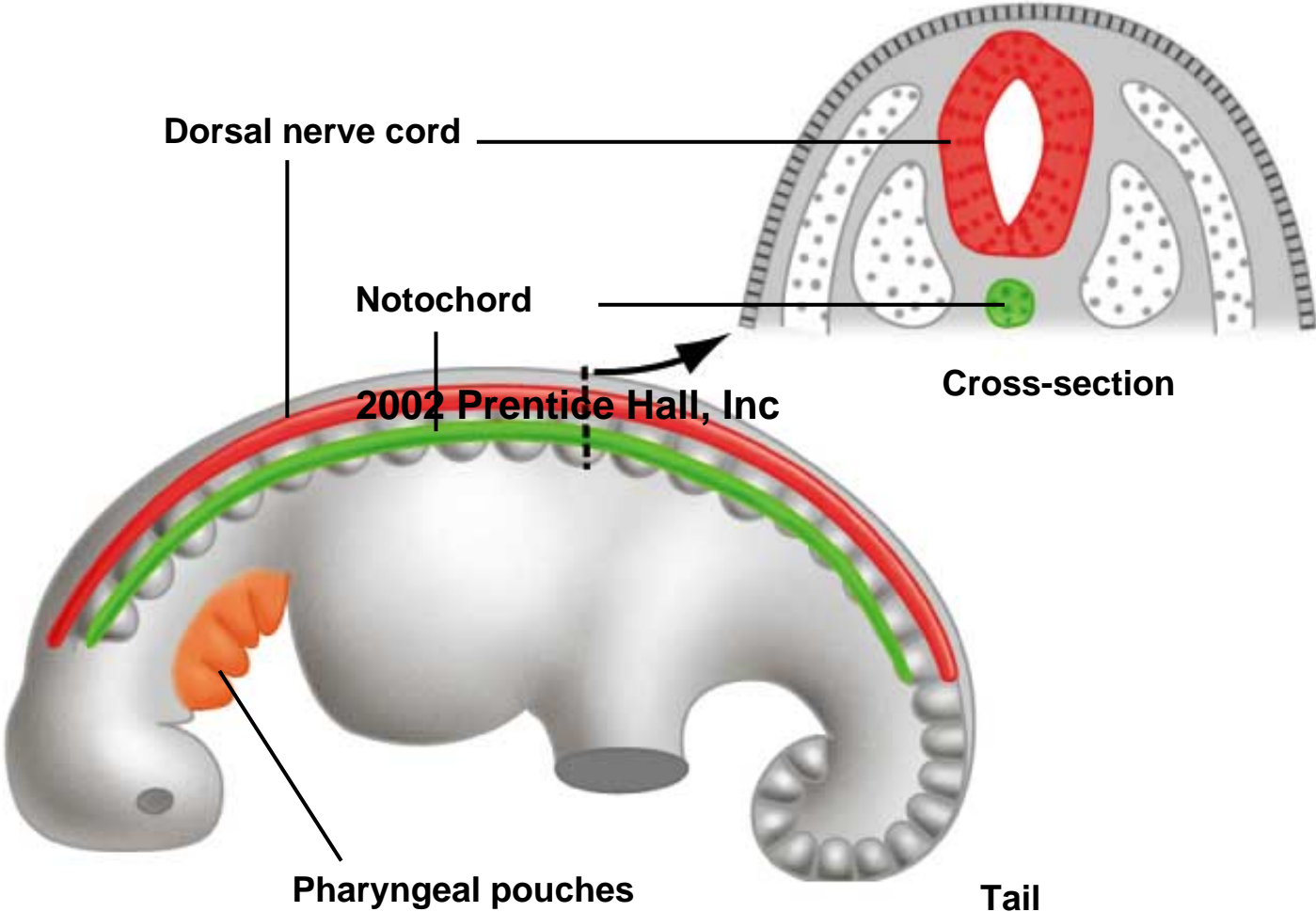
Key Innovations in the Radiation of Vertebrates

- Five key innovations led to the origin and diversification of vertebrates:
 - Notochord: provided support and became the forerunner of the spinal column.
 - Jaw: facilitated capturing and eating prey.
 - Limbs: necessary for colonizing terrestrial habitats.
 - Amniotic eggs: enabled reproduction to be carried out in non-aquatic habitats.
 - Endothermy: provided the ability to power sustained and rapid movements.



Vertebrates

Embryo



Dorsal nerve cord

Notochord

Cross-section

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Pharyngeal pouches

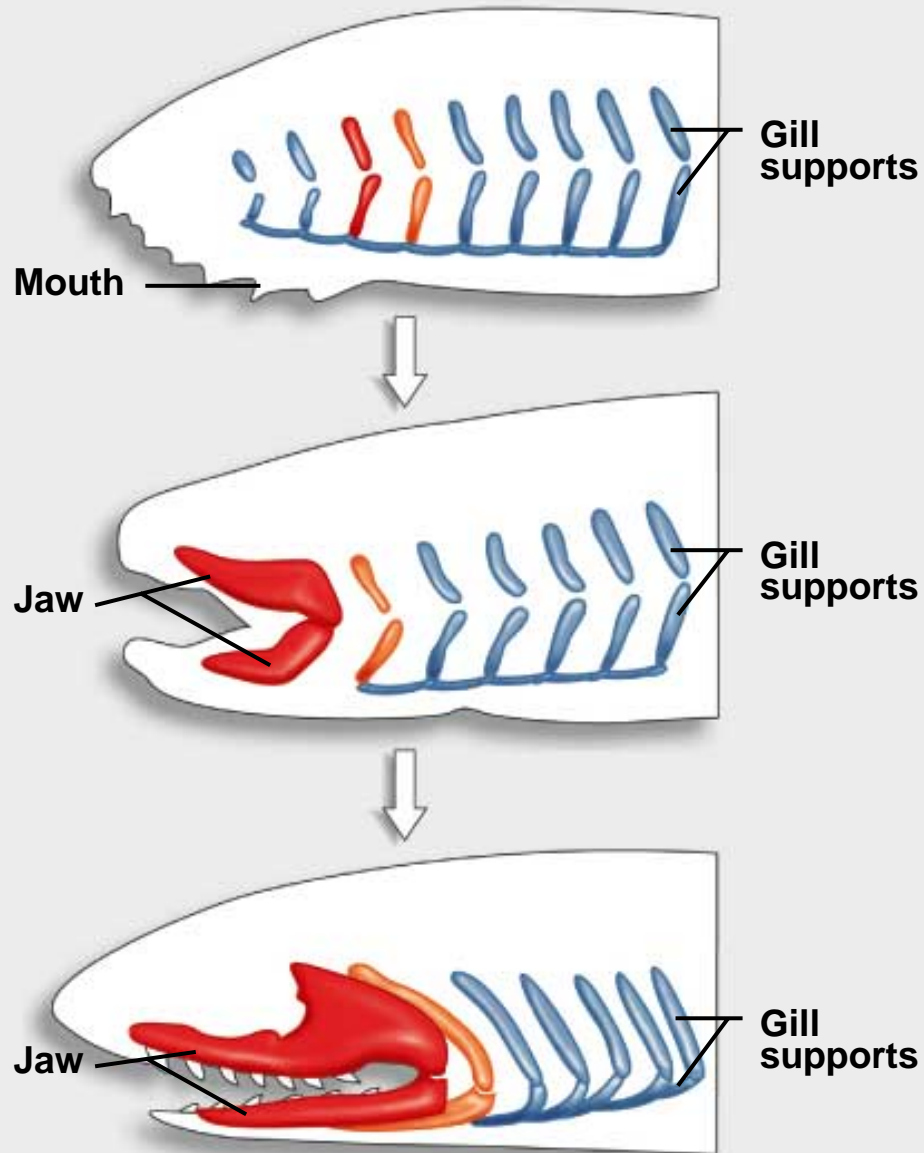
Tail



Lamprey feeding on fish

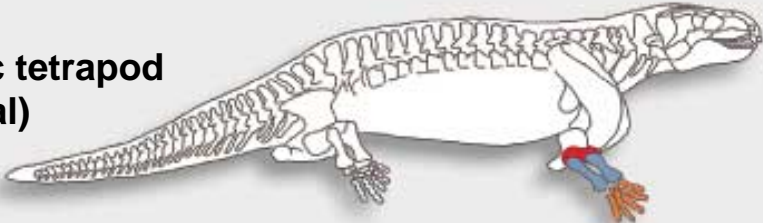


EVOLUTION OF THE JAW

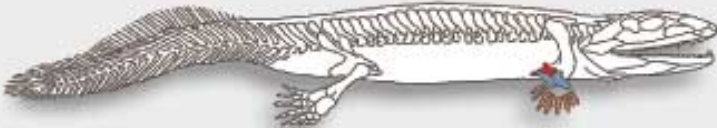


EVOLUTION OF THE LIMB

Paleozoic tetrapod
(terrestrial)



Early tetrapod
(semi-terrestrial)



Lobe-finned
fish (aquatic)



Fin



Limb

