# The Mesozoic World

A quick review of Dinosaurian animals

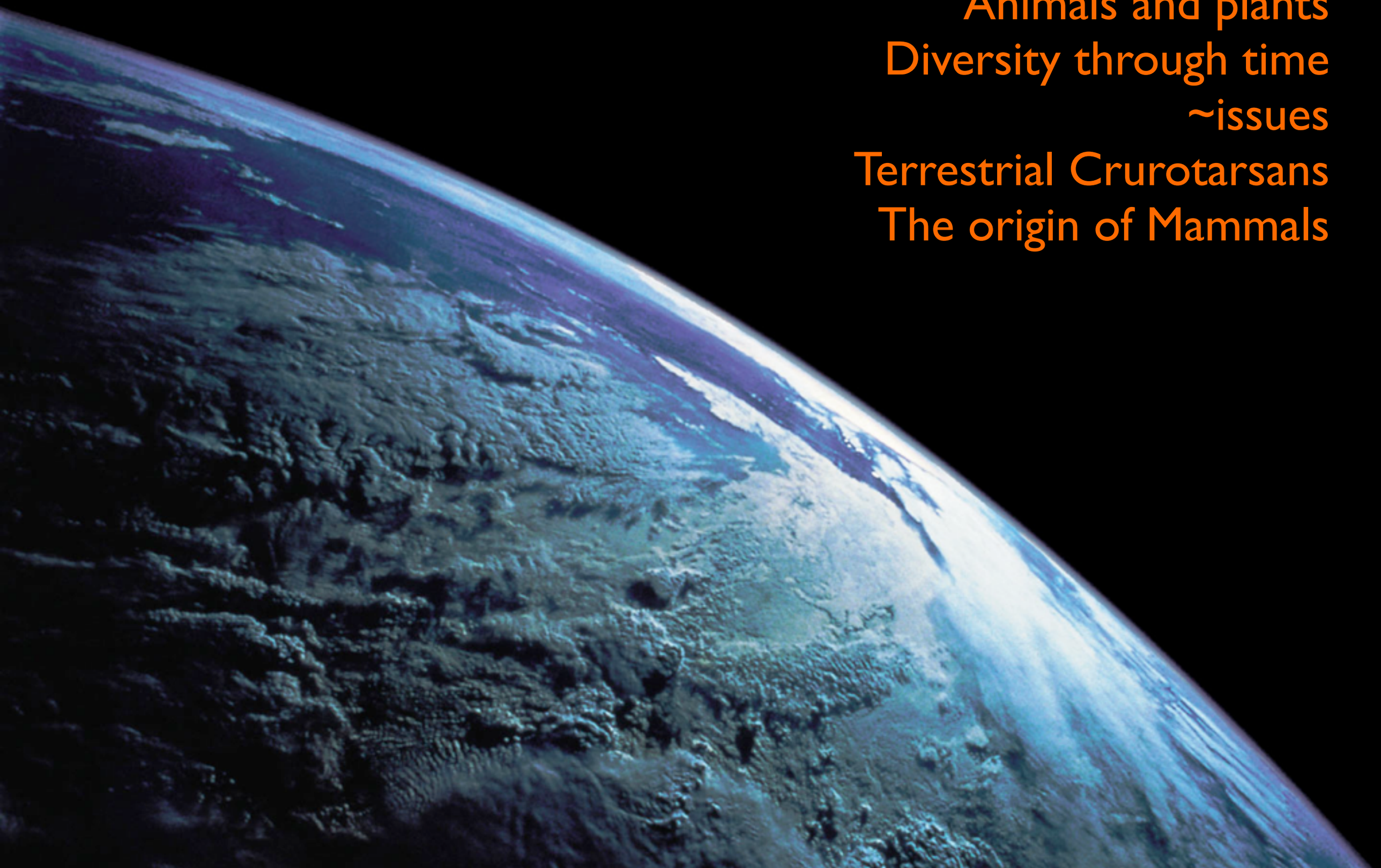
Animals and plants

Diversity through time

~issues

Terrestrial Crurotarsans

The origin of Mammals



Theropoda
Sauro-
podomorpha
Thyreophora
Ornithopoda
Marginocephalia
Paleogene
Paleocene
Cretaceous
Late
Early
Jurassic
Late
Middle
Early
Triassic
Late
Middle
Early
10 Ma
Birds
Deinonychosauria
Allosauroidea
Ceratosauria
Sauropoda
Stegosauria
Ankylosauria
Euornithopoda
Pachycephalosauria
Ceratopia
Maniraptora
Tetanurae
Heterodontosauridae
Herrerasauridae
Prosauropoda
Cerapoda
Genasauria
Saurischia
Ornithischia

# Some early terrestrial archosaurs in the Triassic...

remember these guys?

*Rhyncosaurs*
- early Triassic
- VERY abundant
- Herbivorous

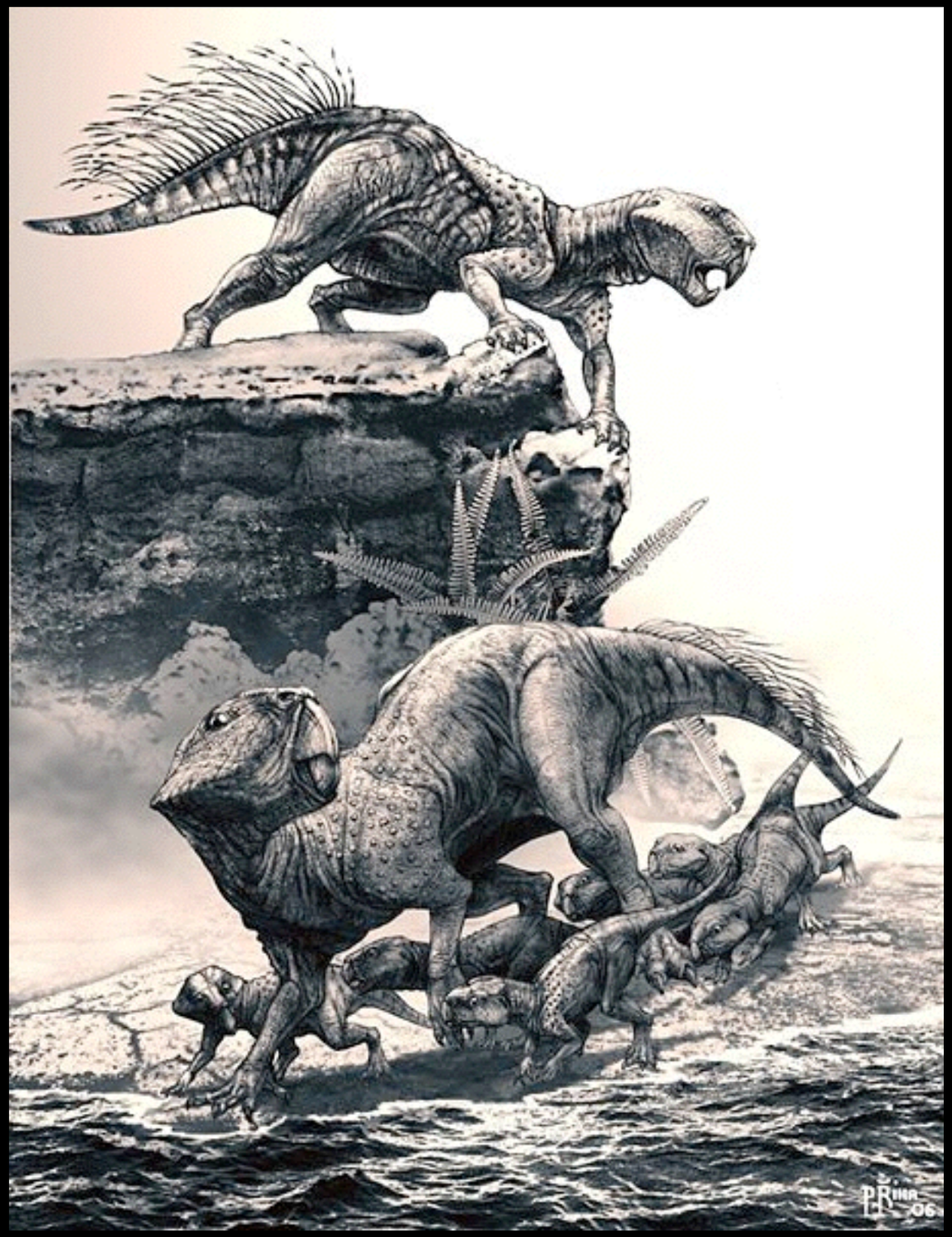
*Terrestrisuchus*

*Rauisuchians*

*Saltoposuchus*

*Proterosuchus*
Basal Archosaur

# Ornithischians!



# Thyreophorans: Stegosaurs & Ankylosaurs

*Scelidosaurus*
*13 ft long*
*Early Jurassic, England*

*Gastonia*

*Stegosaurus*


*Kanyesaurus westicus*

# Ceropoda: Marginocephalia: Pachycephalosaurs

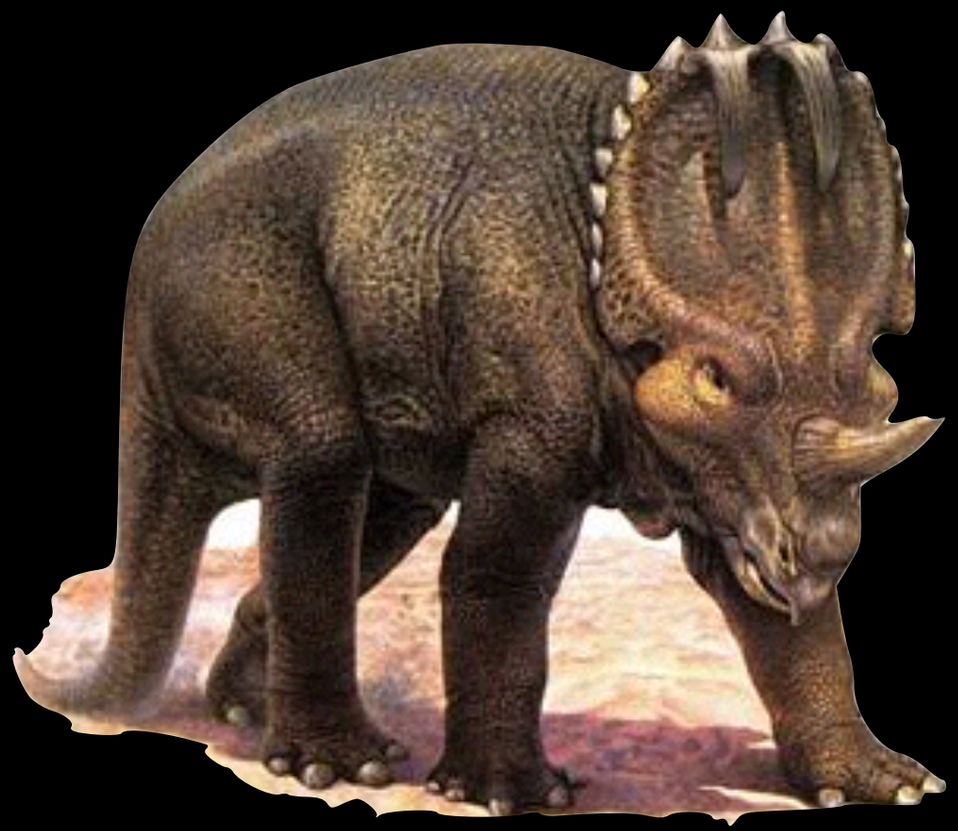
*Homalocephale*

*Stegoceras*

*earlier*
*'flat'*

*derived*
*'round'*

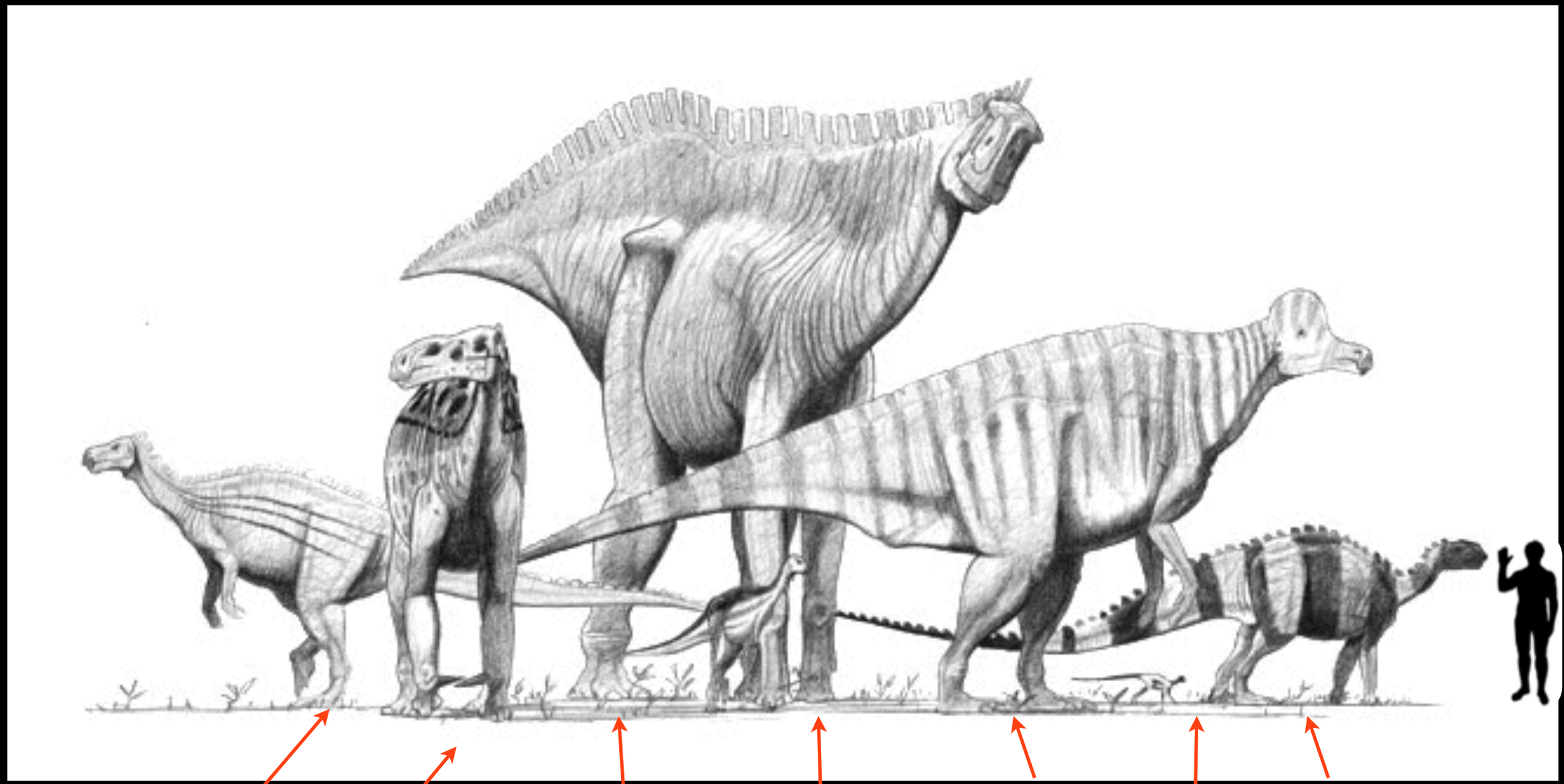
# Ceropoda: Marginocephalia: Ceratopsia



*Centrosaurs*

*Chasmosaurs*

# Ceropoda: Ornithopoda



*Camptosaurus*

*Iguanodon*

*Shantungosaurus*

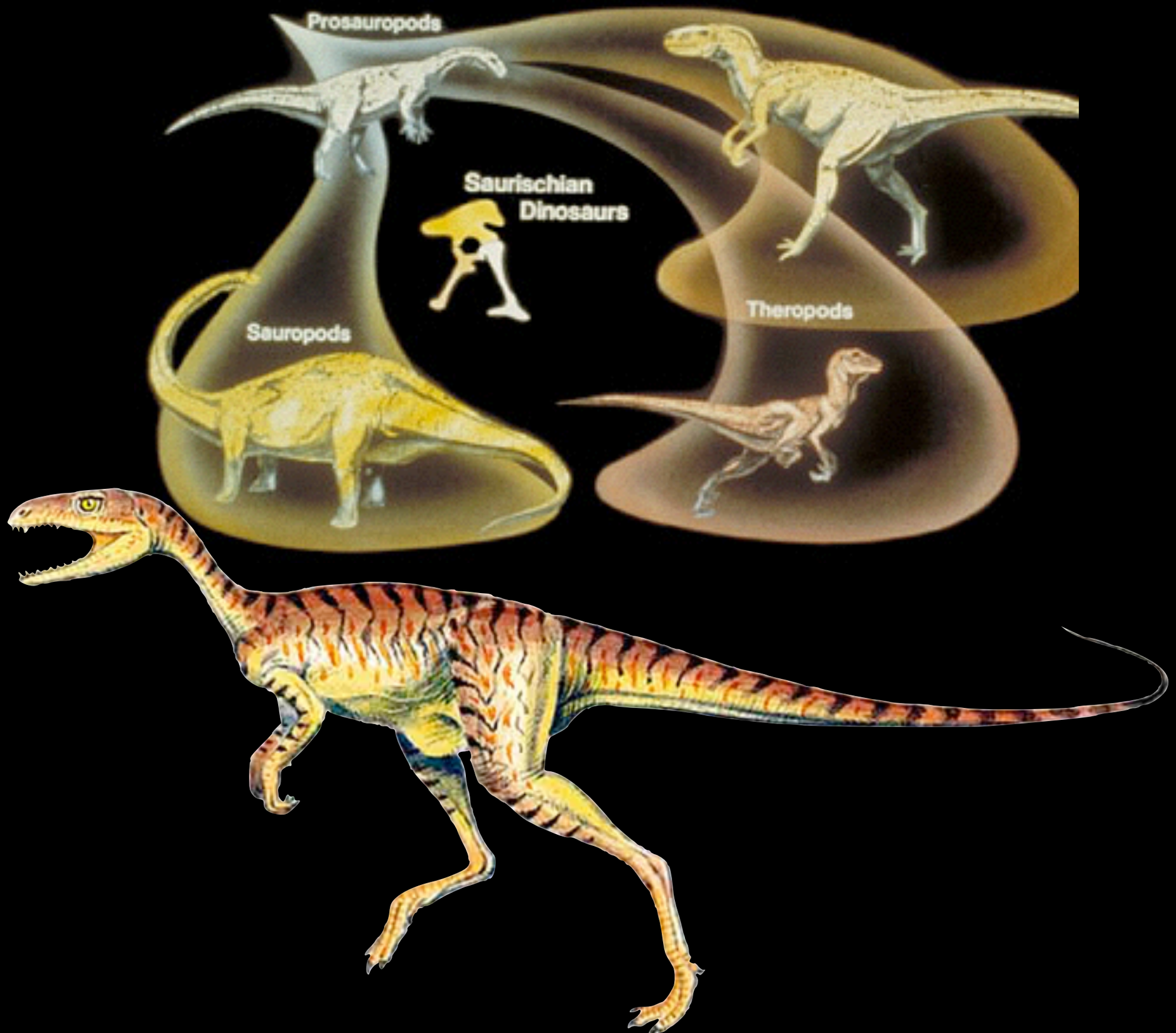
*Dryosaurus (small)*

*Corythosaurus*

*Heterodontosaurus (small)*

*Tenontosaurus*

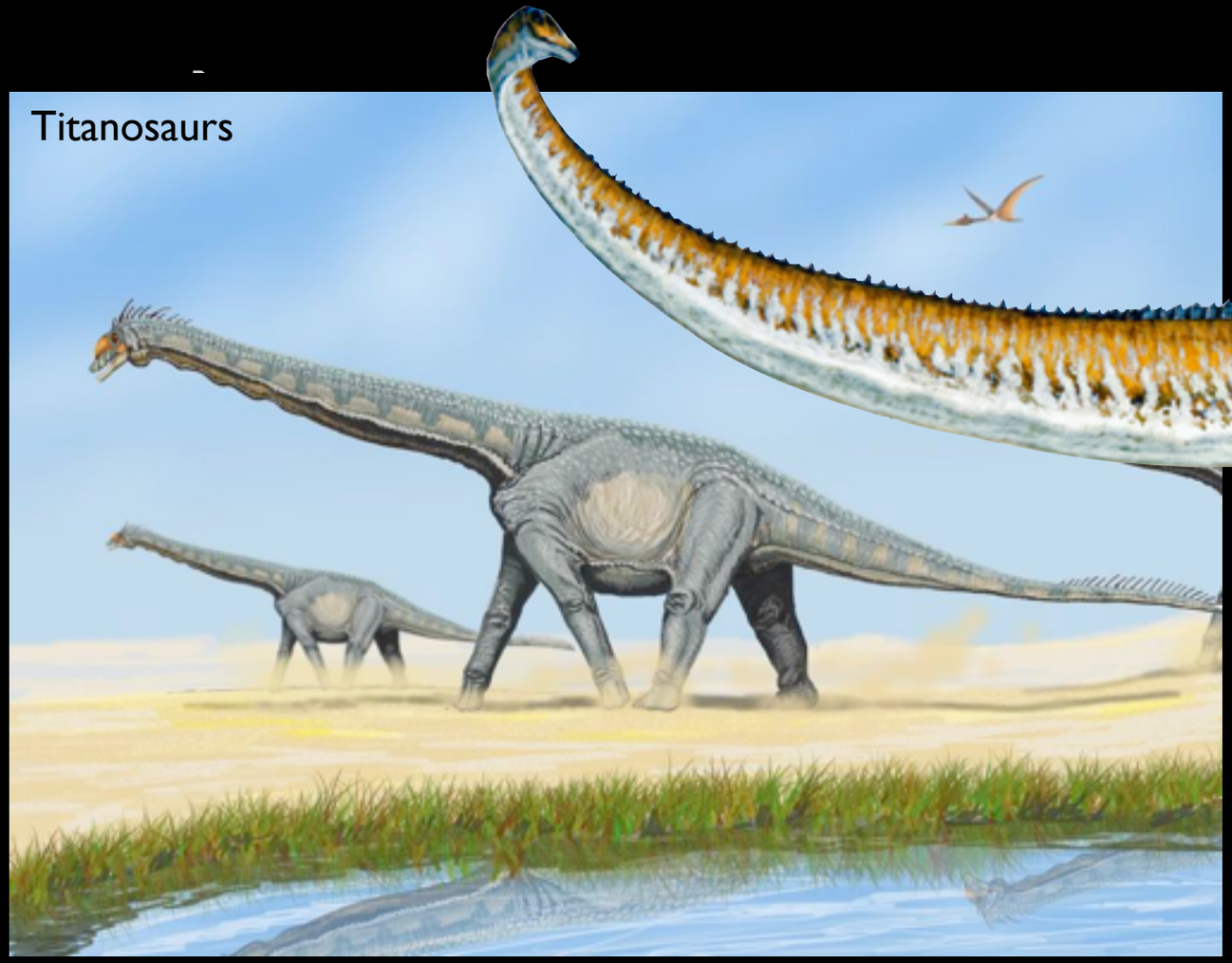
# Saurischians!



# Sauropodamorpha

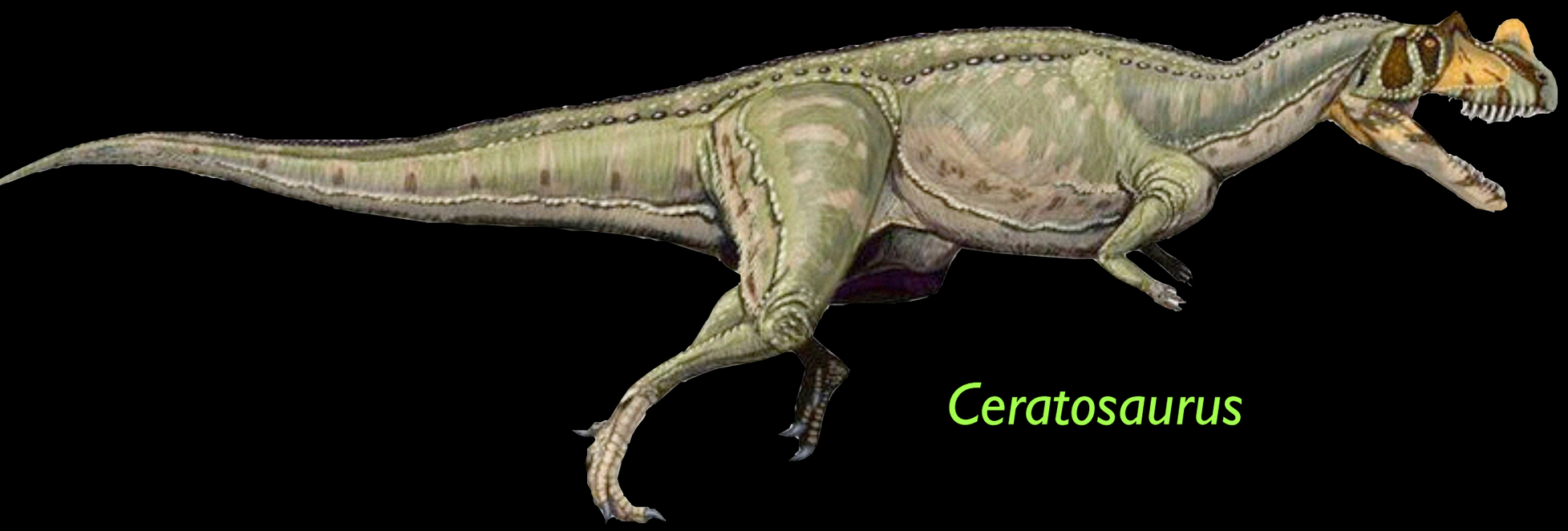
*Coloradisaurus*
Prosauropod

*Brachiosaurus*




*Barosaurus*
Diplodocid

# Non-avian Theropods



*Ceratosaurus*

*Sinvenator*

*Giganotosaurus; Late Cretaceous South America*
*16 meters (52 ft) long*


*Struthiomimus; Late Cretaceous*
*N. America 4.3 meters (14 ft) long*

# Bird-like non-avian Theropods

*Microraptor*

*Mahakala*

# Avian Theropods

*Archaeopteryx*

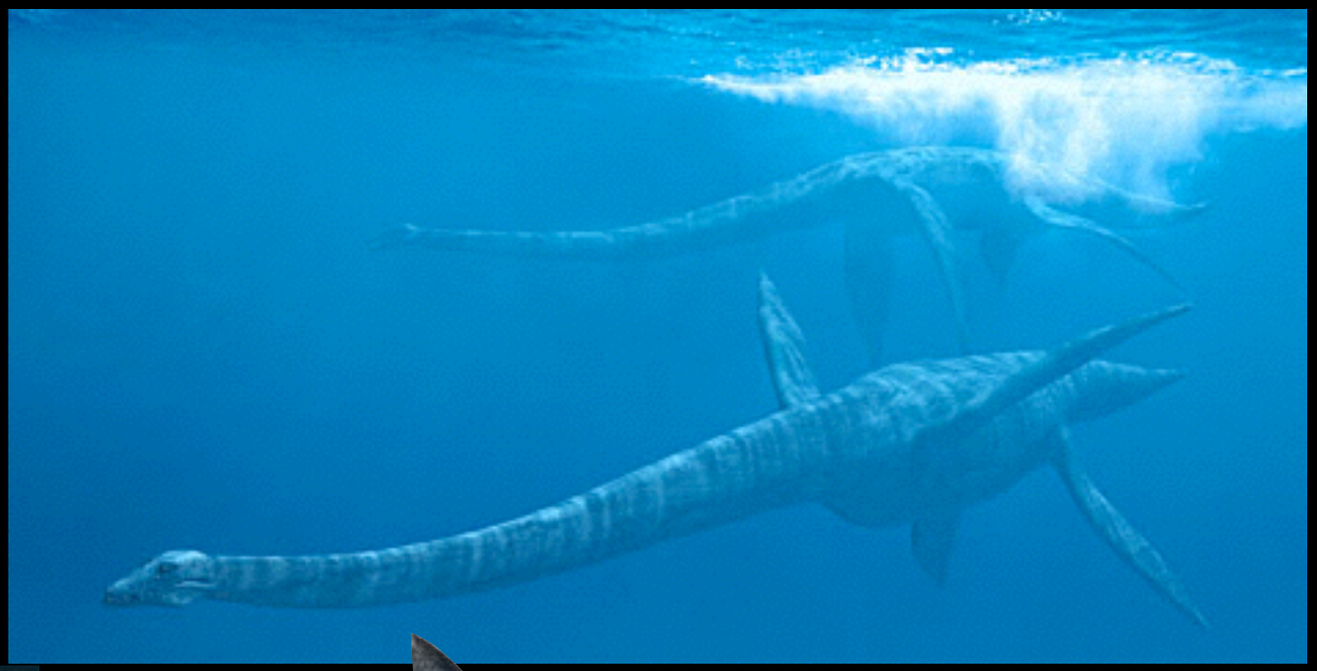
*Frigate Bird*

*Raven*

# Pterosaurs!

# Marine reptiles!

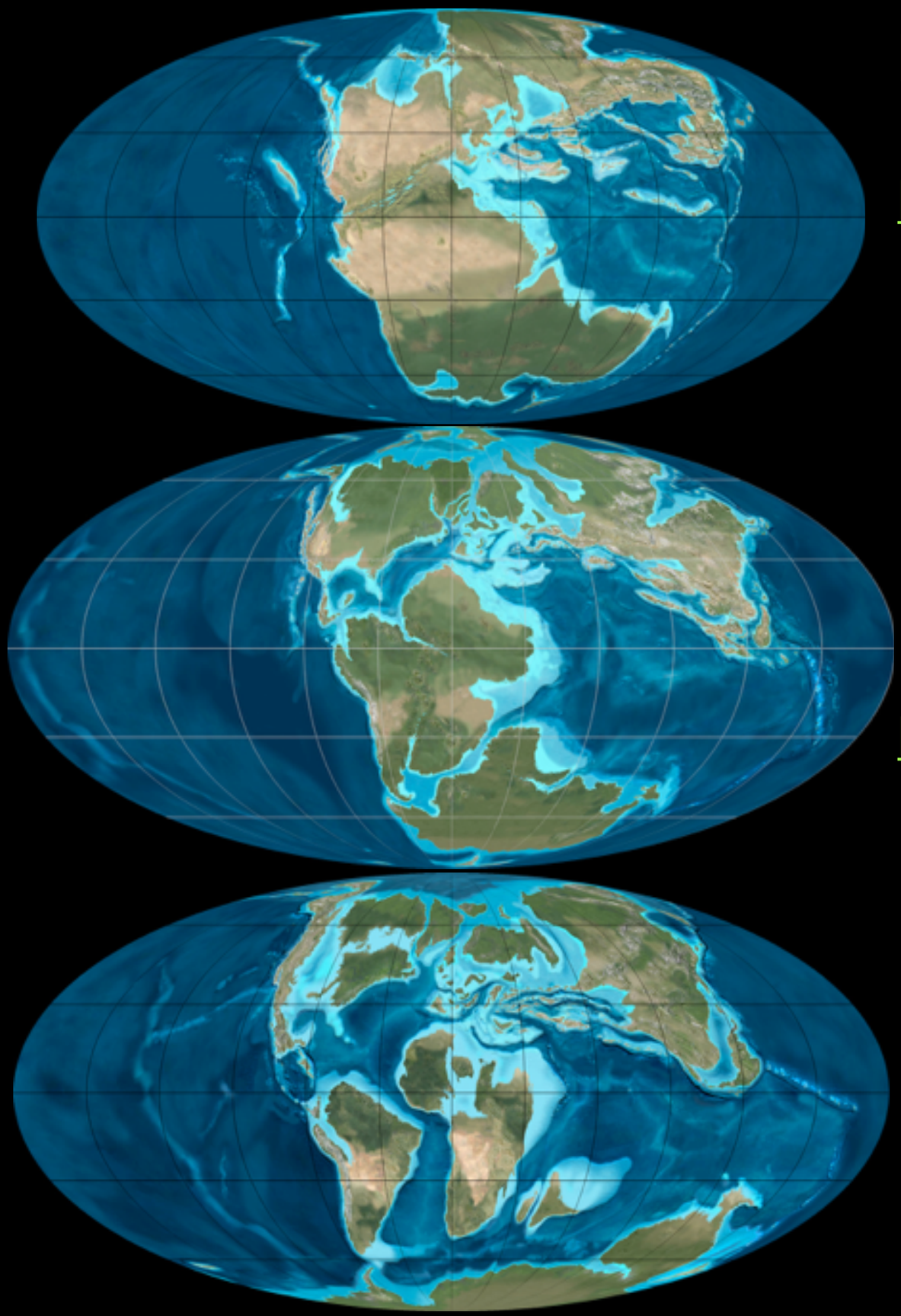
*Mosasaurs*



*Plesiosaurs*

*Ichthyosaurs*

*Pliosaurs*



# Big scale questions:

<u>Biogeography</u>

When/How did dinosaurs originate?

How does diversity change through time?

Are there spatial patterns among dinosaur groups?

Are there temporal patterns among dinosaur groups?

<u>Ecology</u>

Are there correlations between groups?

Dinosaurs + plants?

# When/How did dinosaurs originate?

245 to 230 Ma

Silesauridae

Dinosauria

*Asilisaurus*

?

*Morganucodon*

*Asilisaurus*

# When/How did dinosaurs originate?

## This is something that we've talked about a lot!

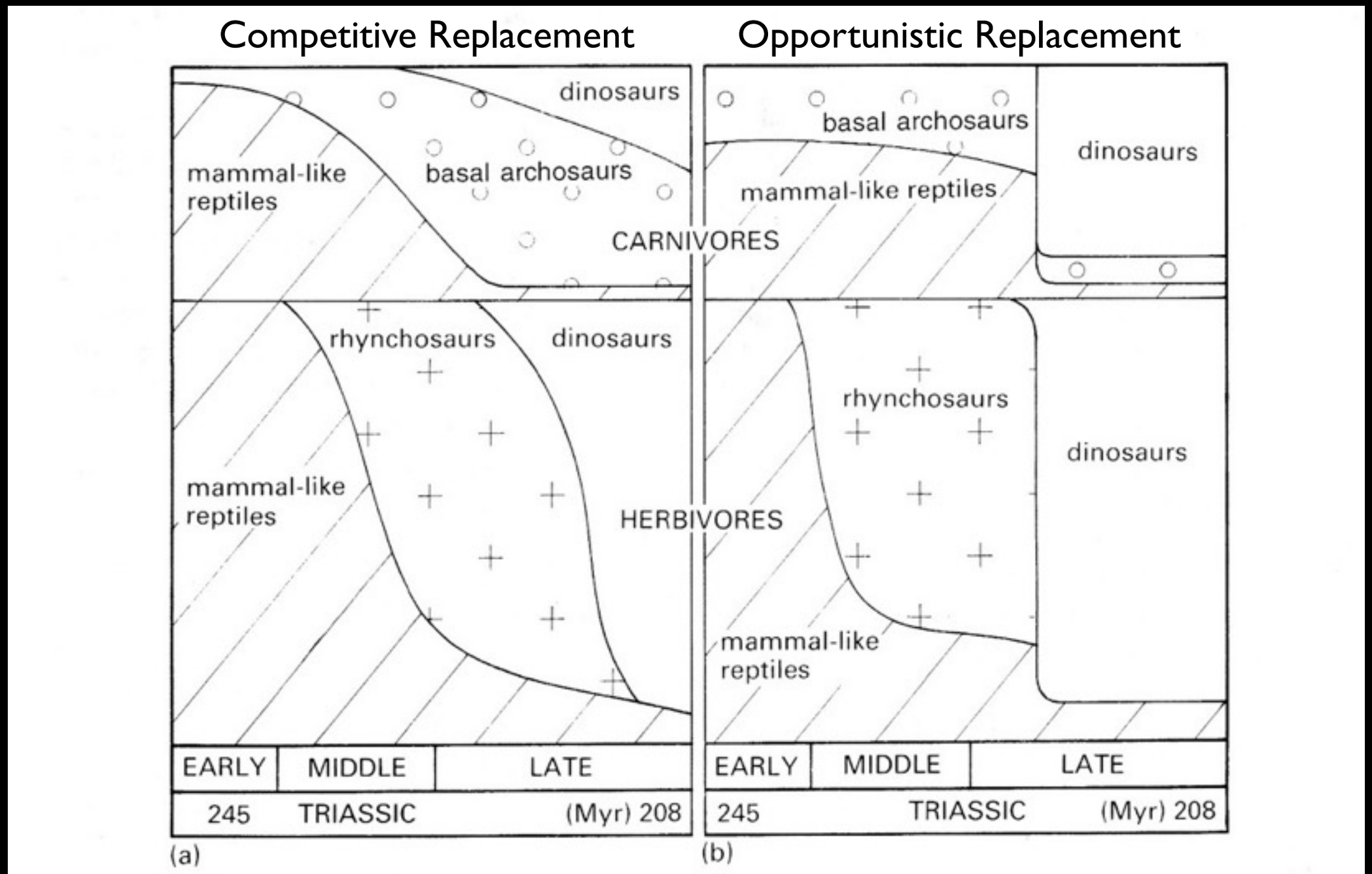



**Fig. 6.10** Two models for the replacement of mammal-like reptiles, basal archosaurs, and rhynchosaurs by dinosaurs: (a) a competitive replacement scenario; (b) an opportunistic mass extinction replacement model.

# Late Triassic: 228-200 Ma

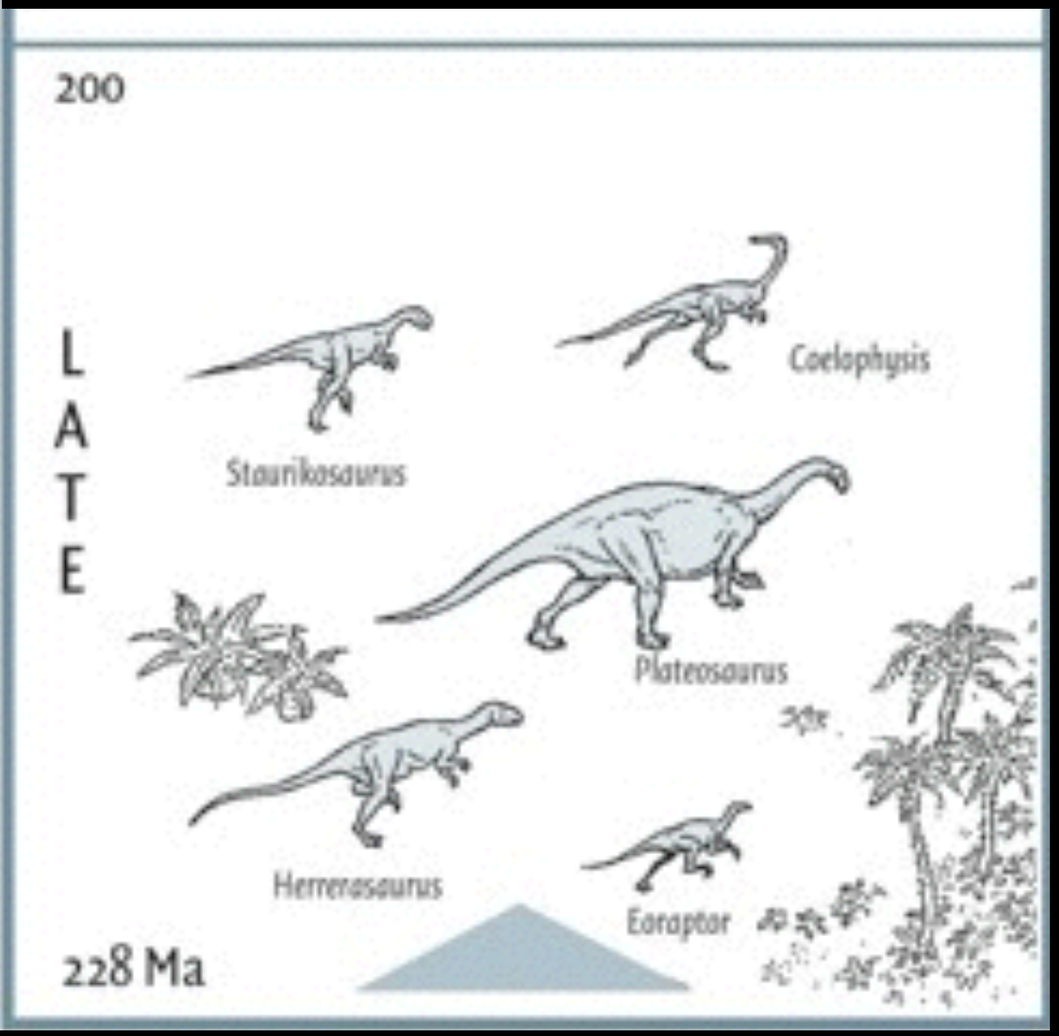
<u>Climate-Tectonics:</u>

Supercontinent at start of Triassic
Warm Climate
Ice Caps gone
Uniform Temperature gradients
Red bed and evaporites suggest continued drying

<u>Plants</u>:

Lycophytes (oldest living vascular plants)
Fern ground cover
Conifers and Tree Ferns dominated forests
Cycads and Ginkgoes appear

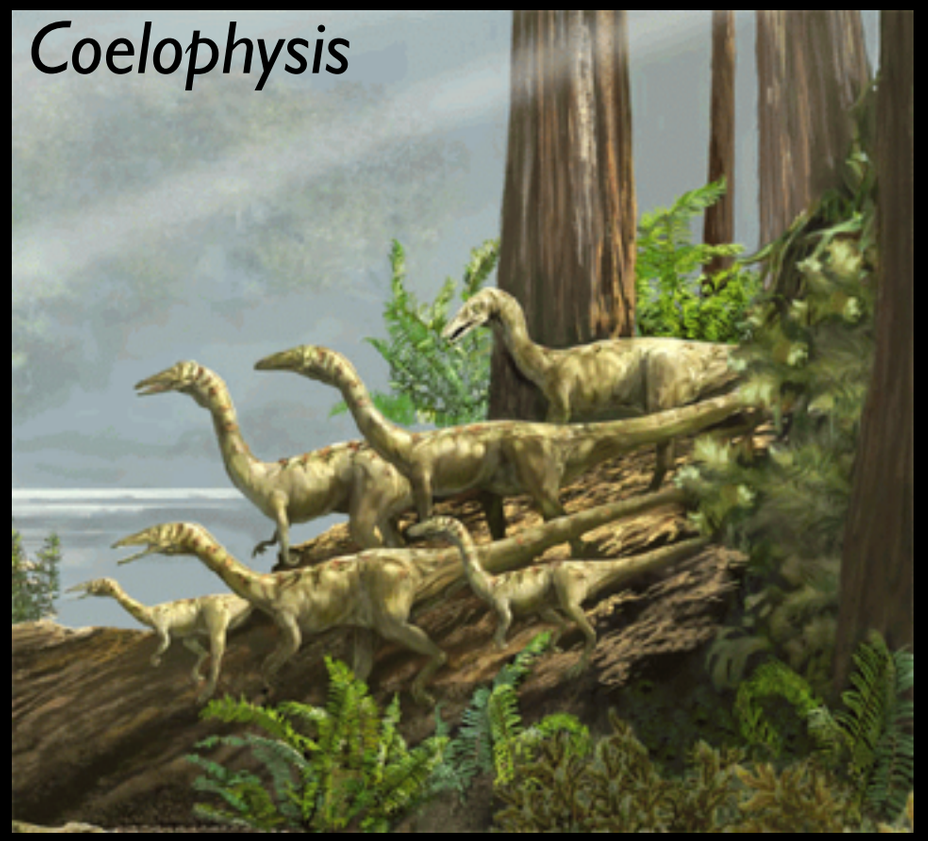
# Late Triassic: 228-200 Ma




In addition: archaic archosaurs and therapsids remain important + first mammals, turtles, ichthyosaurs (long), pterosaurs (small), nothosaurs, placodonts

*Plateosaurus*
Sauropodamorpha

*Pisanosaurus*

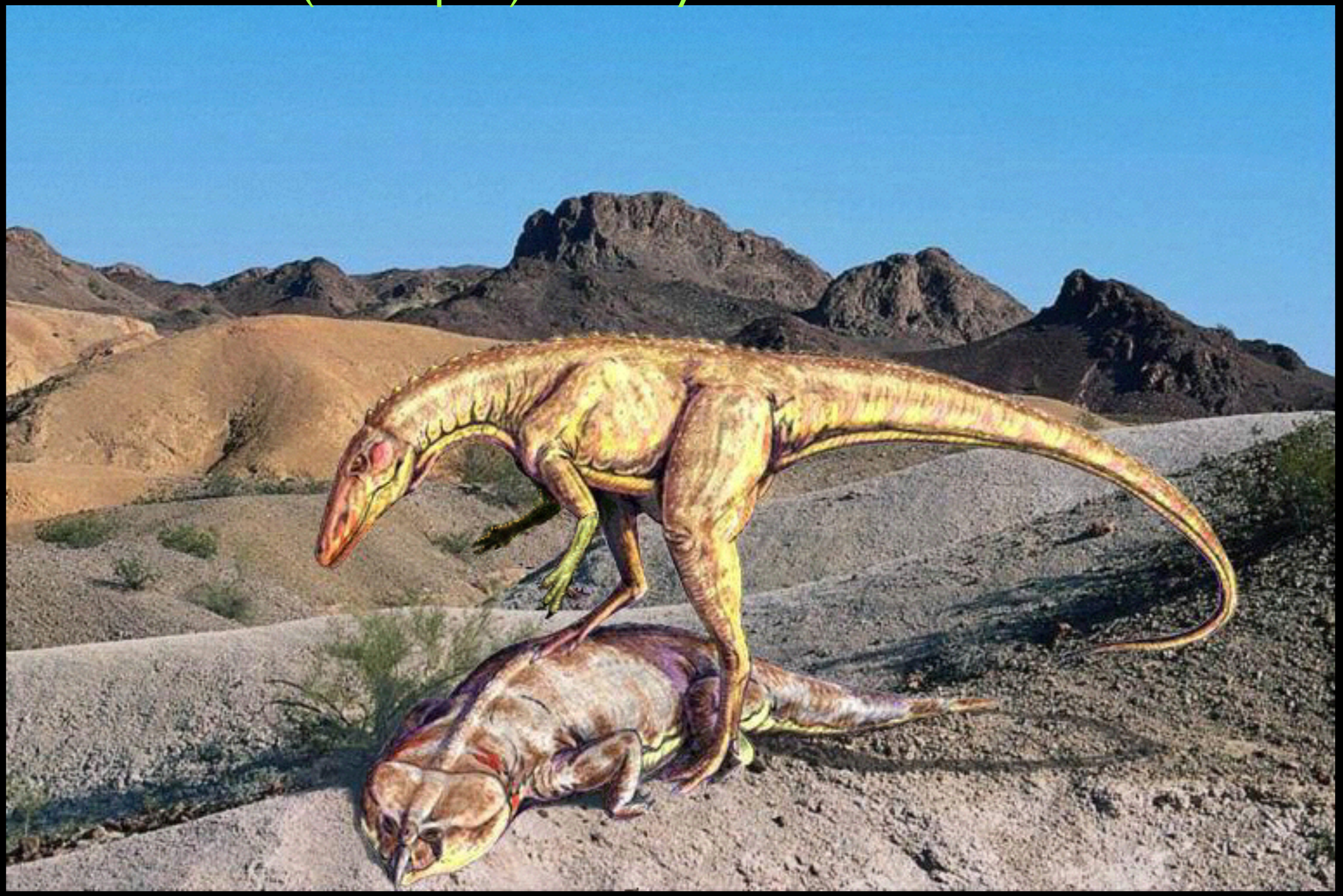


# Late Triassic: 228-200 Ma

- The Triassic is remarkable because there is very little Endemism among flora and fauna: The Pangaea Effect
- Endemism: when faunas are restricted to a certain geographic range
- Increases in diversity typically follow increases in endemism. Why?

# Late Triassic: 228-200 Ma

*Staurikosaurus* (Theropod) *vs.* a Rhyncosaur in the late Triassic



# Jurassic: 200-146 Ma

<u>Climate-Tectonics:</u>

Warm, equable climate (fewer temp. swings as oceans form)

Continents routinely flooded

Extensive rifting and volcanism

North Atlantic opens

Sea levels higher (little, if any, permanent ice)

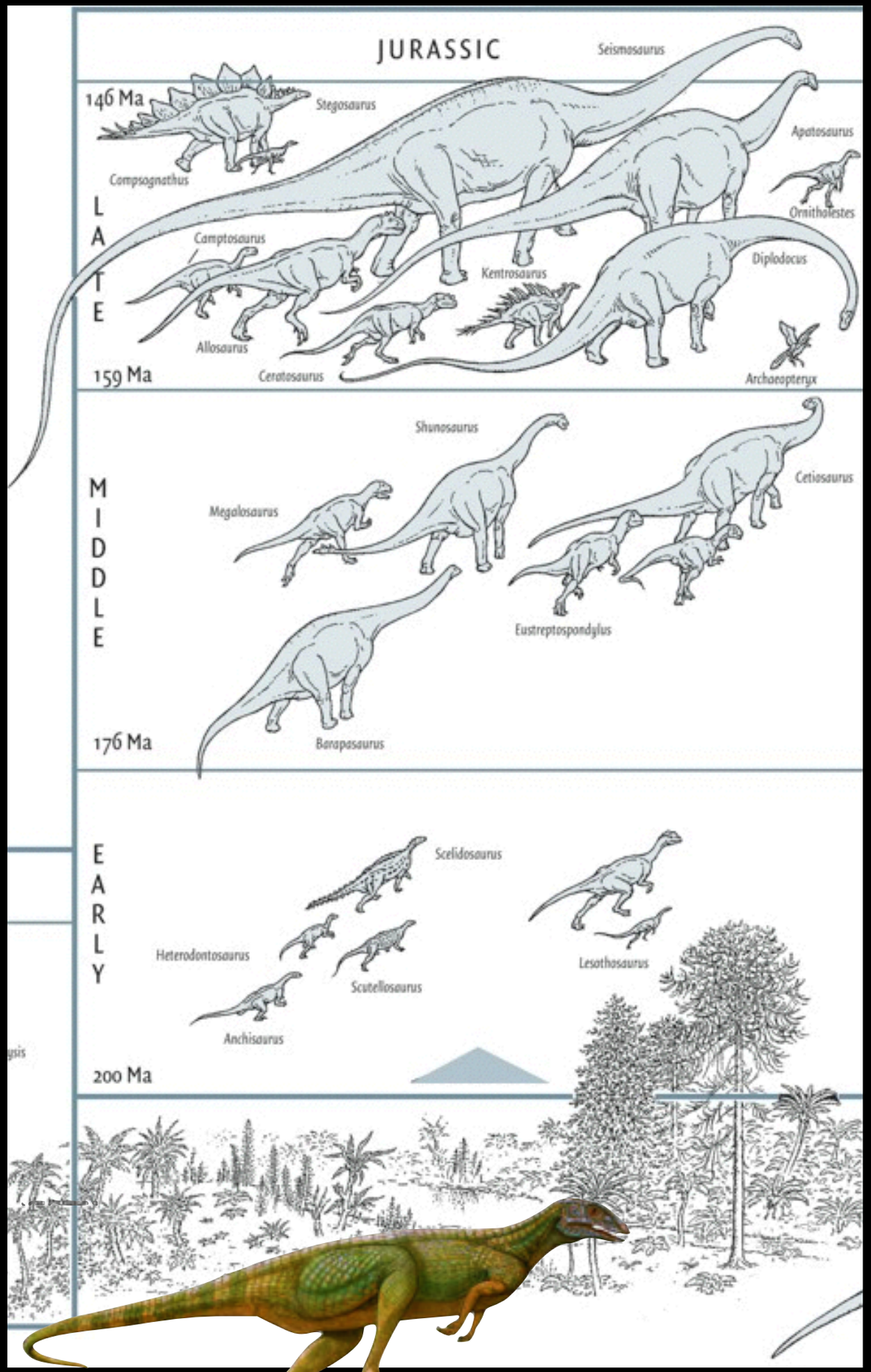
<u>Plants</u>:

Lush jungles covered the planet

Confers were the primary tall trees

Cycads, Ginkgoes (northern hemisphere)

Ferns were the dominant undergrowth




In addition: mammals (nocturnal insectivores), lizards & amphibians (daytime insectivores, ichthyosaurs (long), pterosaurs (small), plesiosaurs, first birds

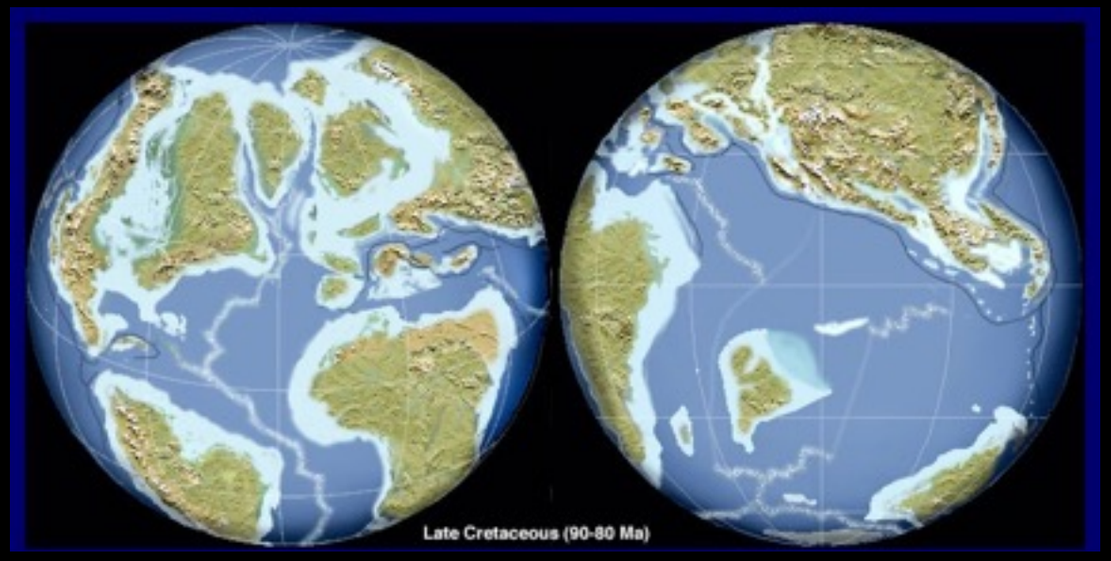
# Jurassic: 200-146 Ma

- Dinosaurs are the dominant terrestrial vertebrates
- Small mammals, pterosaurs, and newly evolved crocodilians share the landscape
- Pangaea had not 'unzipped'. Therefore, there was little endemism represented in terrestrial biota

# Jurassic: 200-146 Ma

- The middle Jurassic is not well known
- This is primarily the result of bias in the fossil record (few sediments formed)... not because there were no Dinos!
- End Jurassic characterized by ecosystems becoming isolated: DIVERSITY and ENDEMISM increase!
- Sauropods and Stegosaurs are the dominant herbivores

# Cretaceous: 146-65.5 Ma




<u>Climate-Tectonics:</u>

Equable climate, but some emerging seasonality

Continued rifting, volcanism, inland seas

Increased $CO_2$, increased greenhouse environment

Development of the Southern Atlantic

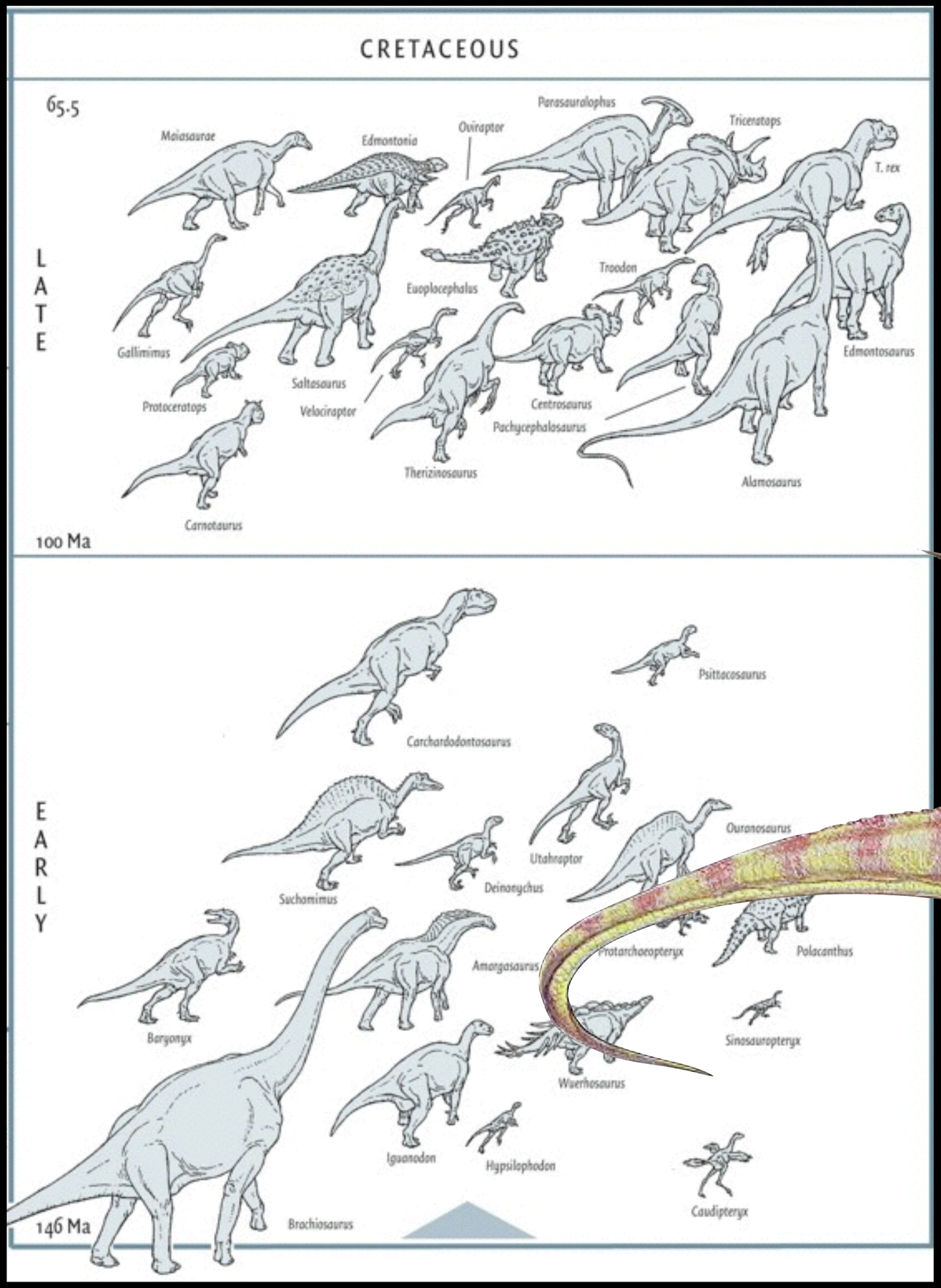
Complete unzipping of Pangaea


<u>Plants</u>:

Cycads, ginkgoes and ferns in <u>decline</u>

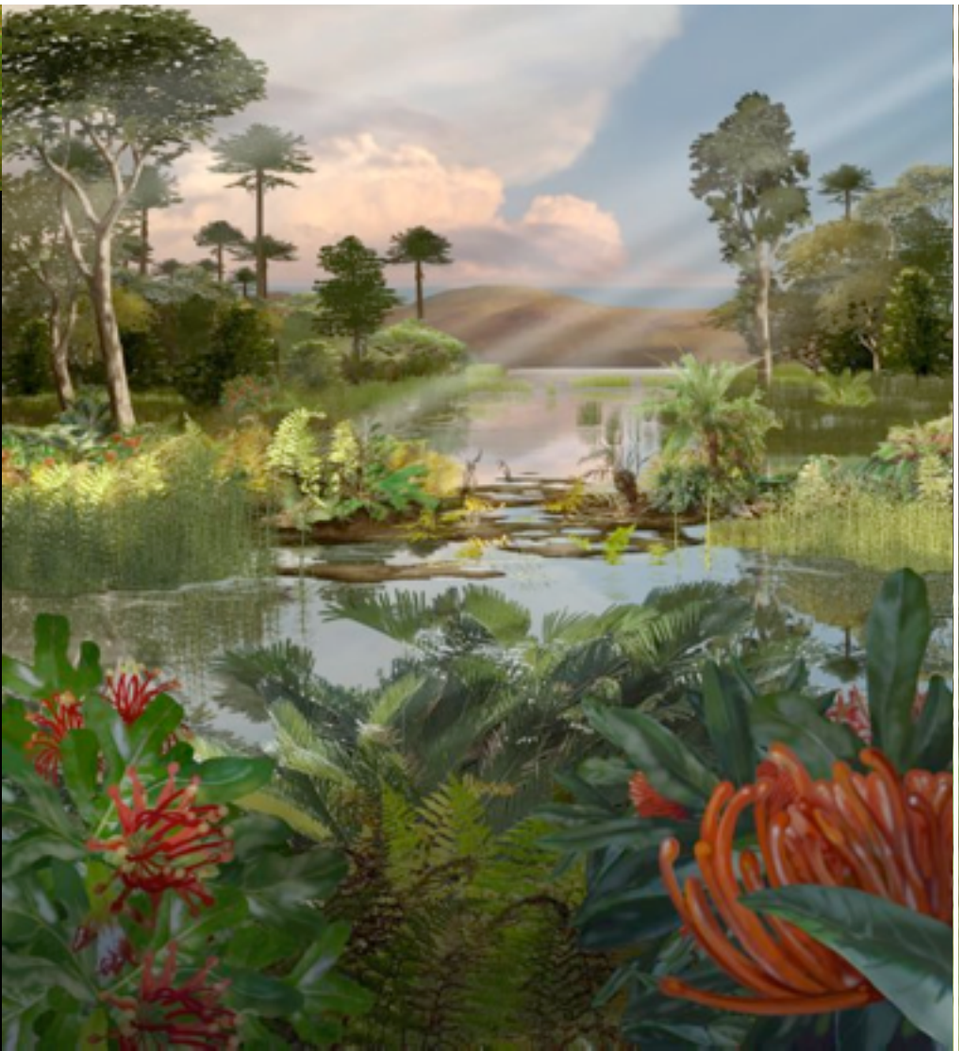
Angiosperms take over the understory

Conifers remain dominant, but their ranges become more restricted as angiosperms continue to flourish



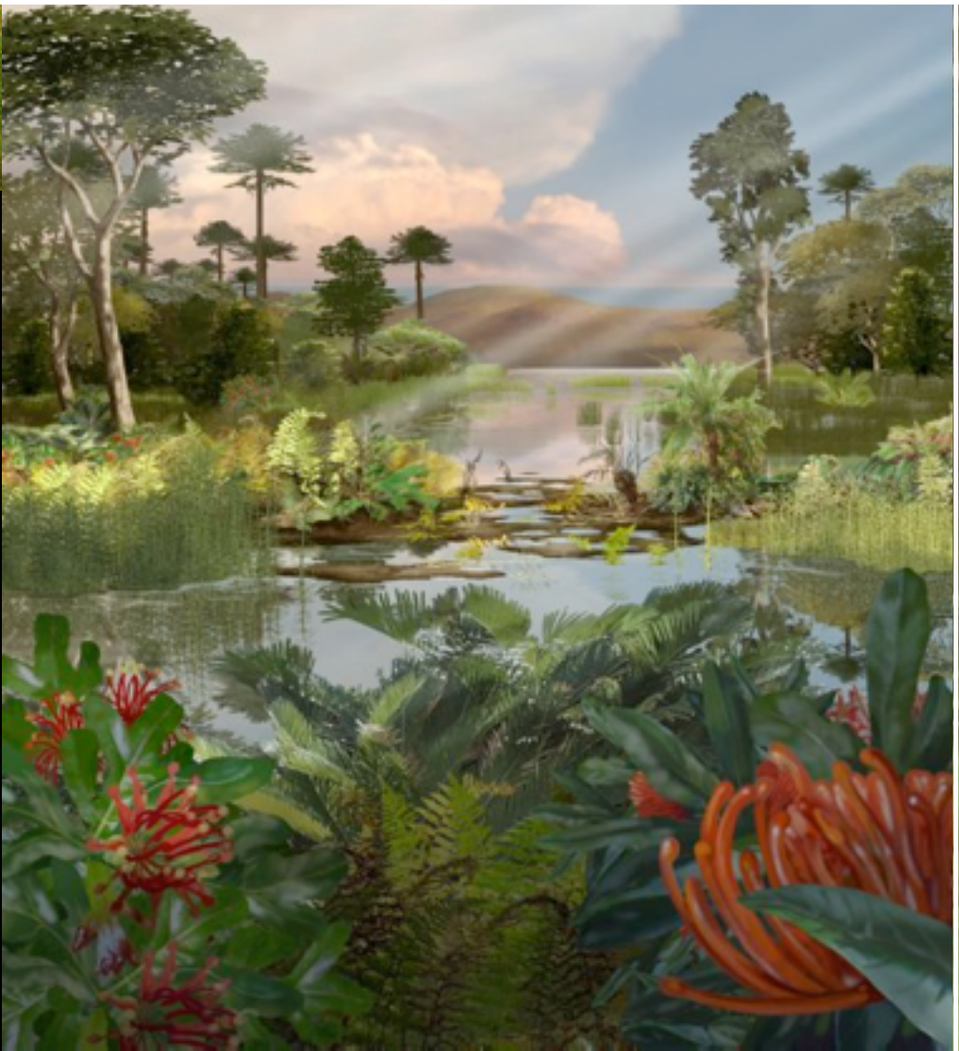

In addition: mammals (nocturnal insectivores), lizards & amphibians (daytime insectivores, ichthyosaurs (fish-like), pterosaurs (large), plesiosaurs, small diversity of birds

# Cretaceous: 146-65.5 Ma



- Continued increase in Endemism as Pangaea separates
- Early Cretaceous: rise of Ornithopods
- Ankylosaurs and Ceratopsians become dominant herbivores
  - ~ note the success of the ‘chewers’...
- Troodontids and Dromaeosaurs explode in diversity

# Cretaceous: 146-65.5 Ma



- Late Cretaceous: the most diverse time for dinosaurs
  - Tyrannosaurs
  - Pachycephalosaur explosion
- This diversity does not seem to be the result of climate... no severe or sudden climate changes during this time (endemism)
  - Southern continents: sauropods, ornithopods, ankylosaurs, & Ceratosaur theropods (Jurassic-Style)
  - Northern continents: Pachycephalosaurs, Ceratopsians & Hadrosaurids