

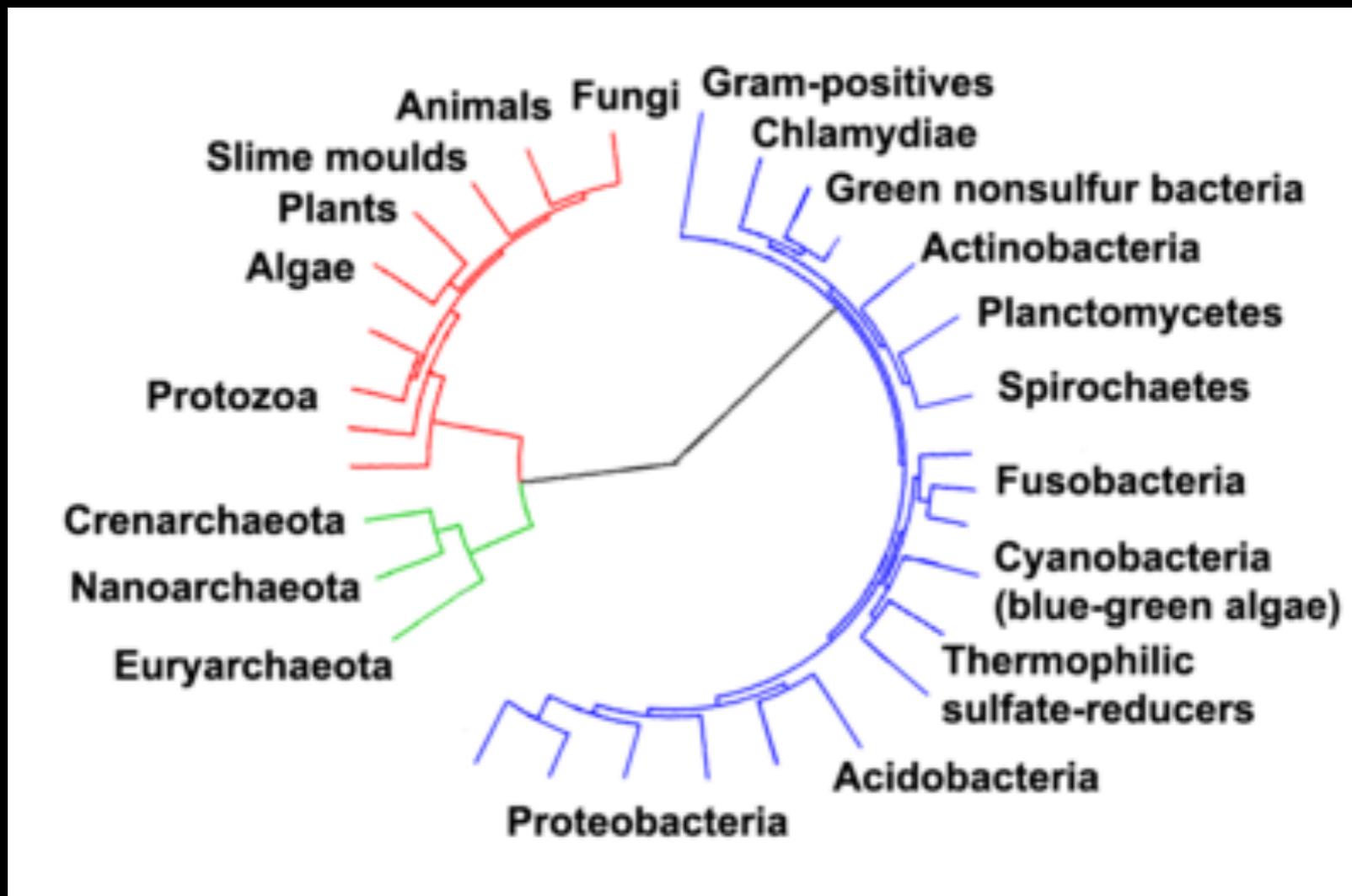
History of Life Part I.

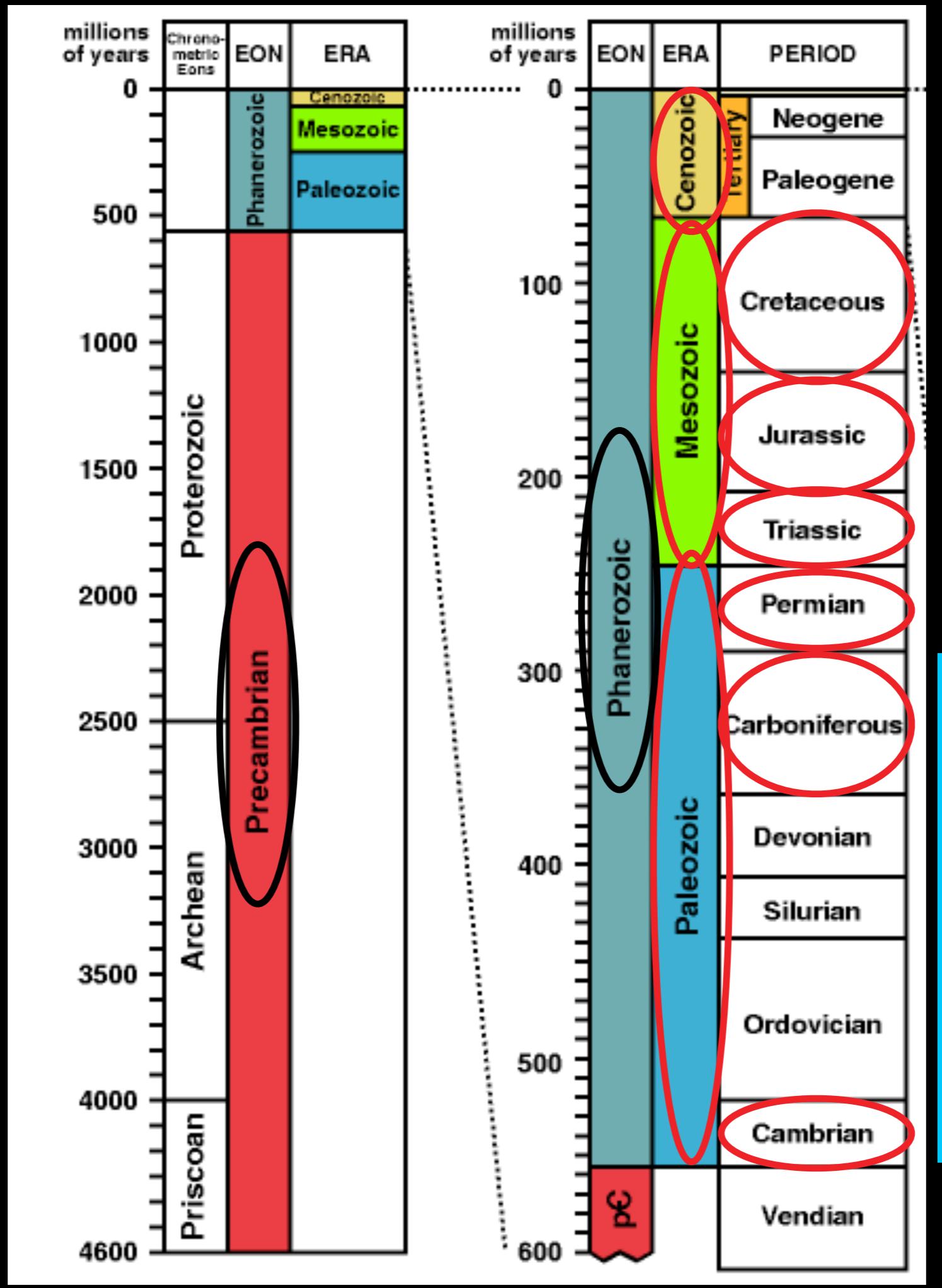


Diadectes
Early Permian

Life on Earth: united by RNA, DNA, amino acids, metabolic pathways

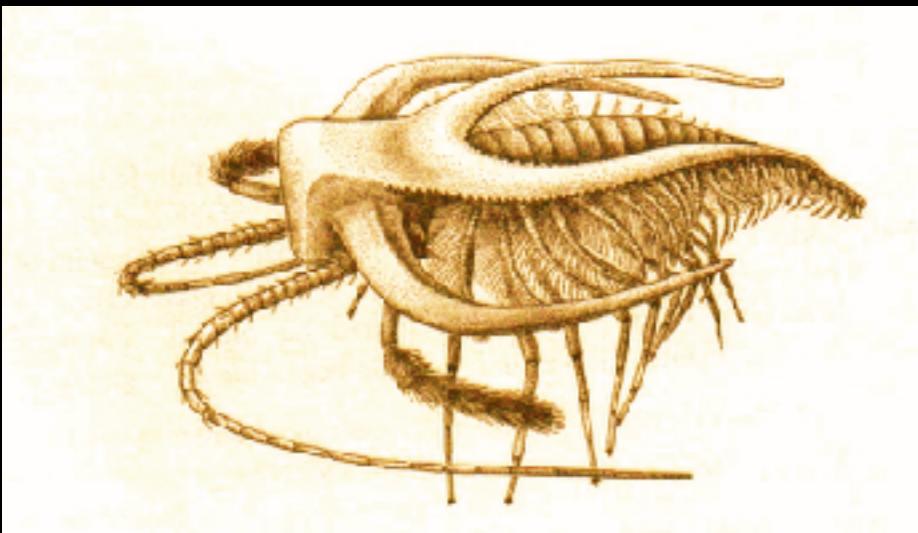
3.8 Ga





Cambrian ‘Explosion’

ca. 520-510 Ma



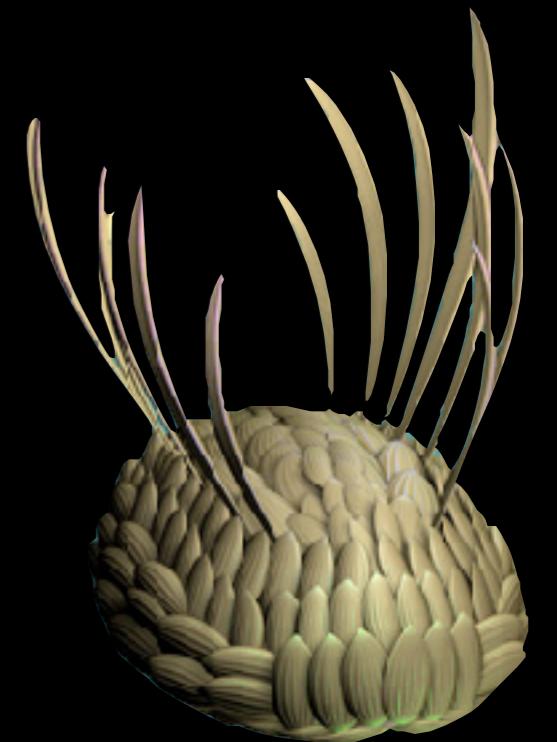
Marrella



Opabinia



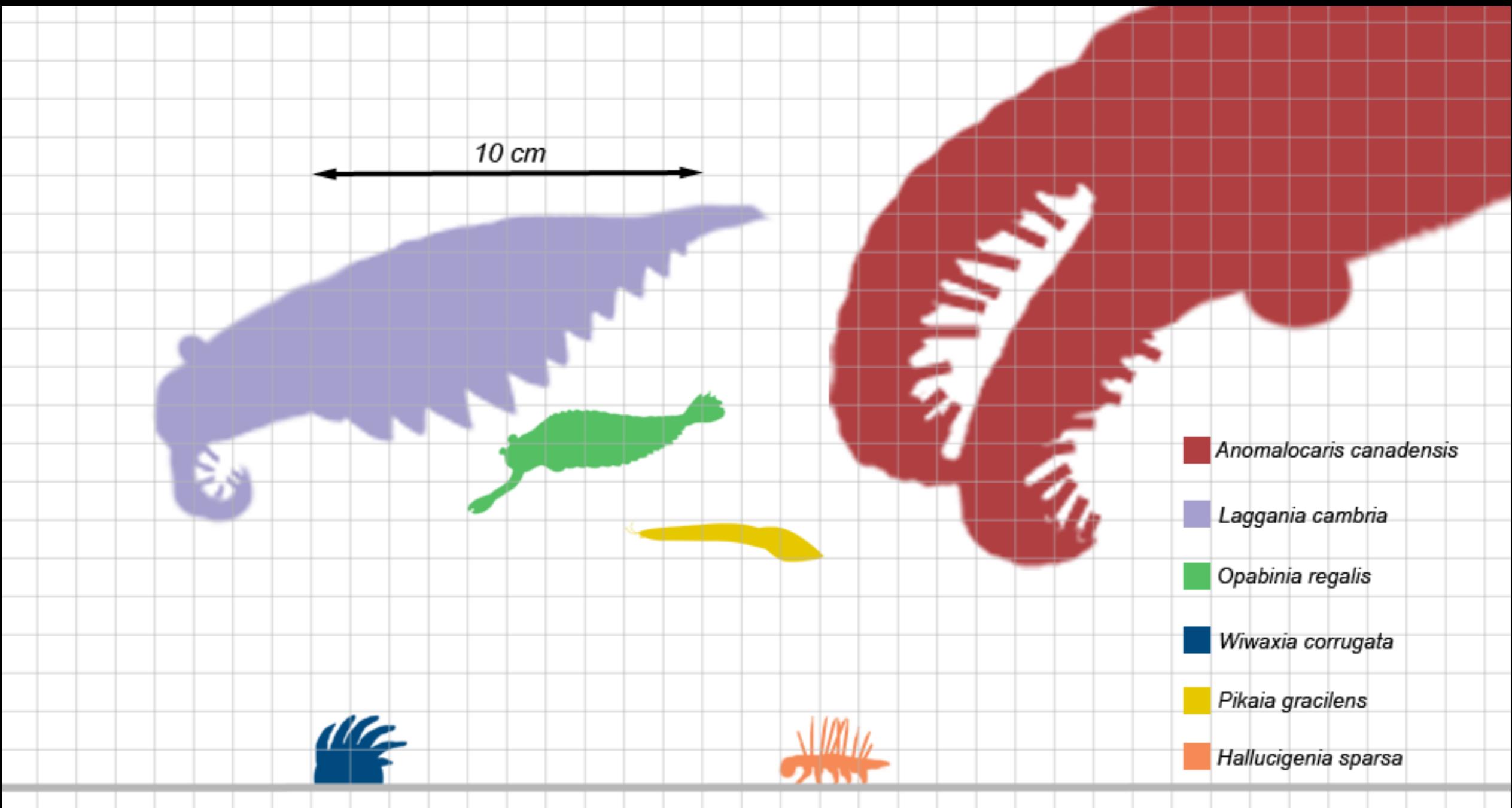
Hallucinogenia



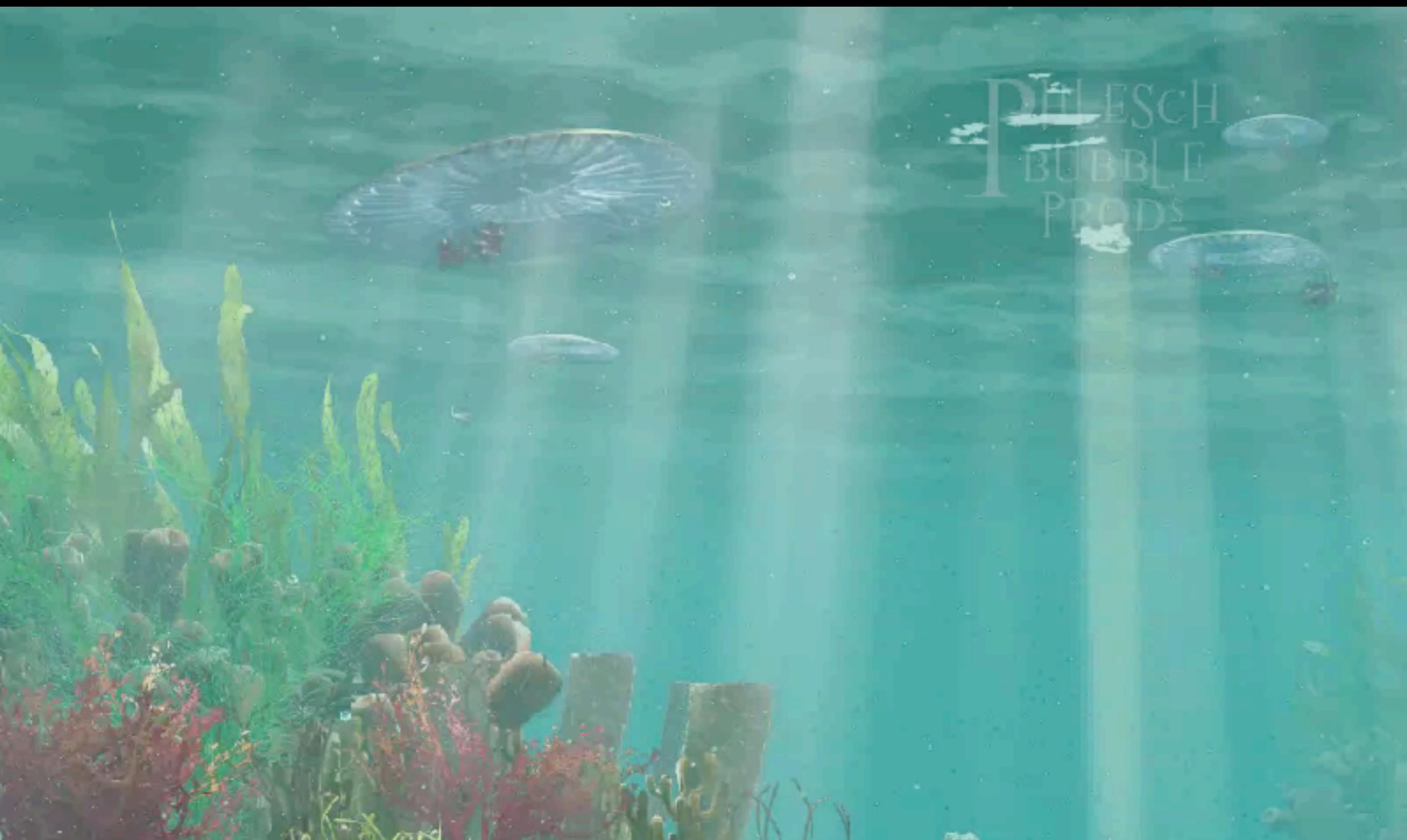
Wiwaxia



Anomalocarids



The Cambrian Sea

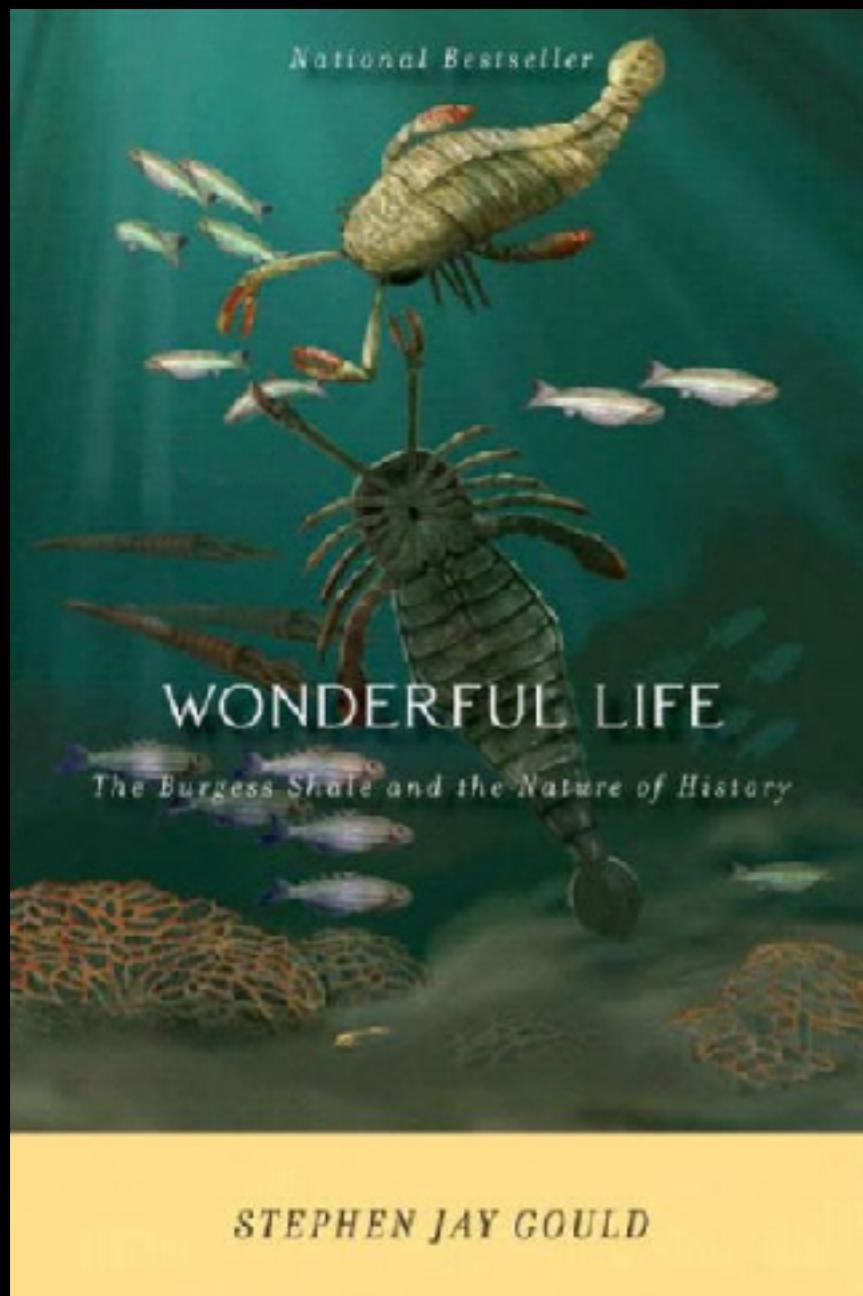


Stephen Jay Gould

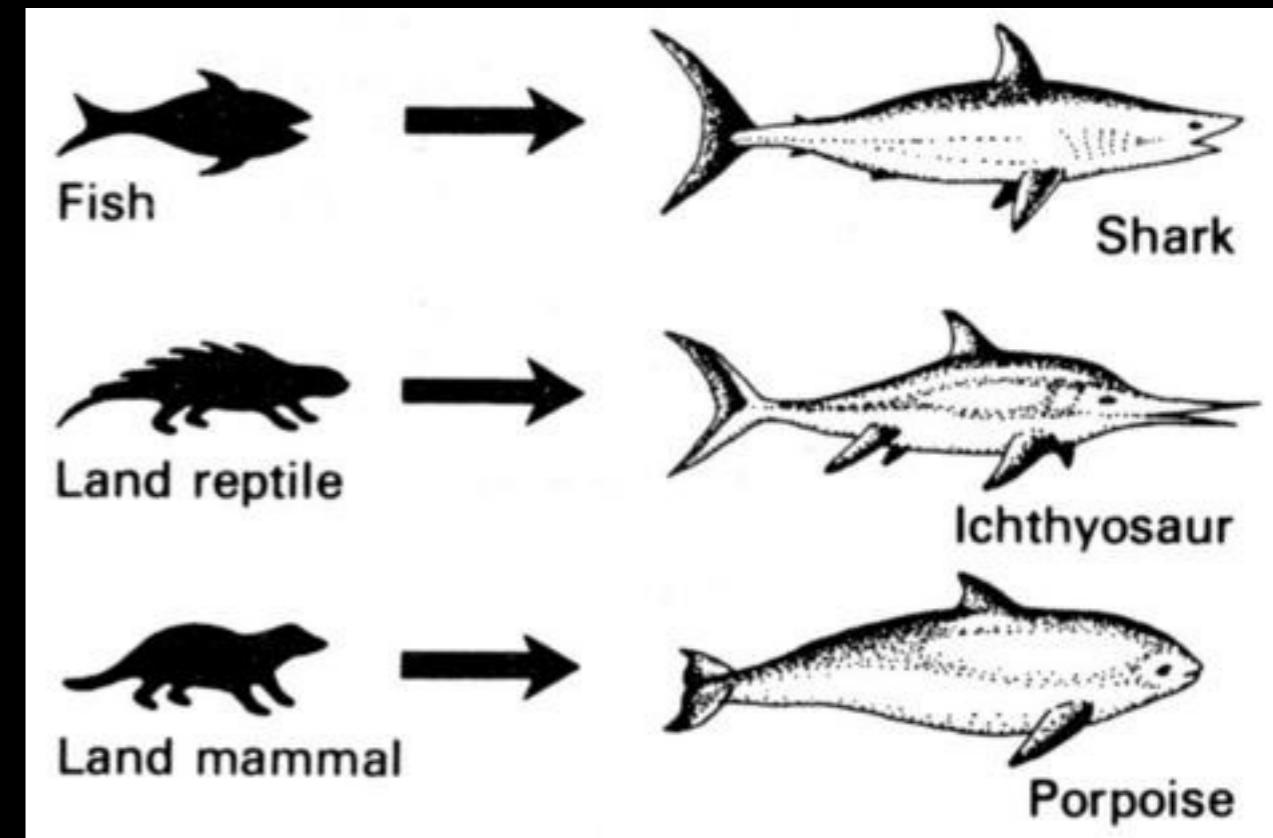
vs.

Conway-Morris

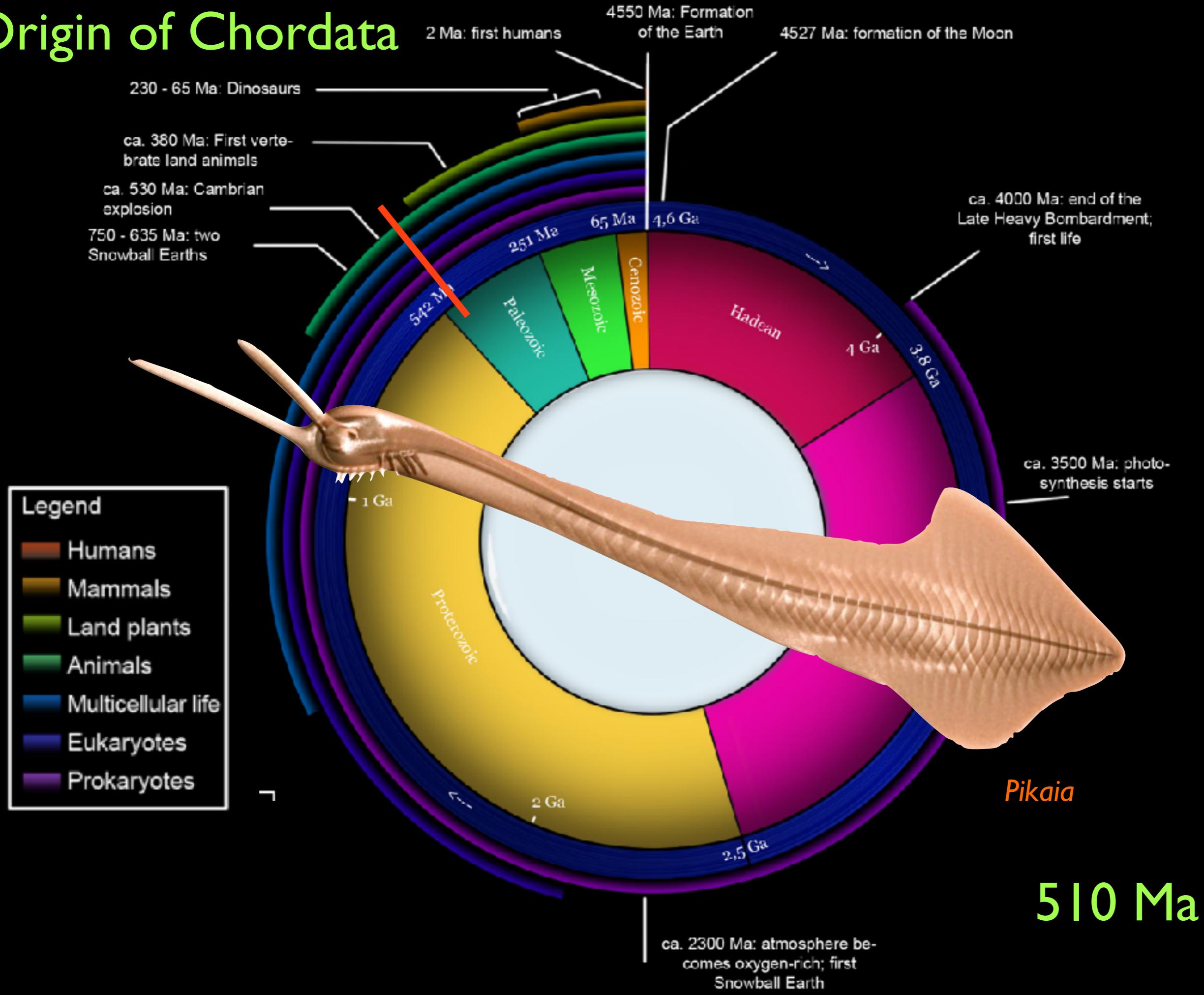
It's a Wonderful Life

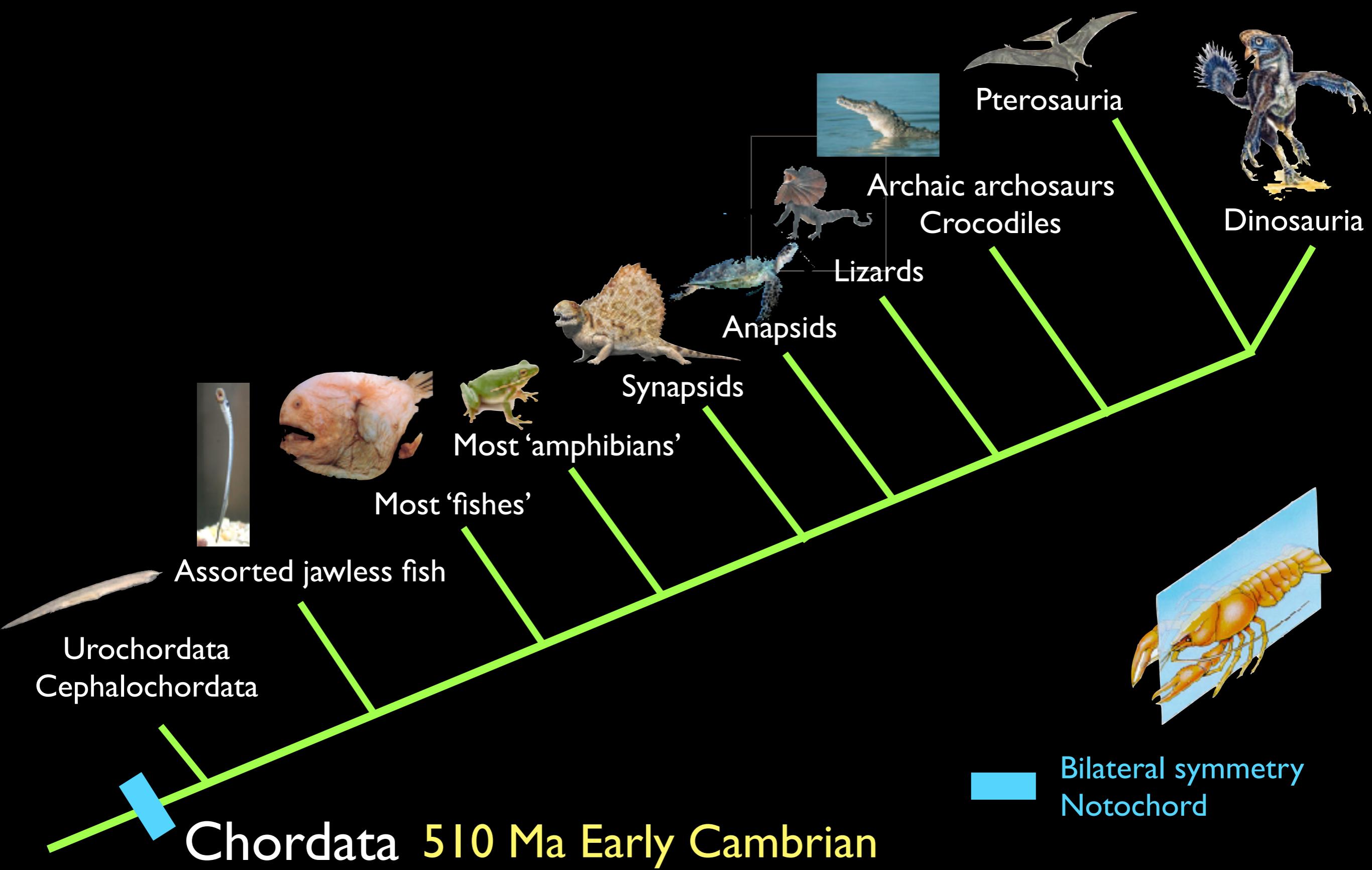


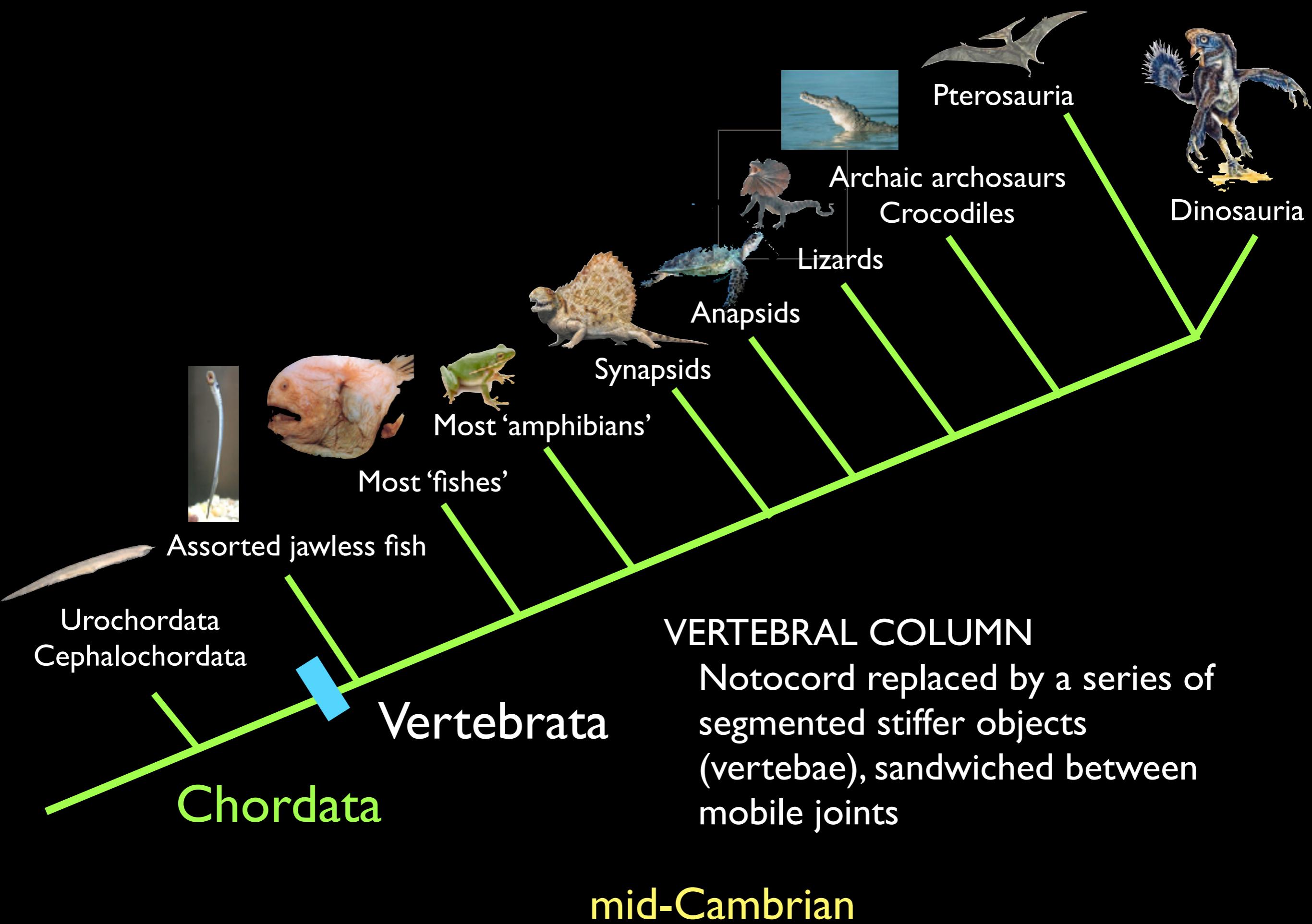
Evolutionary 'optima'

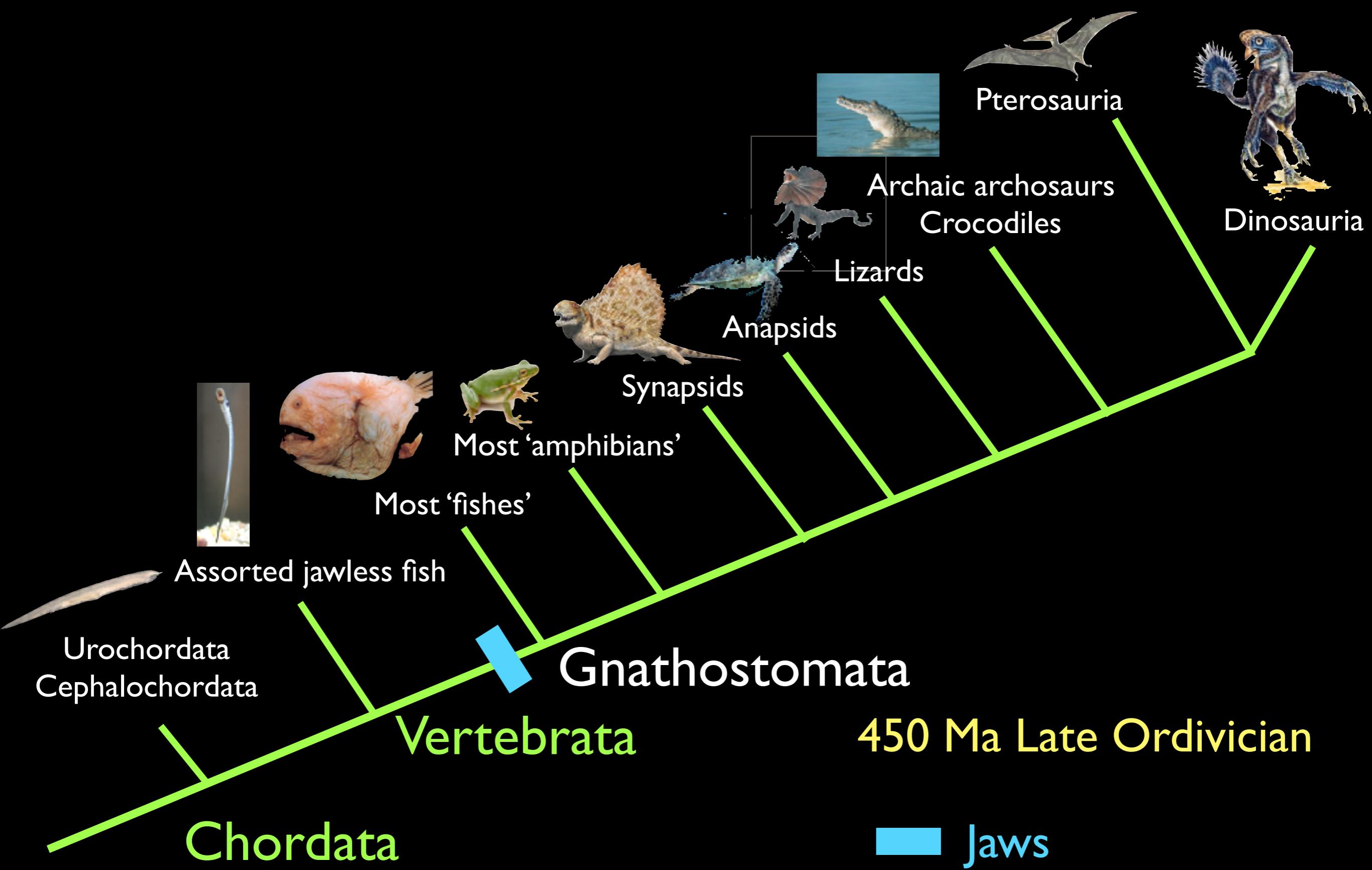


Origin of Chordata

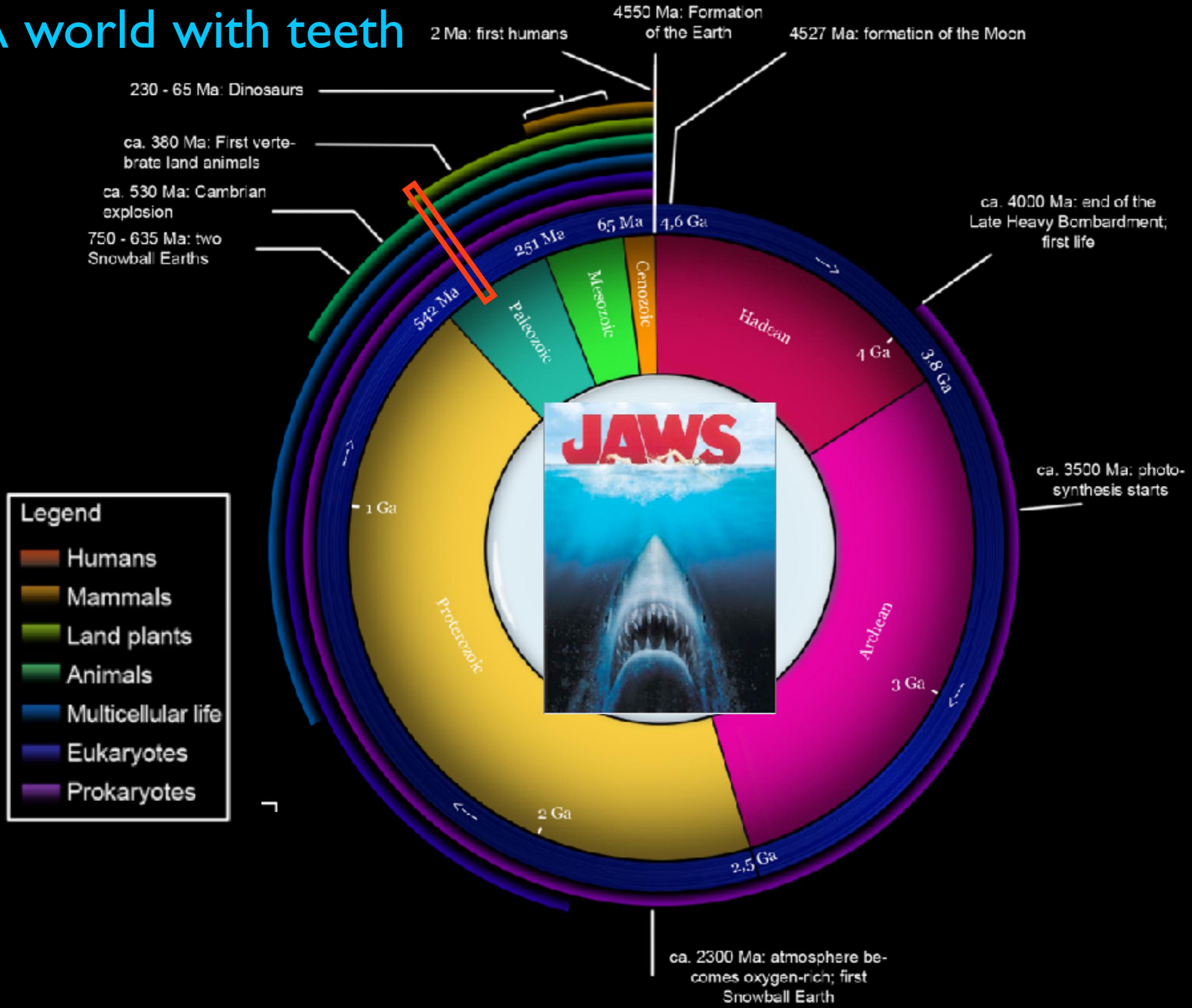






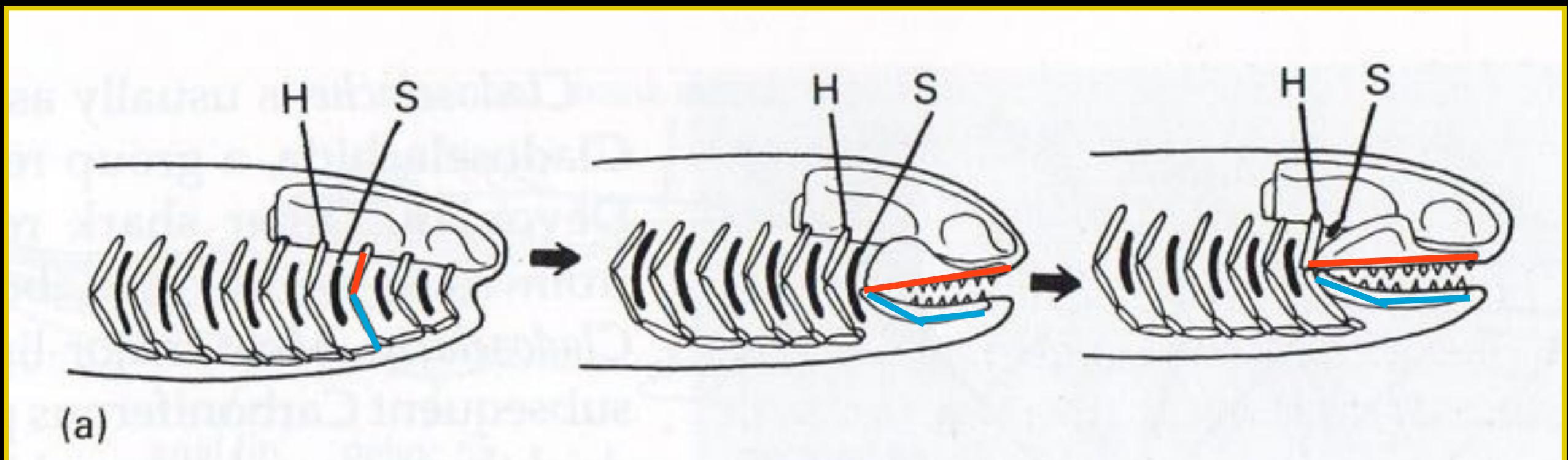


A world with teeth



Gnathostomata

'jawed vertebrates'

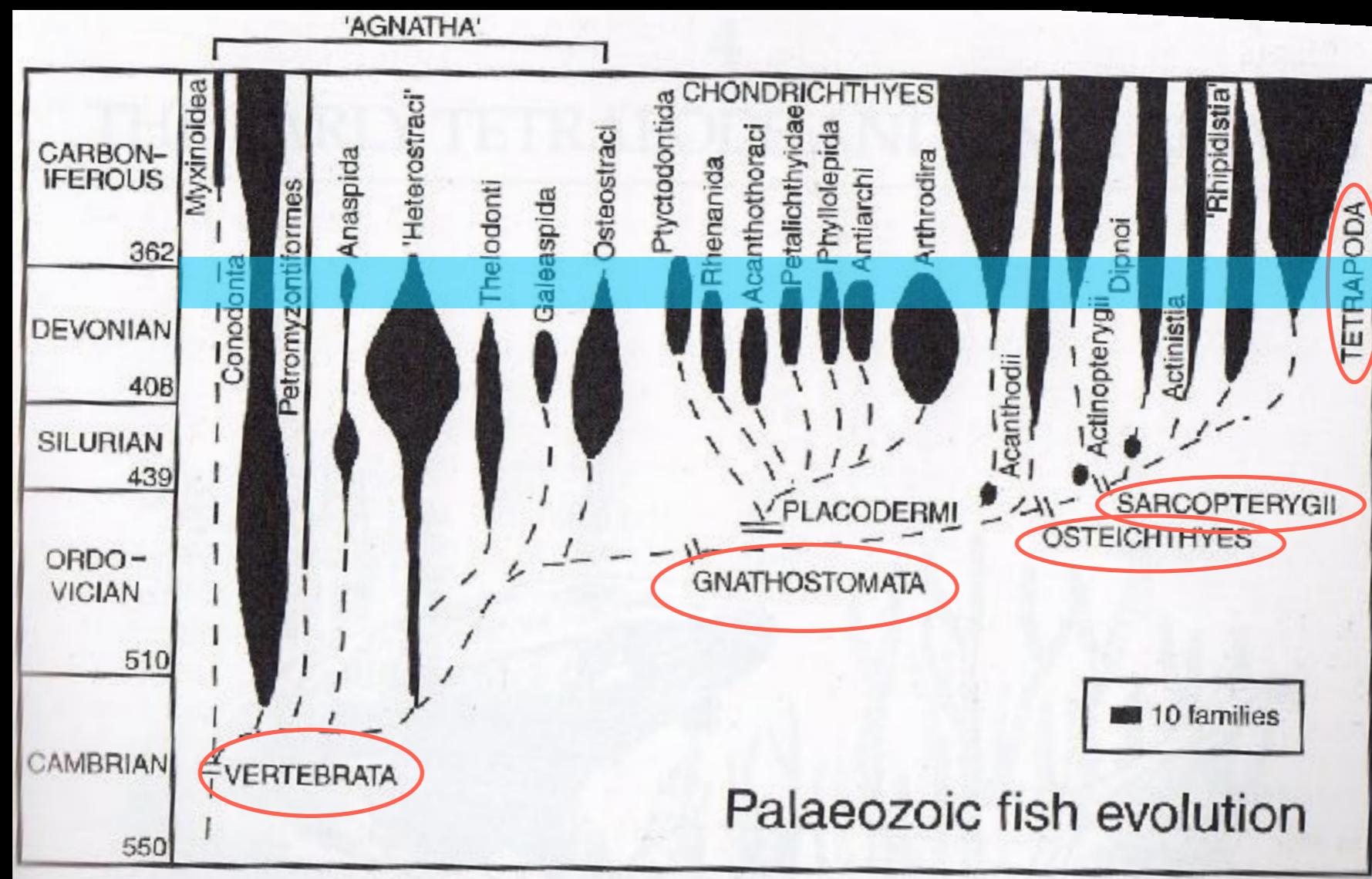


Evolution of the Jaw



Dunkleosteus
Late Devonian
(Just before the Carboniferous)

Selective pressures?
Apex predator
Unhealed bite marks on some specimens
Other Dunkleosteus



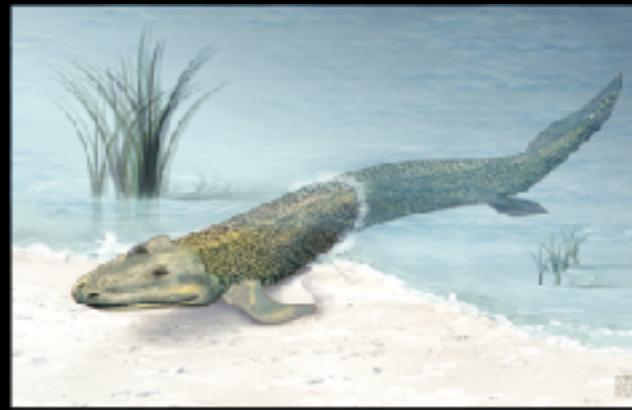
Late Devonian Extinction

The Origin of Tetrapoda

Living fossil? Not quite



Modern Coelacanth



Tiktaalik

Late Devonian
'Fishapod'

Tetrapoda

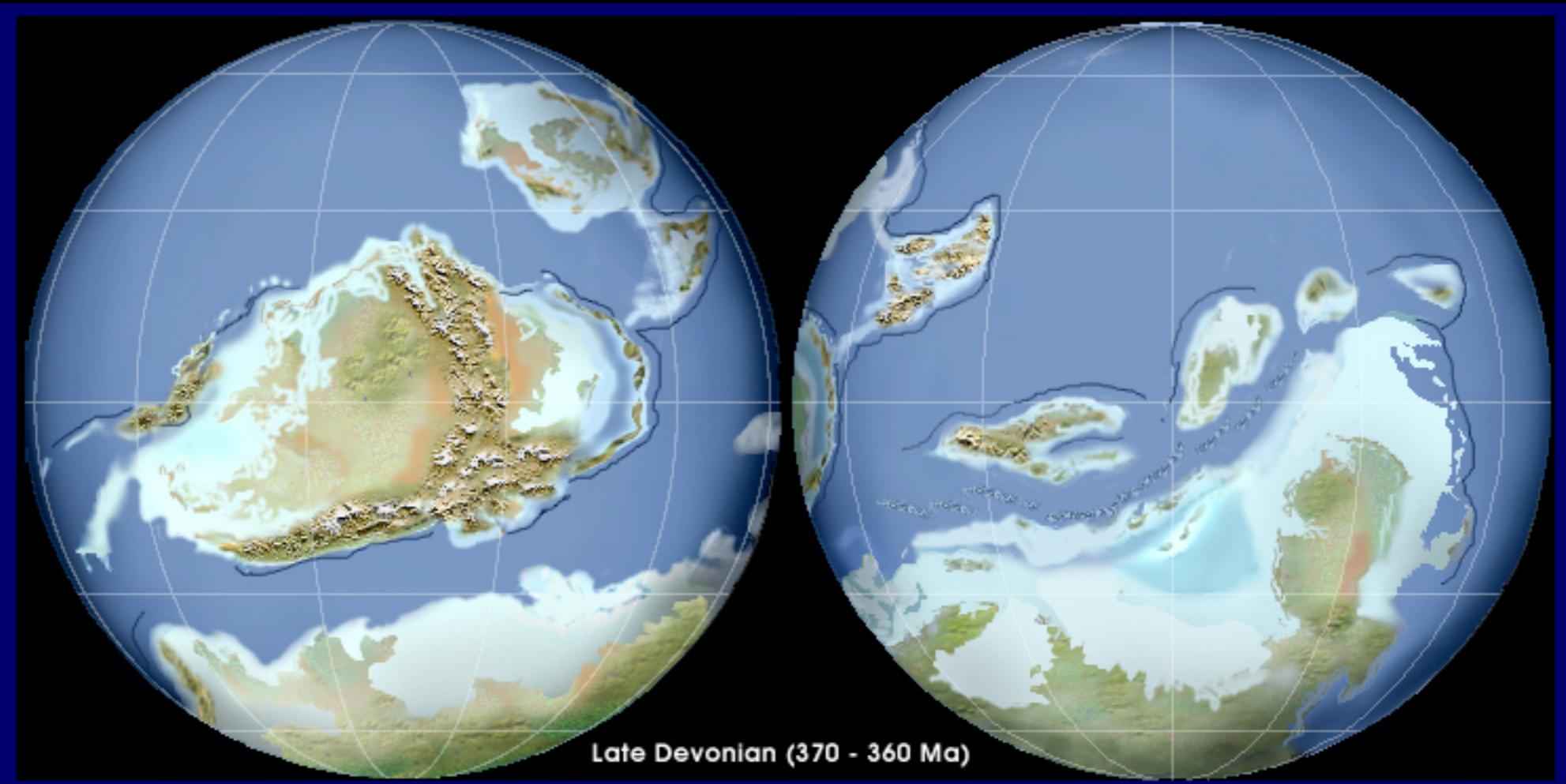


Dunkleosteus

Lobe Finned Fishes
(Sarcopterygii)

Bony fish
(Osteichthyes)

Gnathostomata
'jawed vertebrates'



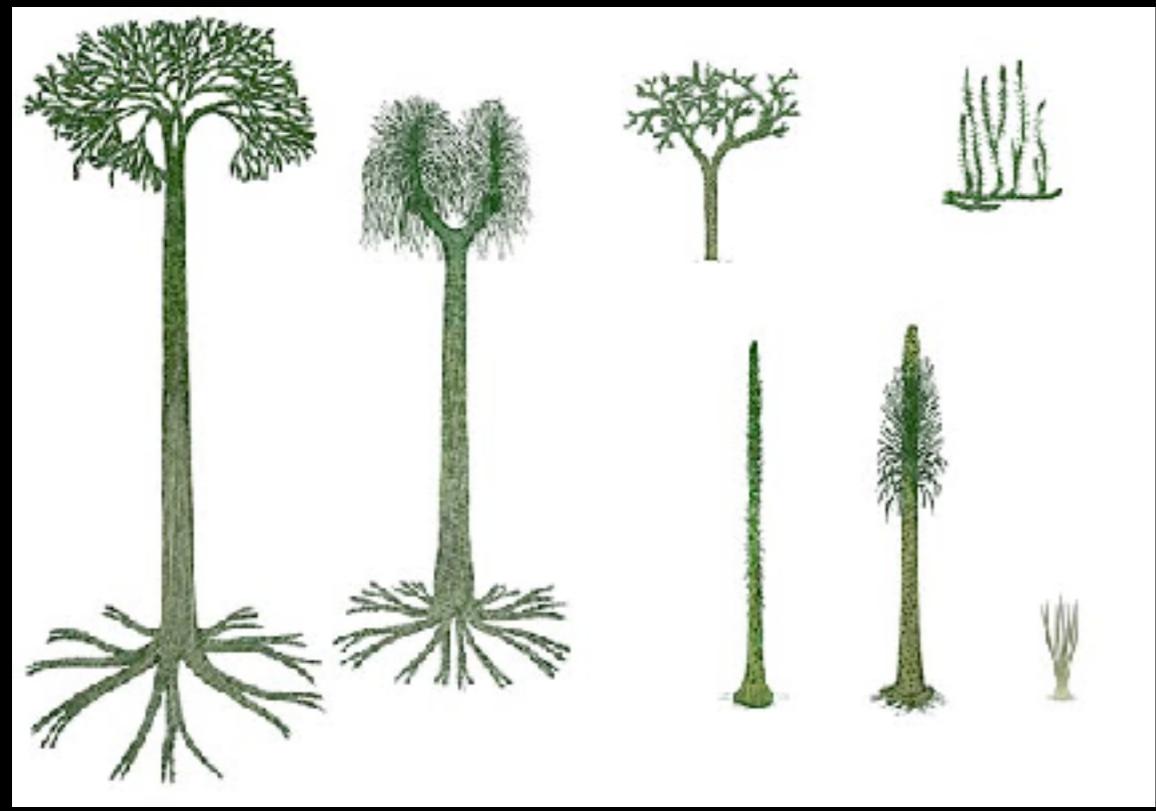


Monotypic riverside stands



Diverse arthropod
communities





Lycopsids



Asteroxylon

On land, rhizomatous plants begin colonizing stream and lake banks



"Devonian canopy"

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Archaeopteris canopy (progymnosperm)

What's so interesting about the Devonian?



Modern Ecosystems



Devonian Ecosystems

● Rare top predators

● ● ● Few meso-predators

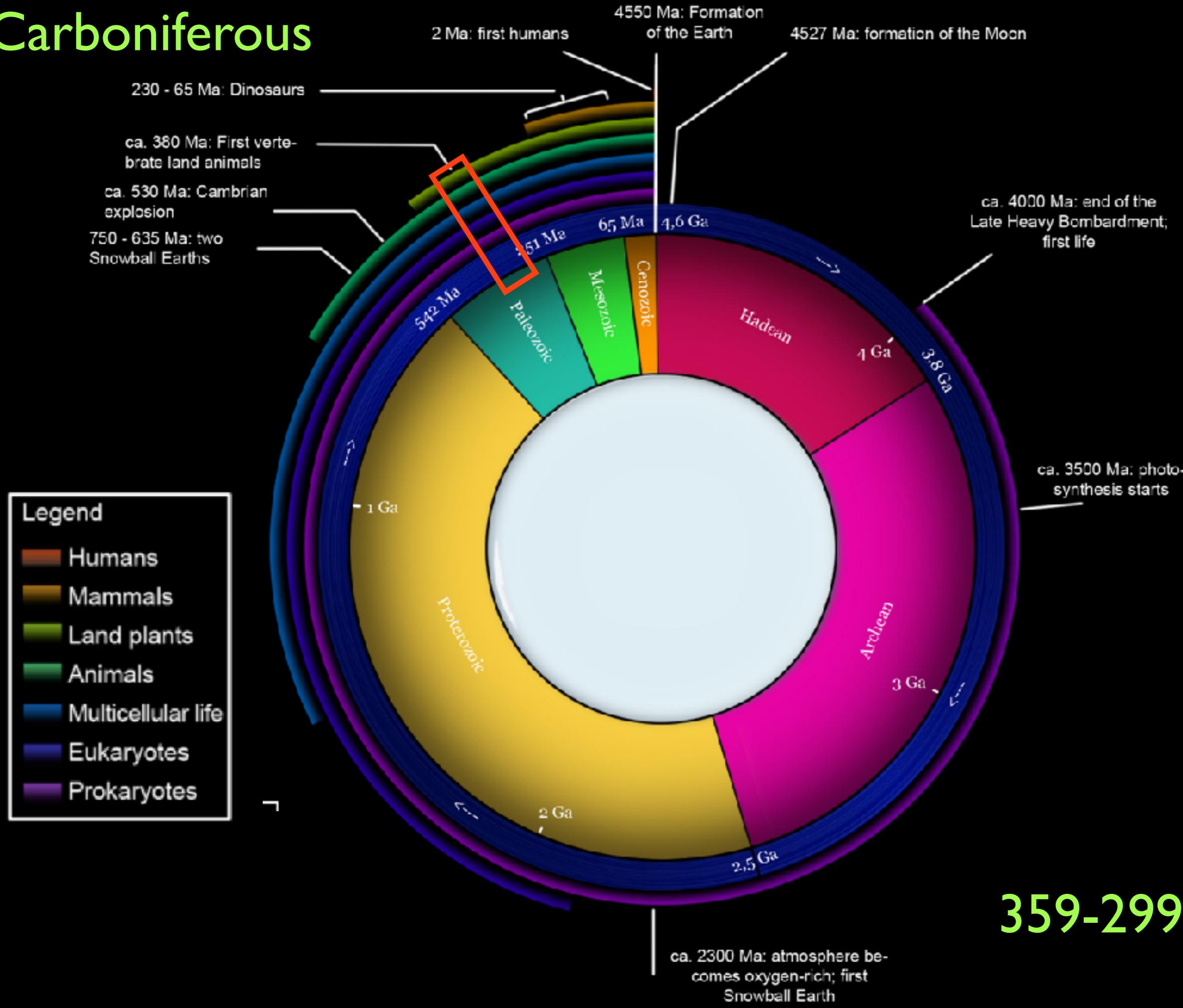
● ● ● ● ● ● ● Many herbivores

● ● ● ● Abundant top predators

● ● ● ● Abundant meso-predators

● ● Rare herbivores ● ● Detritivores

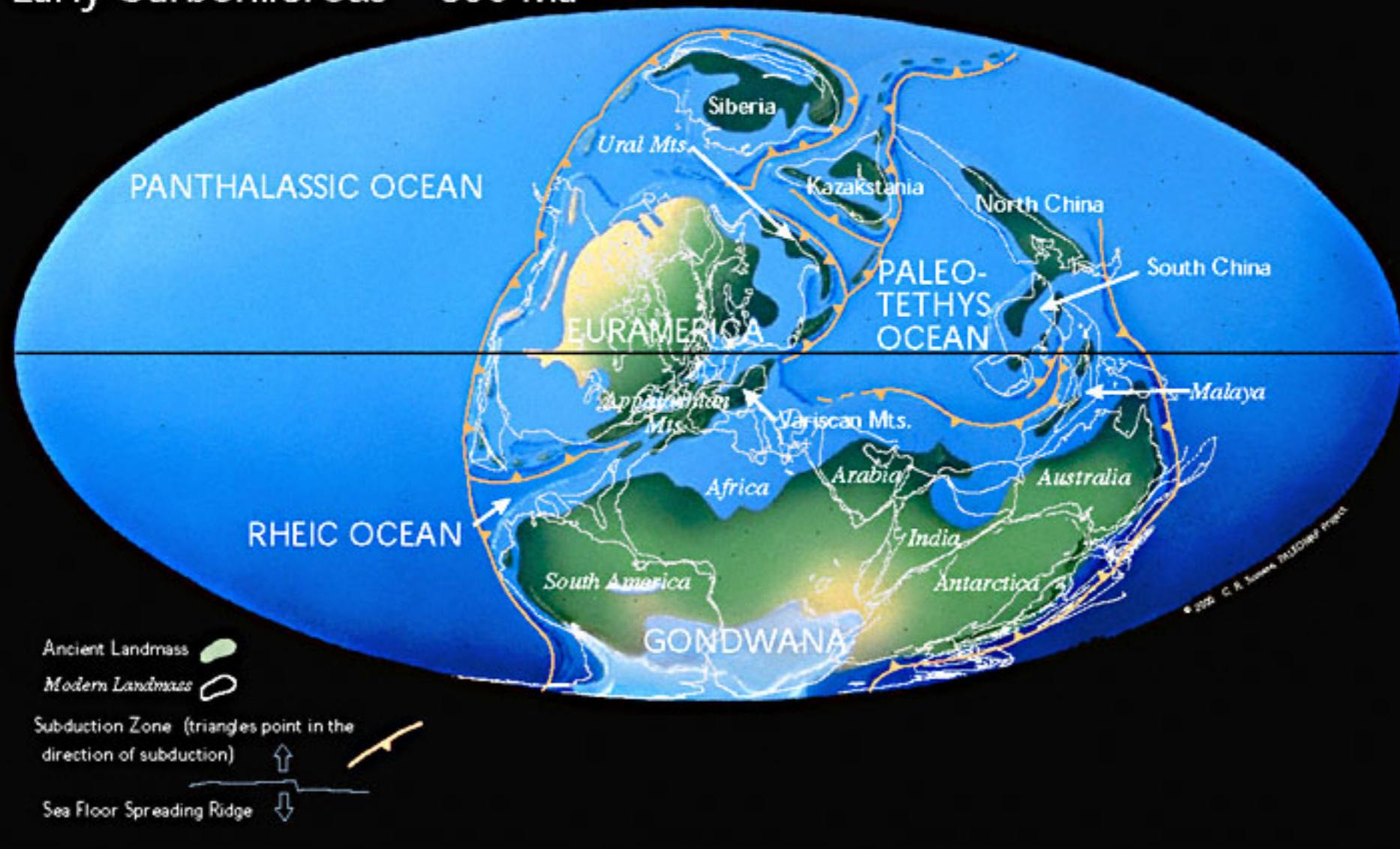
Carboniferous



359-299 Ma

ca. 2300 Ma: atmosphere becomes oxygen-rich; first Snowball Earth

Early Carboniferous 356 Ma





The Carboniferous
High temperatures
High humidity
High O₂
Low CO₂



Enourmous Lepidodendron forests



Meganeura: 75 cm wingspan



[O₂]_{atm} = 35%



Carboniferous swamps:
Refugia for older plant forms

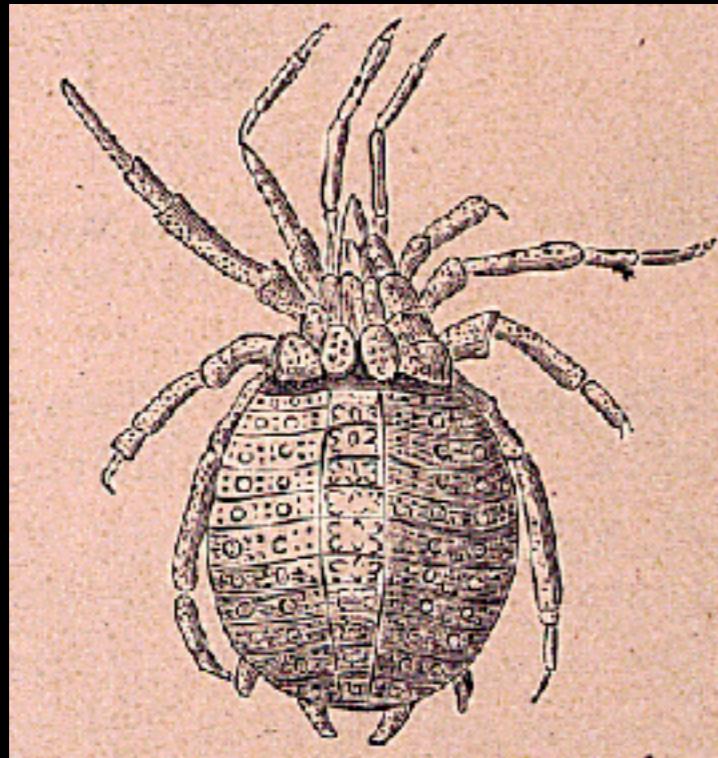


Open 'Niches'

Carboniferous drylands:
Sites of evolutionary innovation
i.e. seed-producing plants



Pteridosperms



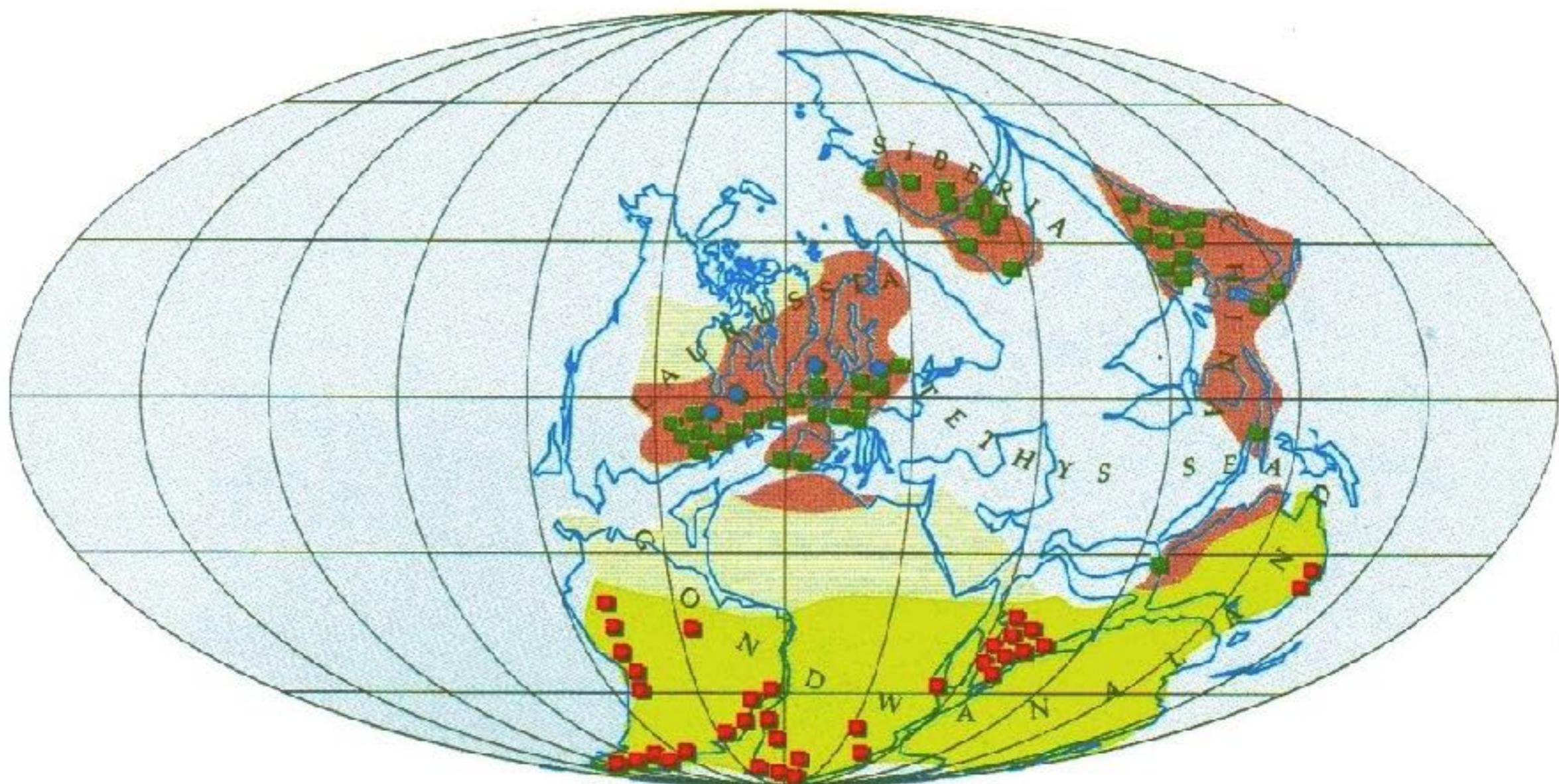
Evolution of hard seeds suggests that herbivorous arthropods became a major selective factor on plants, even without a good fossil record of herbivorous arthropods

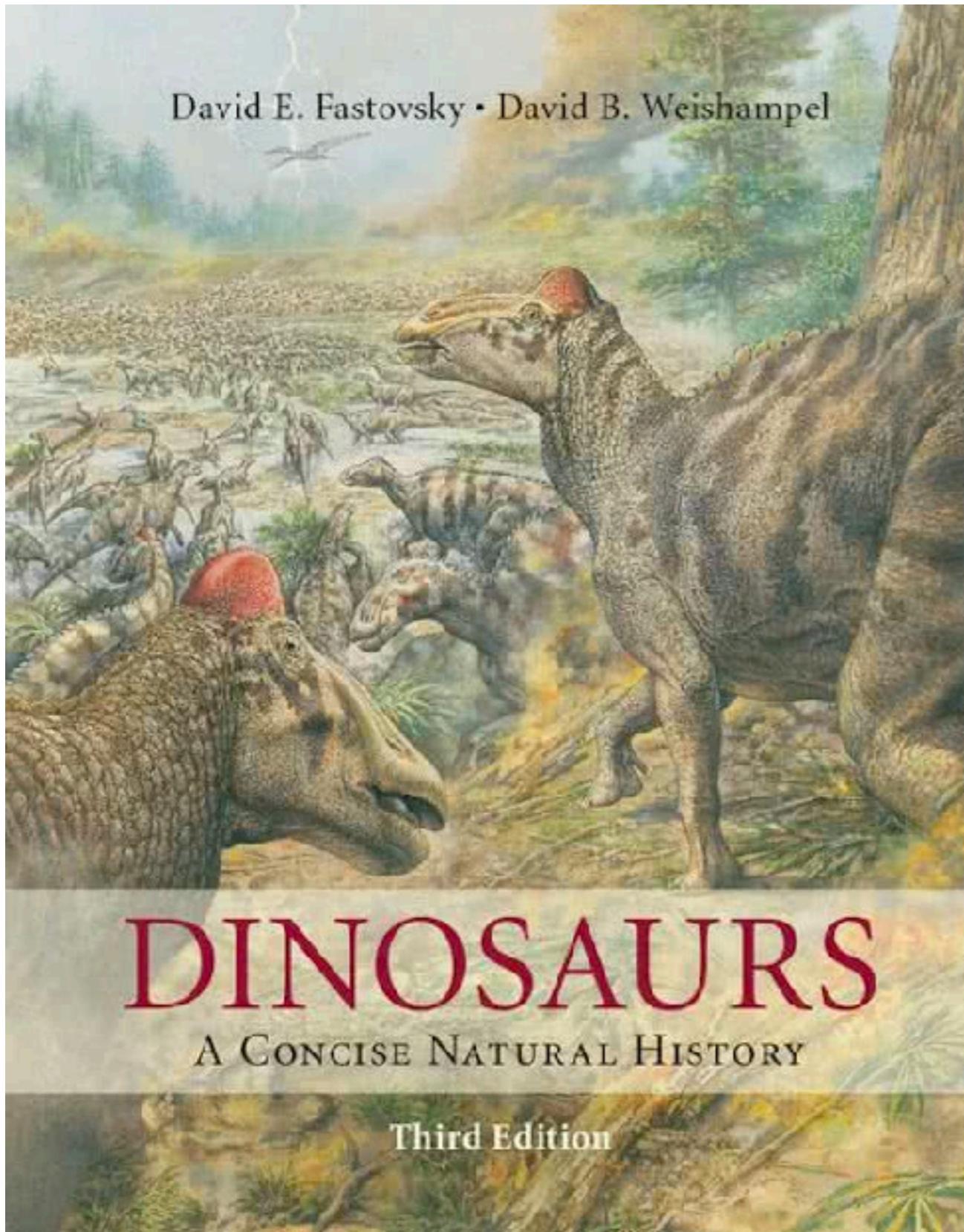
(the first herbivorous vertebrate doesn't show up until the early Permian: *Diadectes*)

- Tillites (glacial deposits)
- Coal deposits
- Vertebrate fossil sites

- Humid conditions
- Glaciated cold
- Arid desert

America and Europe), and Siberia. The two northern continents combined to create Laurasia.





Reading for this week:
Fastovsky & Weishampel

Chapter 4: Who are the Dinosaurs?

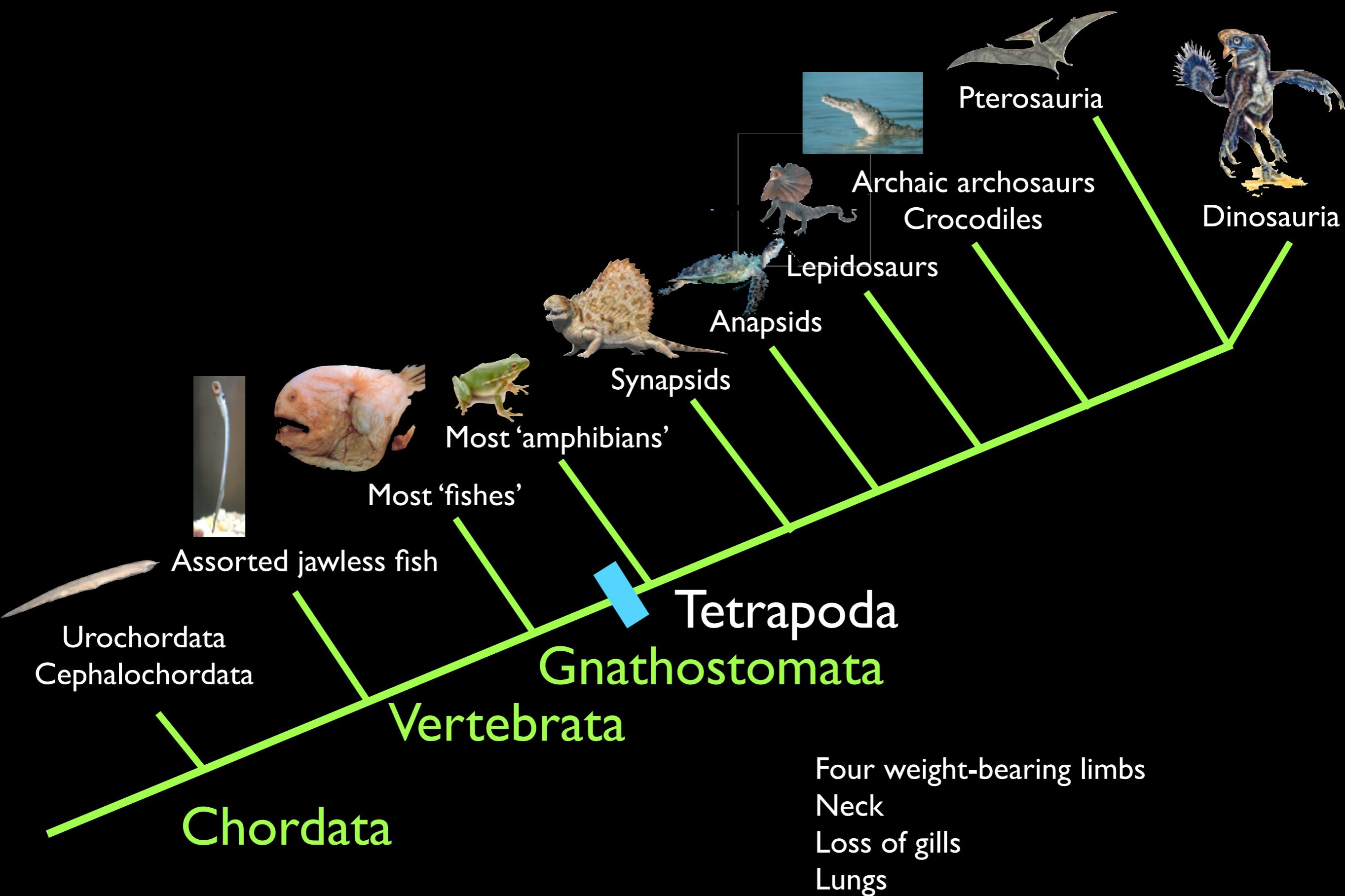
The Carboniferous:Tetrapod Expansion



"Carboniferous forest"

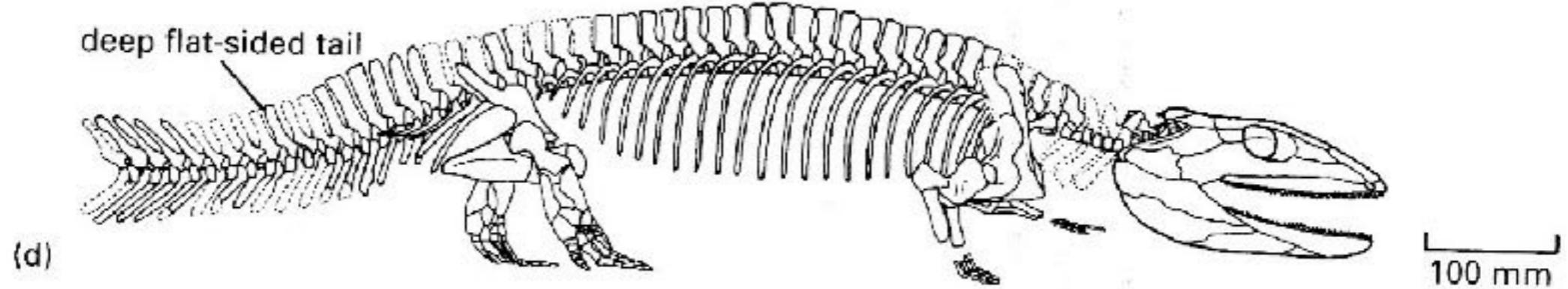
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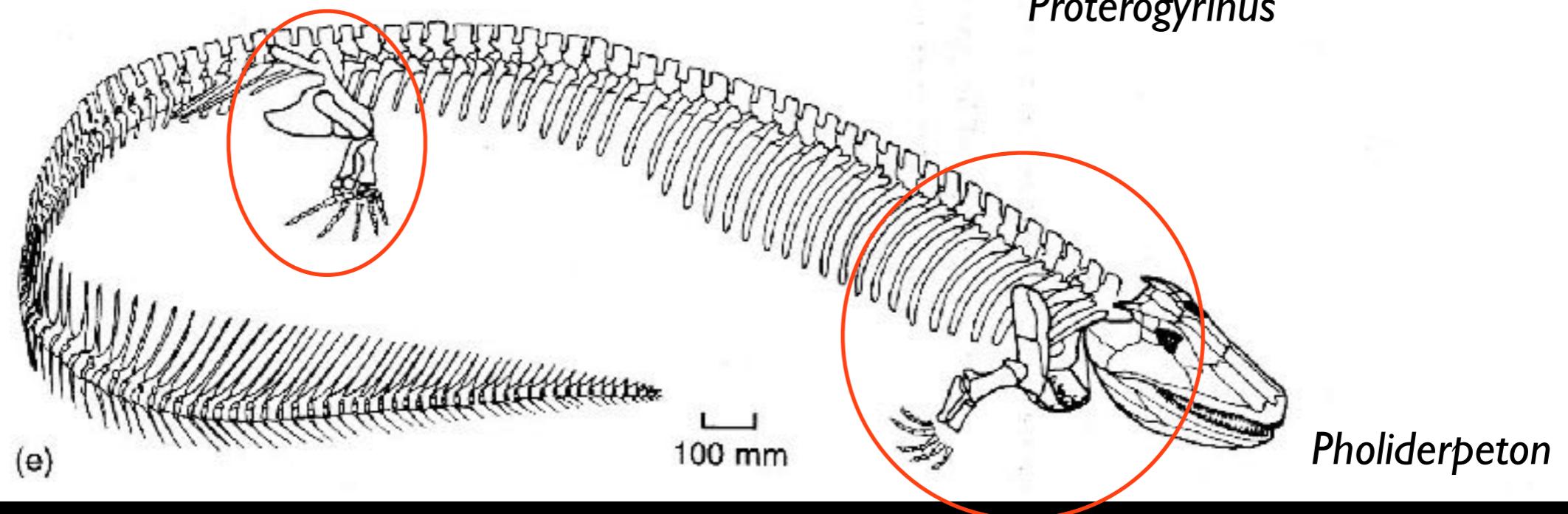


The Basal Tetrapods

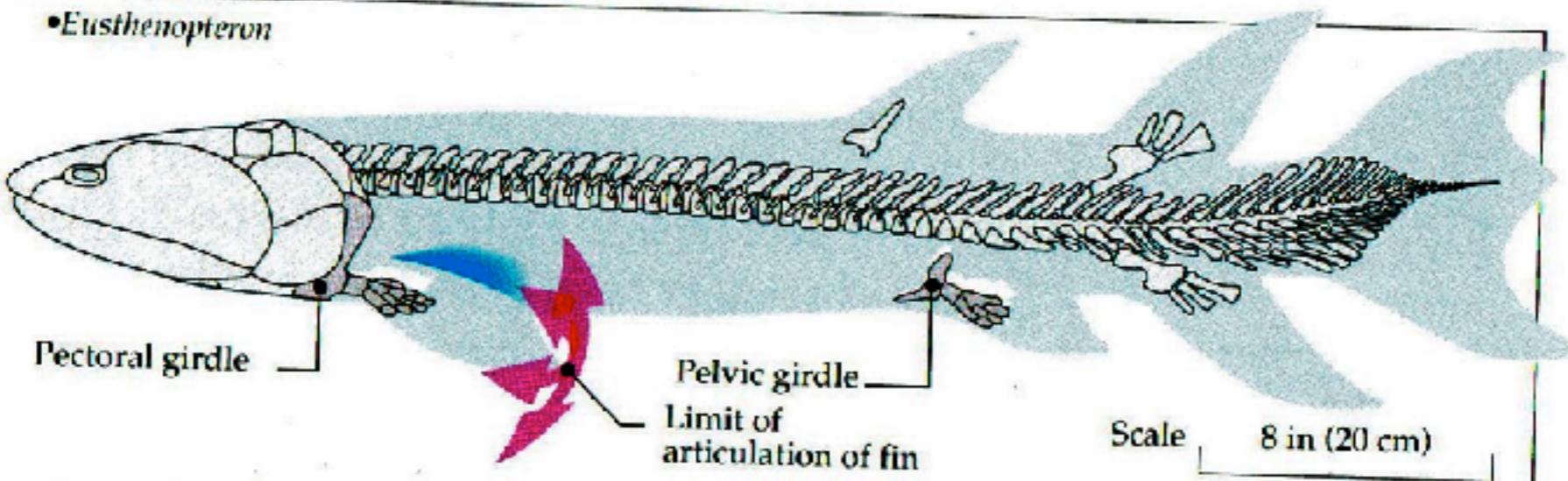
Early Anthracosaur



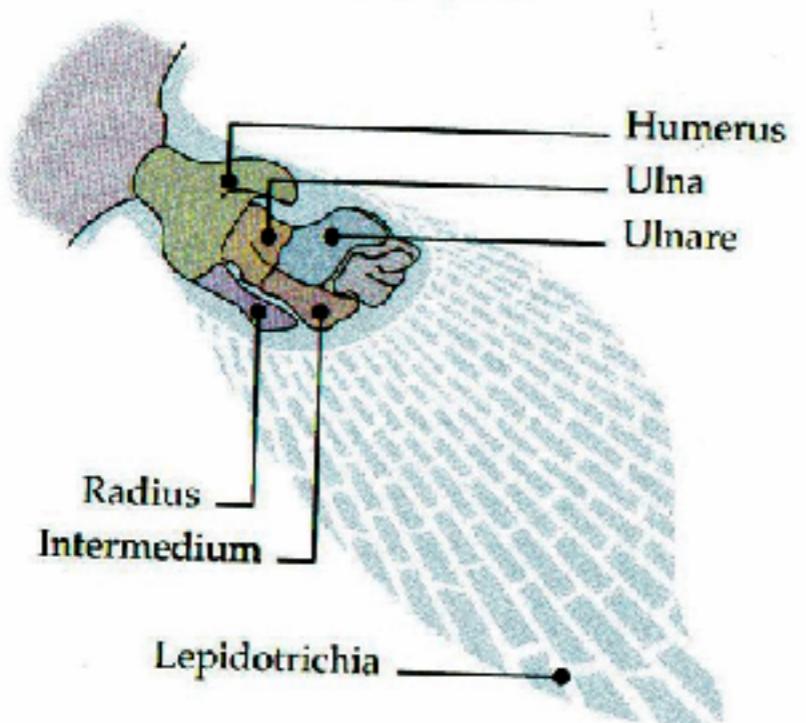
Proterogyrinus



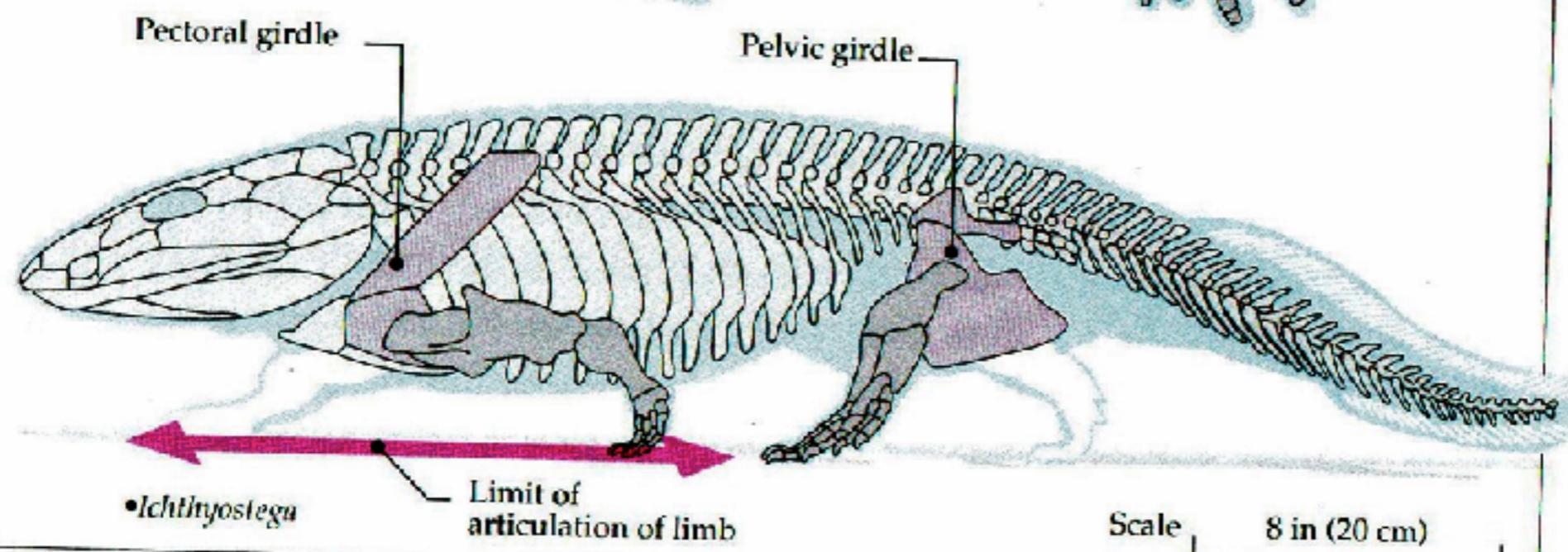
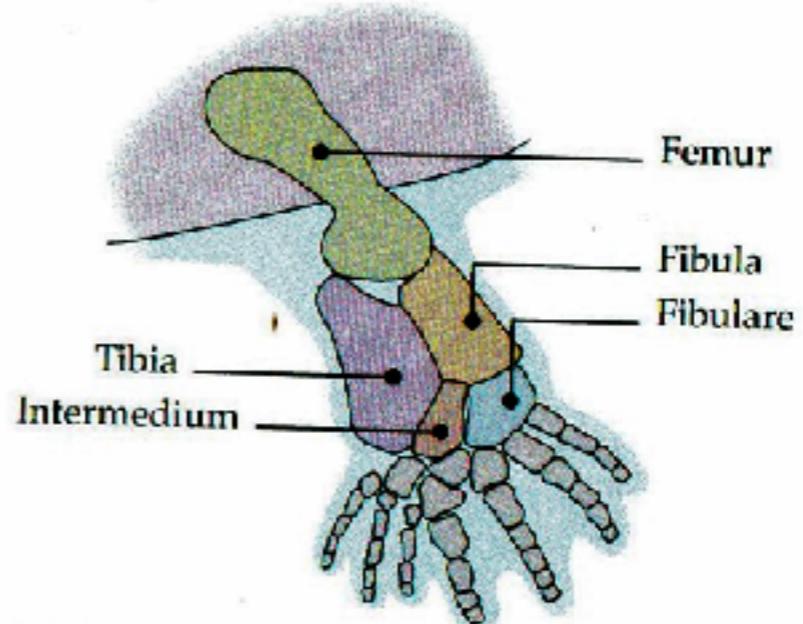
•*Eusthenopteron*



•Pectoral fin of *Eusthenopteron*

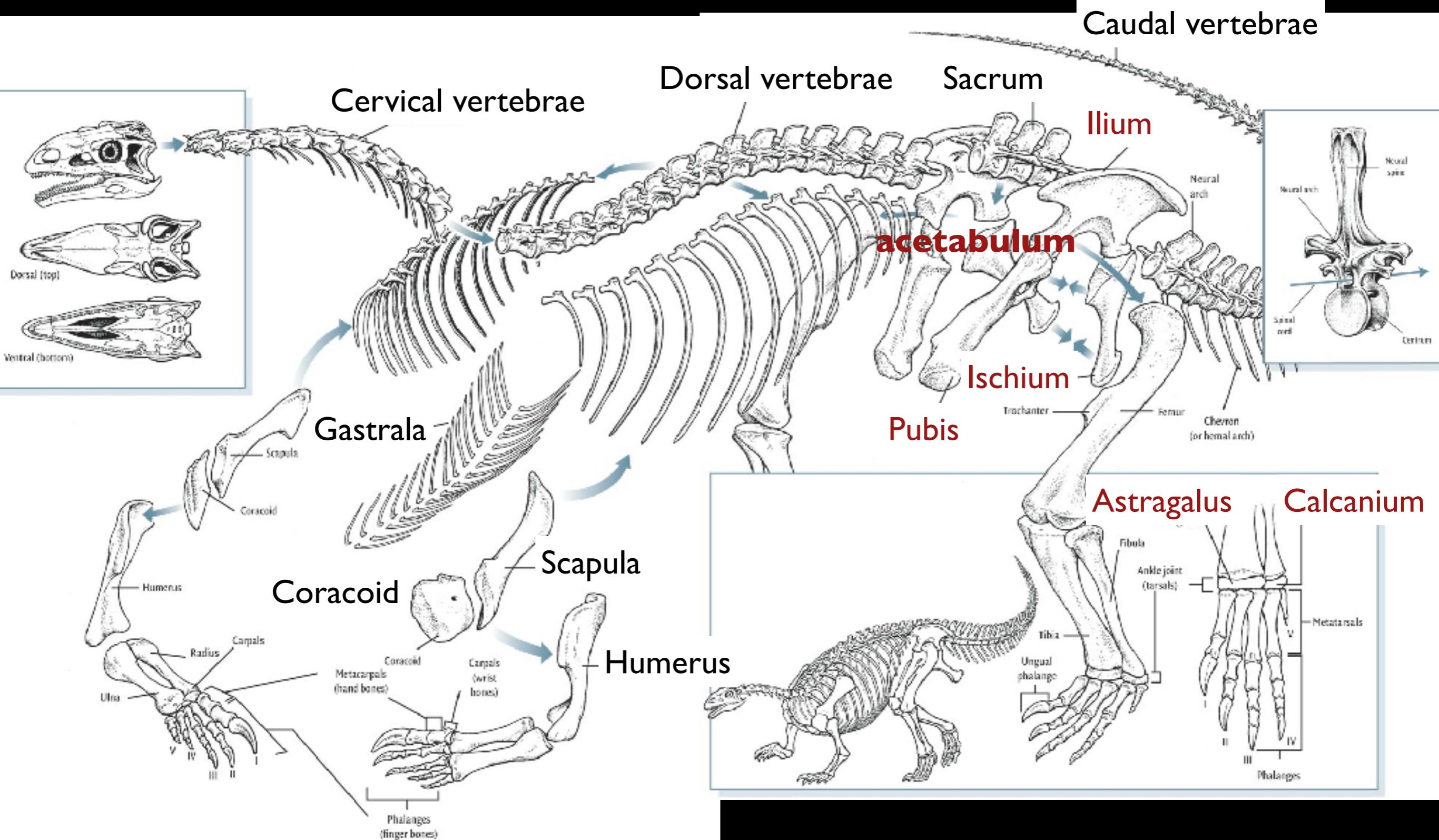


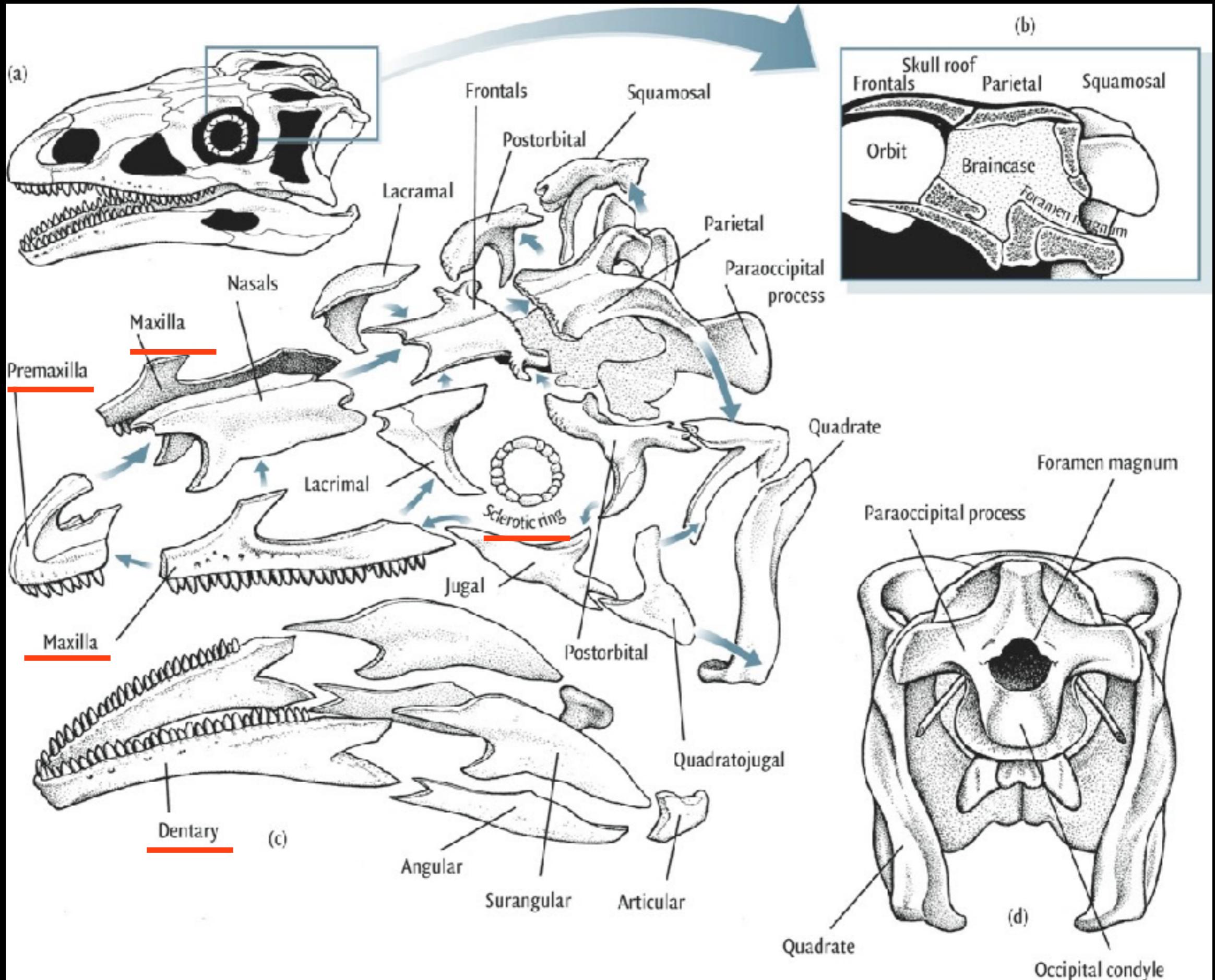
•Hind limb of *Ichthyostega*



The Tetrapod Body Plan

Learn this- in Fastovsky





Late Carboniferous (ca. 290 Ma)



Dominated by Anthracosaurs & Temnospondyl amphibians



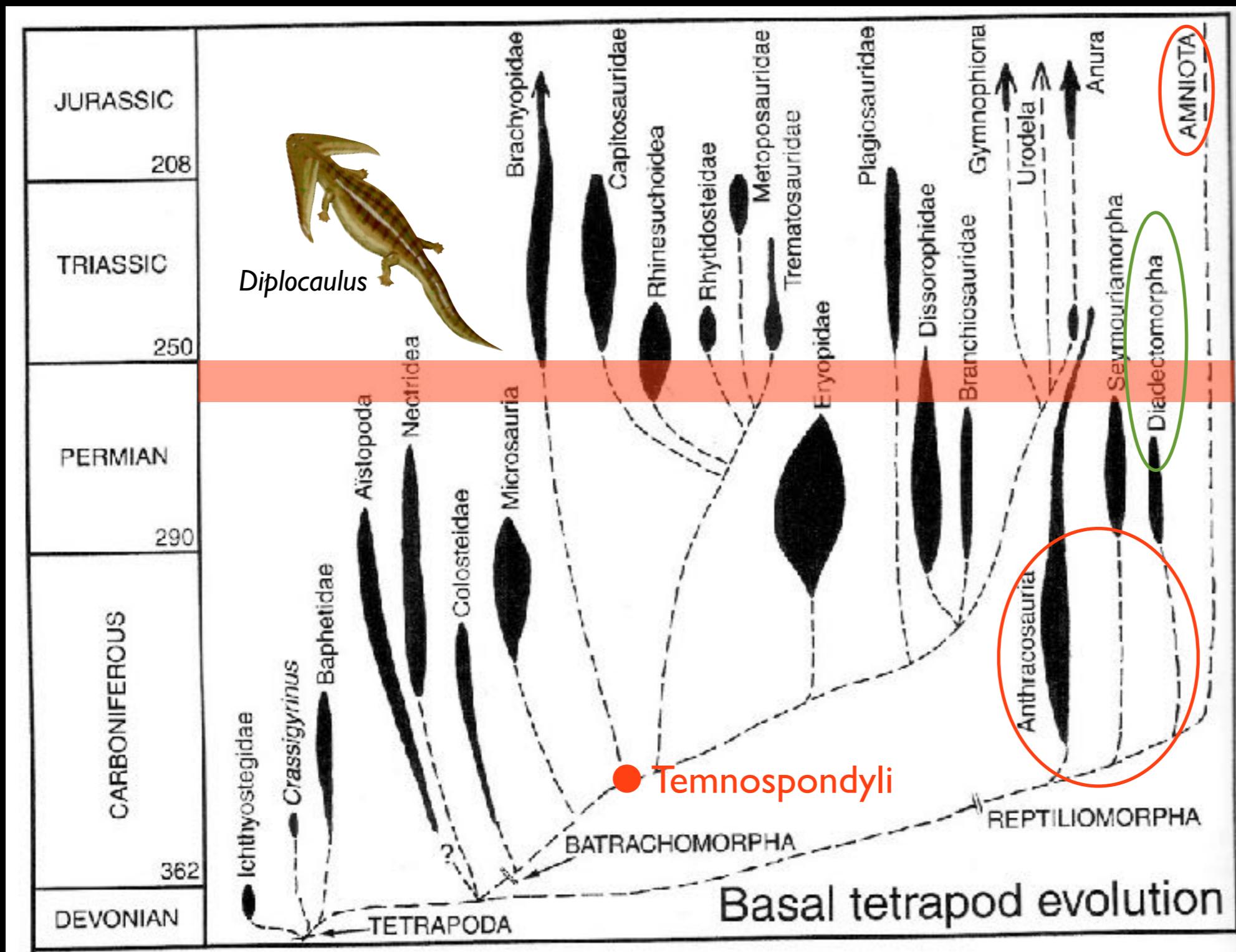
Gymnophiona
(Caecilians)



Urodea
(Salamanders)



Anura
(Frogs/Toads)



Anthracosauria:
Sometimes used to refer to 'reptile-like amphibians'

Diadectes:
First herbivorous land vertebrate!



Food for thought:
Why the radiation?