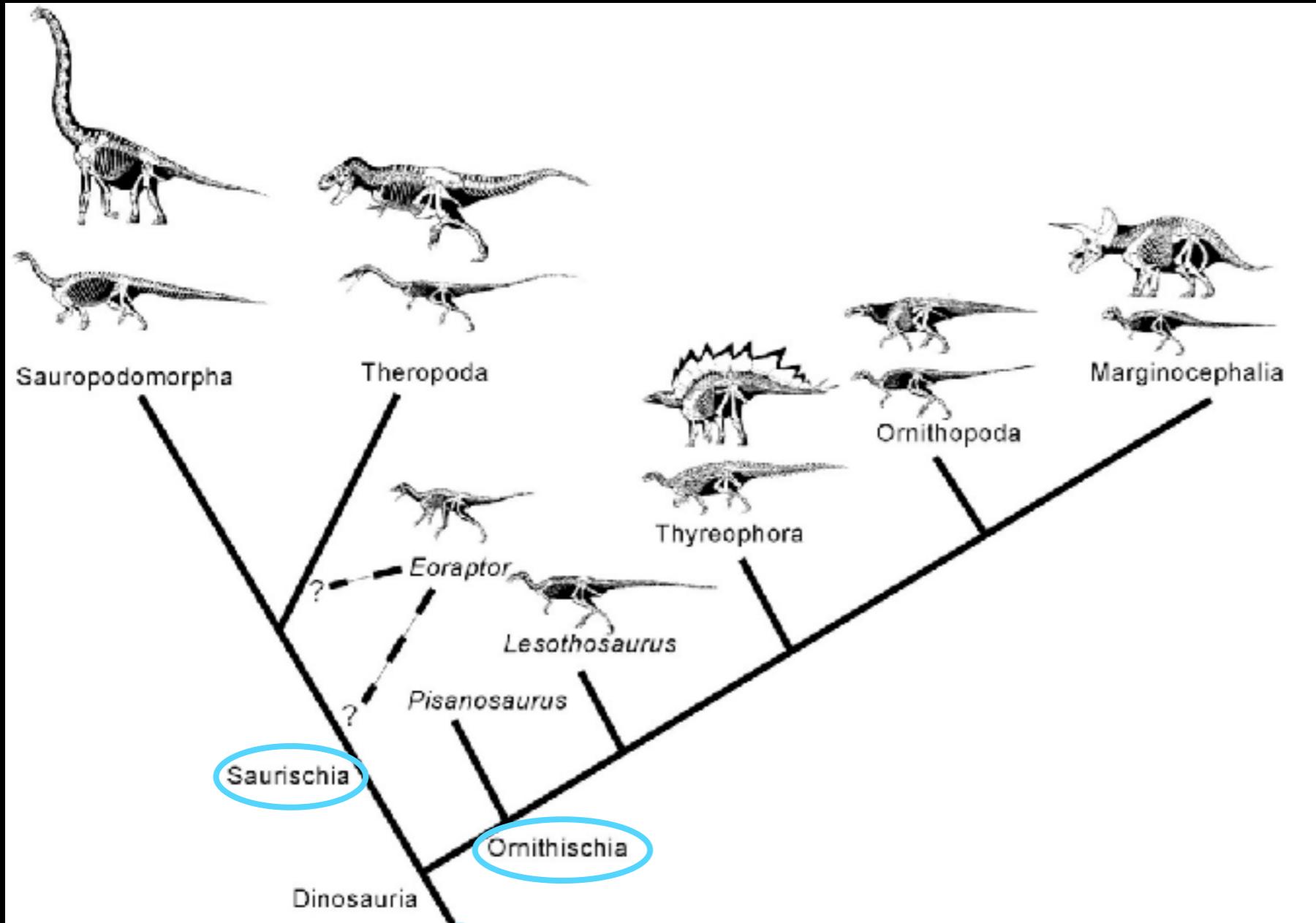


Exam 1 will cover:

## **Chapter 10: The shield-bearers**

# DINOSAURS

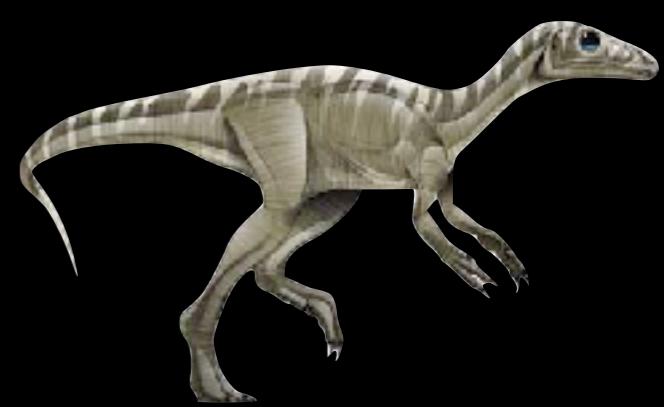
Basal Dinosaurs



*Lesothosaurus*



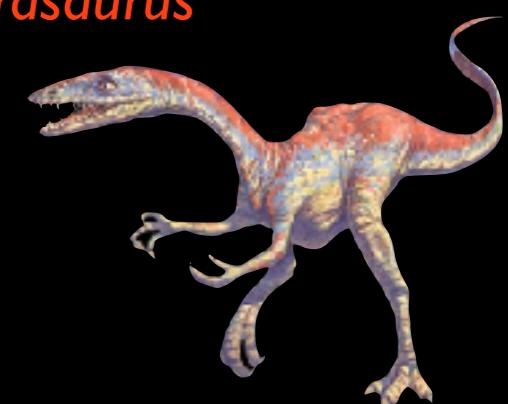
*Pisanosaurus*



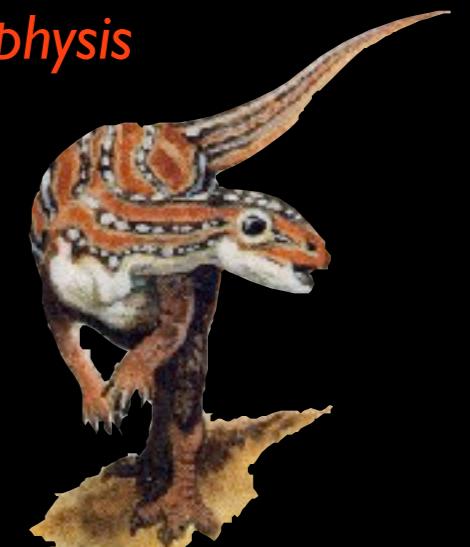
*Eoraptor*



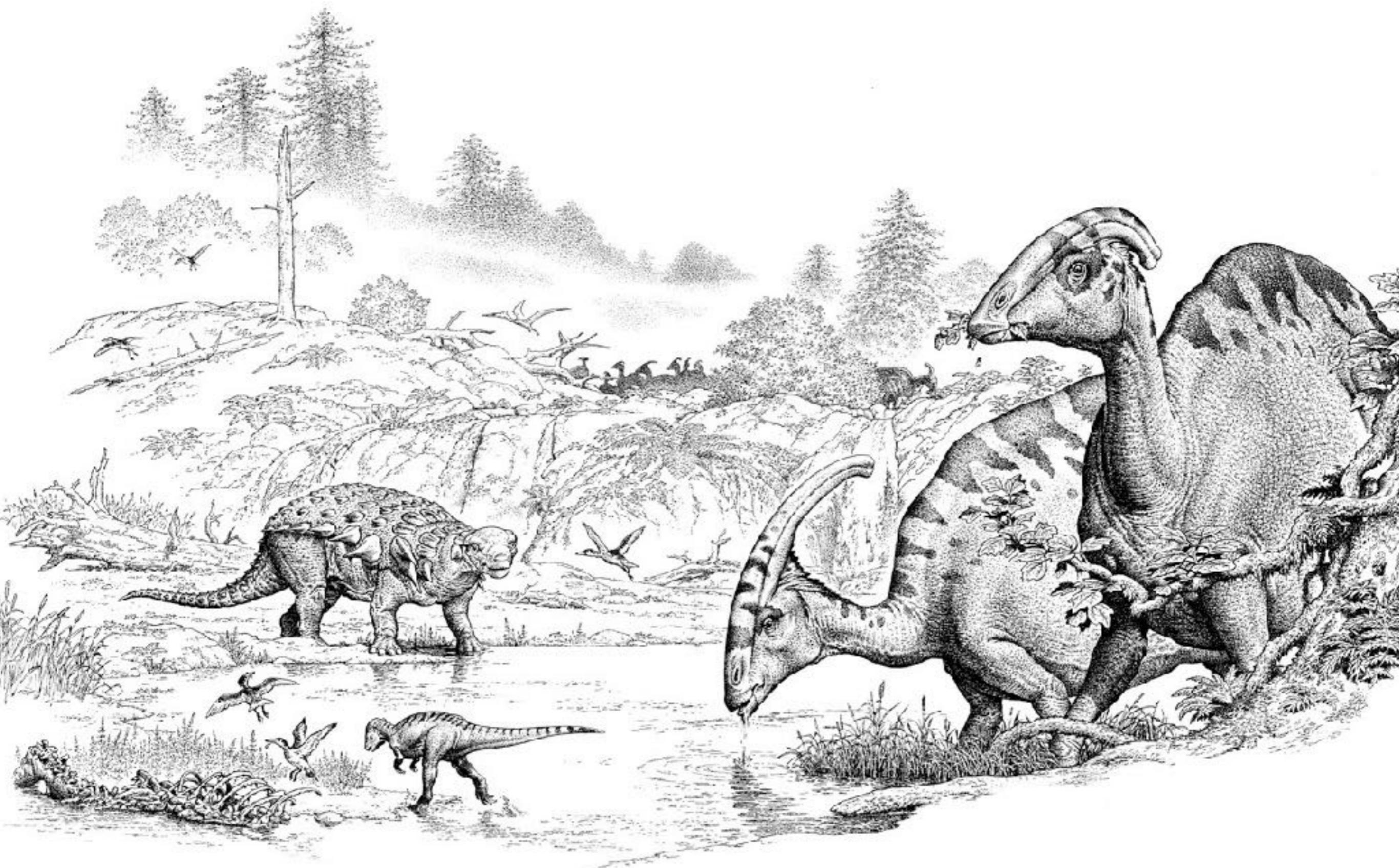
*Herrerasaurus*

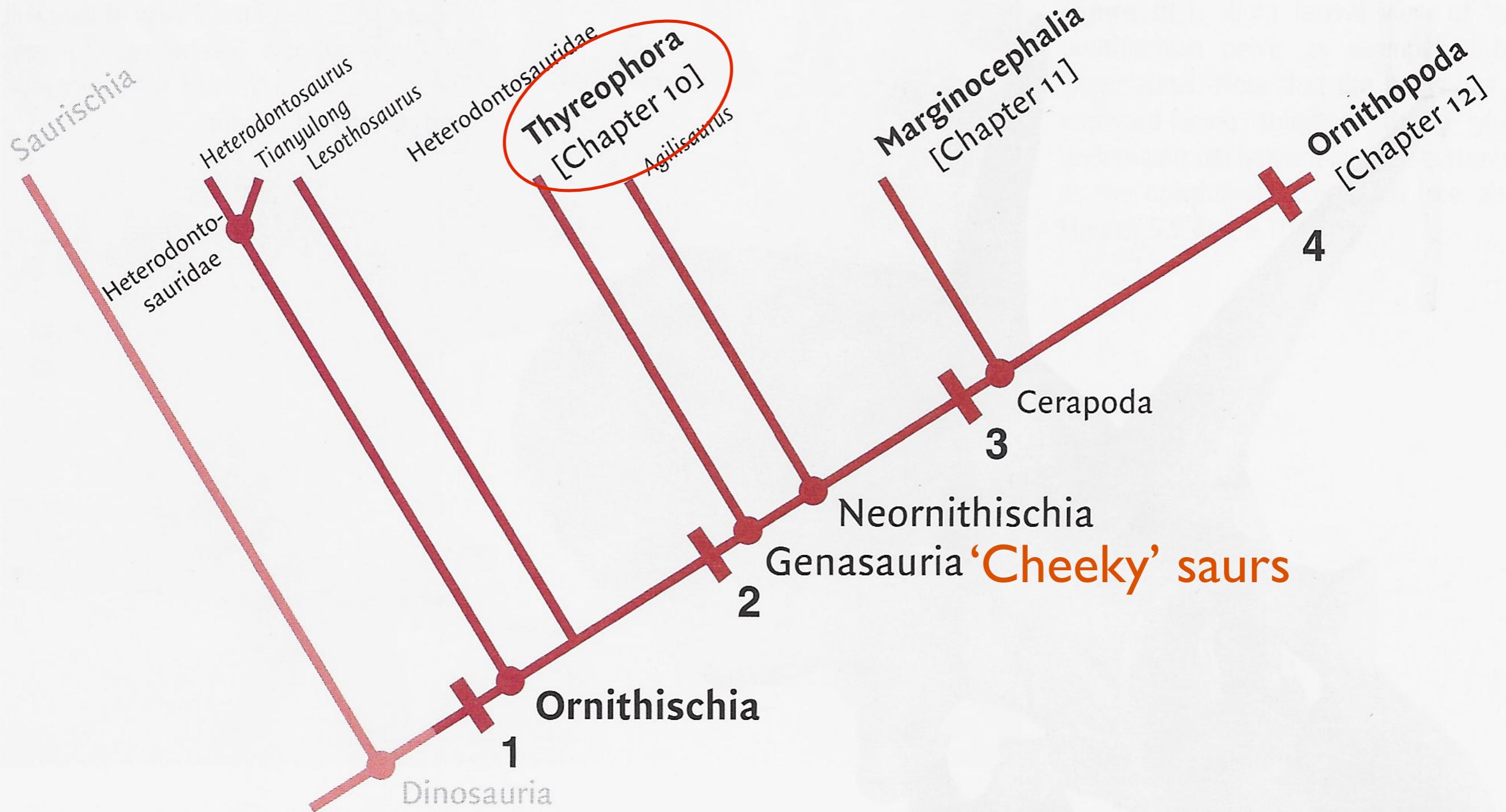


*Coelophysis*



# Ornithischians!





# Genosauria

## Thyreophora

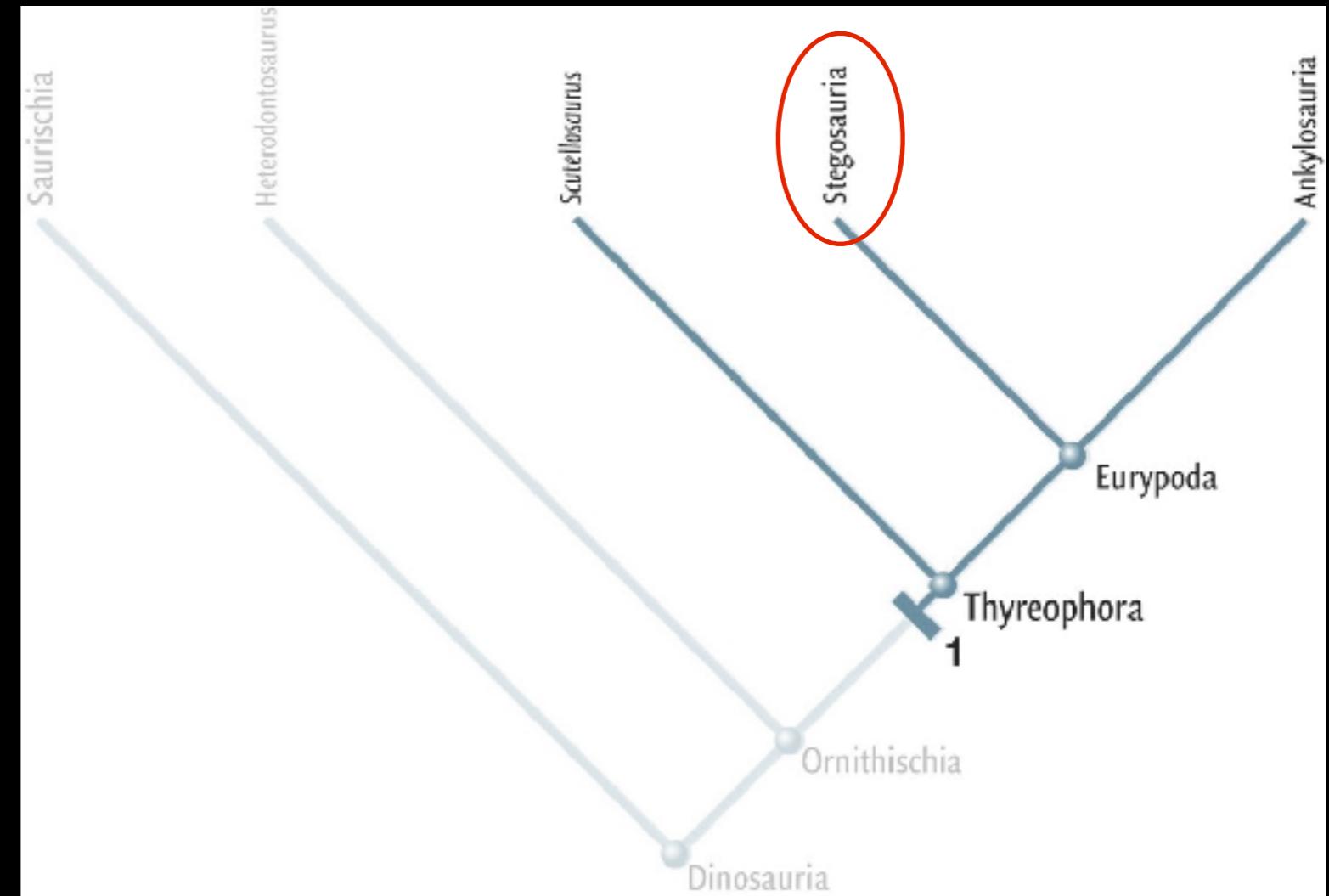
### Stegosauria

*Basal Thyreophorans*

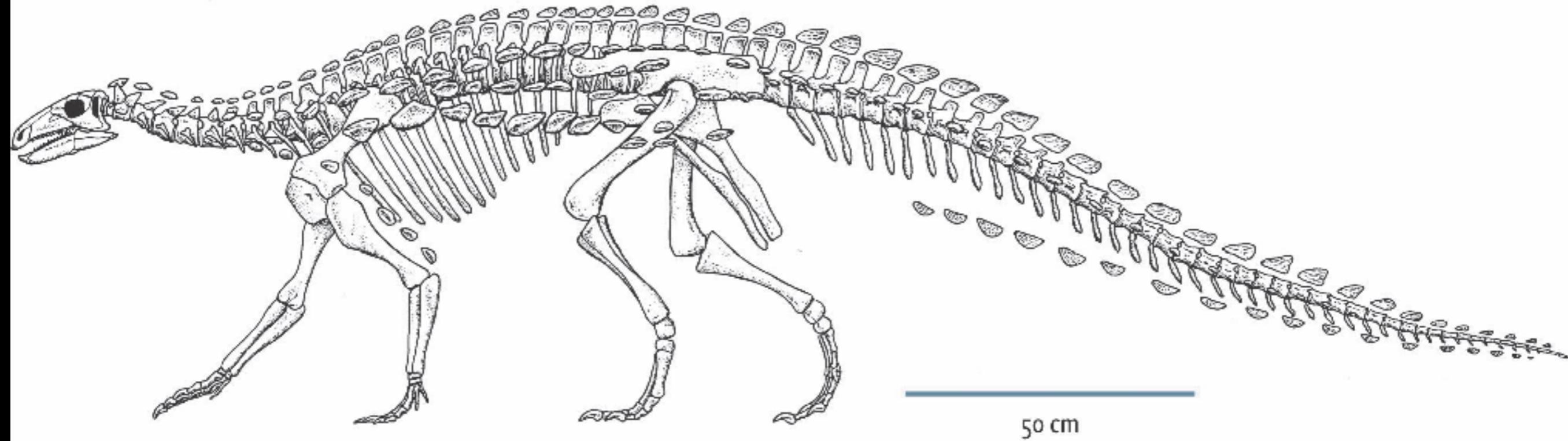
bipedal to quadrupedal  
osteoderms



*Scutellosaurus*  
*4 ft long*  
*Early Jurassic, North America*

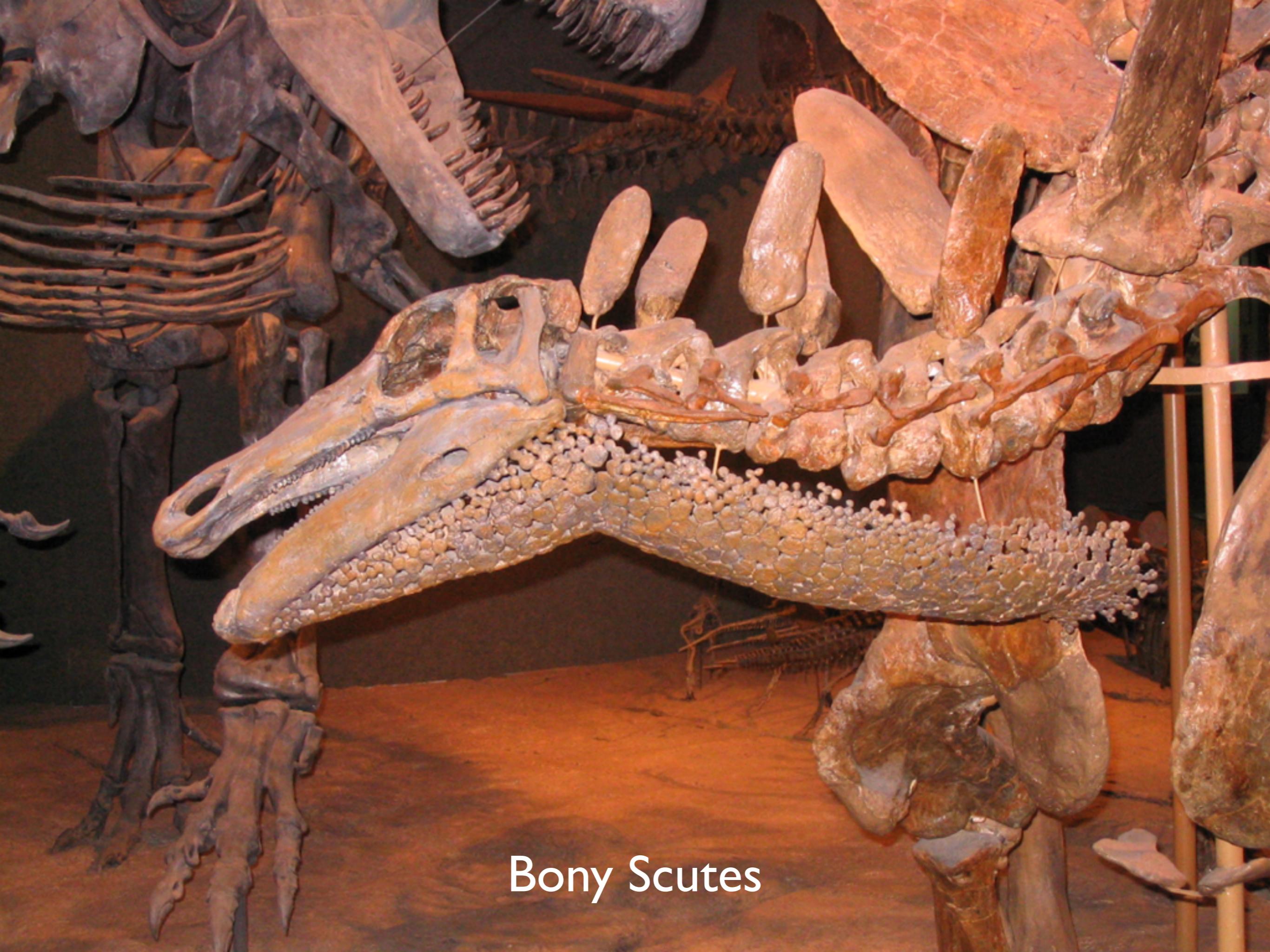


*Scelidosaurus*  
*13 ft long*  
*Early Jurassic, England*



## Bony Scutes (Osteoderms)

*Scelidosaurus*  
13 ft long  
Early Jurassic  
England



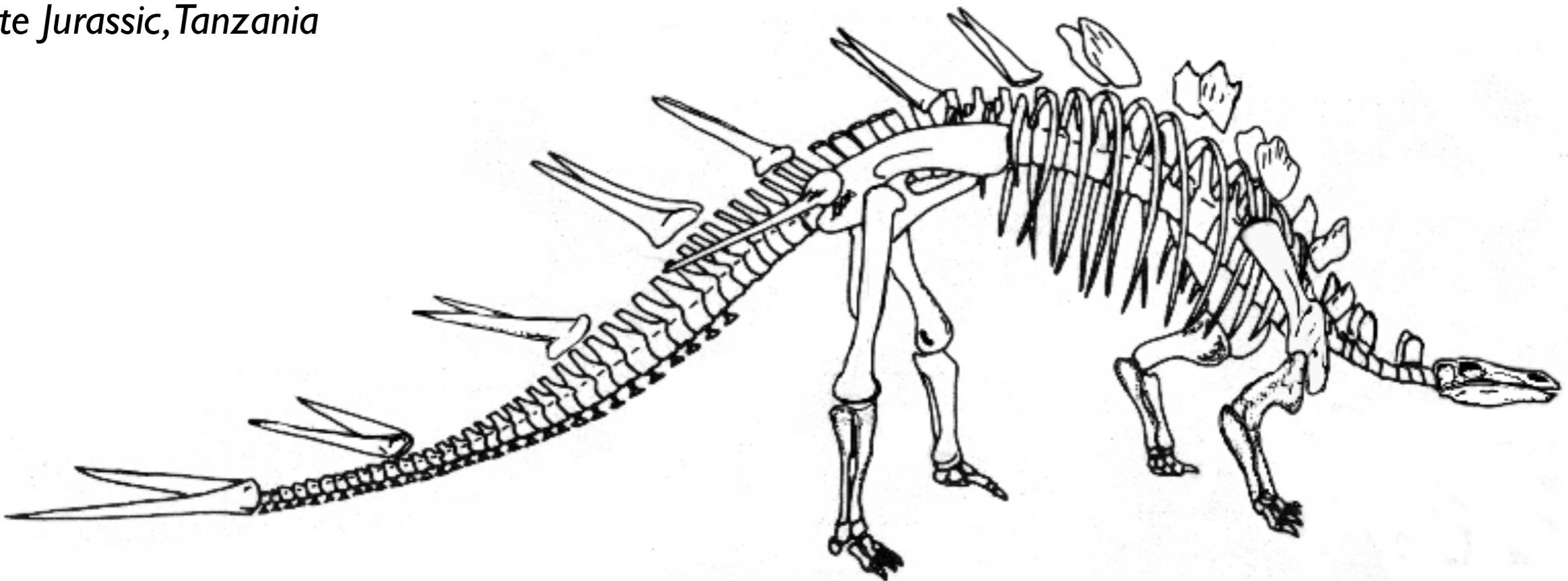
Bony Scutes

# Shared, derived traits of Stegosauria

*Kentrosaurus*

15 ft long

Late Jurassic, Tanzania



- Loss of ossified tendons
- Rows of osteoderms over body
- Plates/Spines
- Hooved Feet
- Tall thoracic vertebrae

# *Basal Stegosauria*

*Parascapular spines*

*Thagomizer*

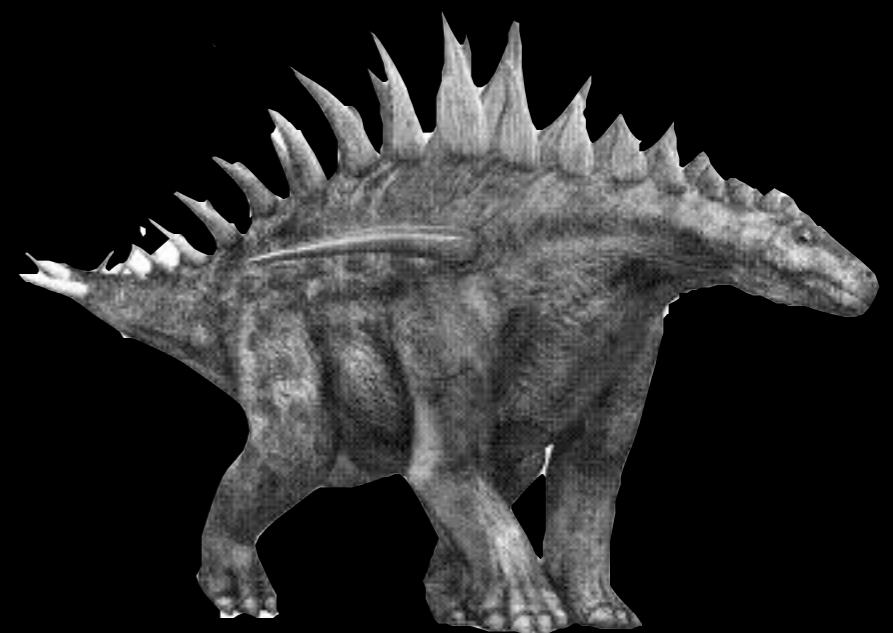
*Plates*

*Osteoderms*

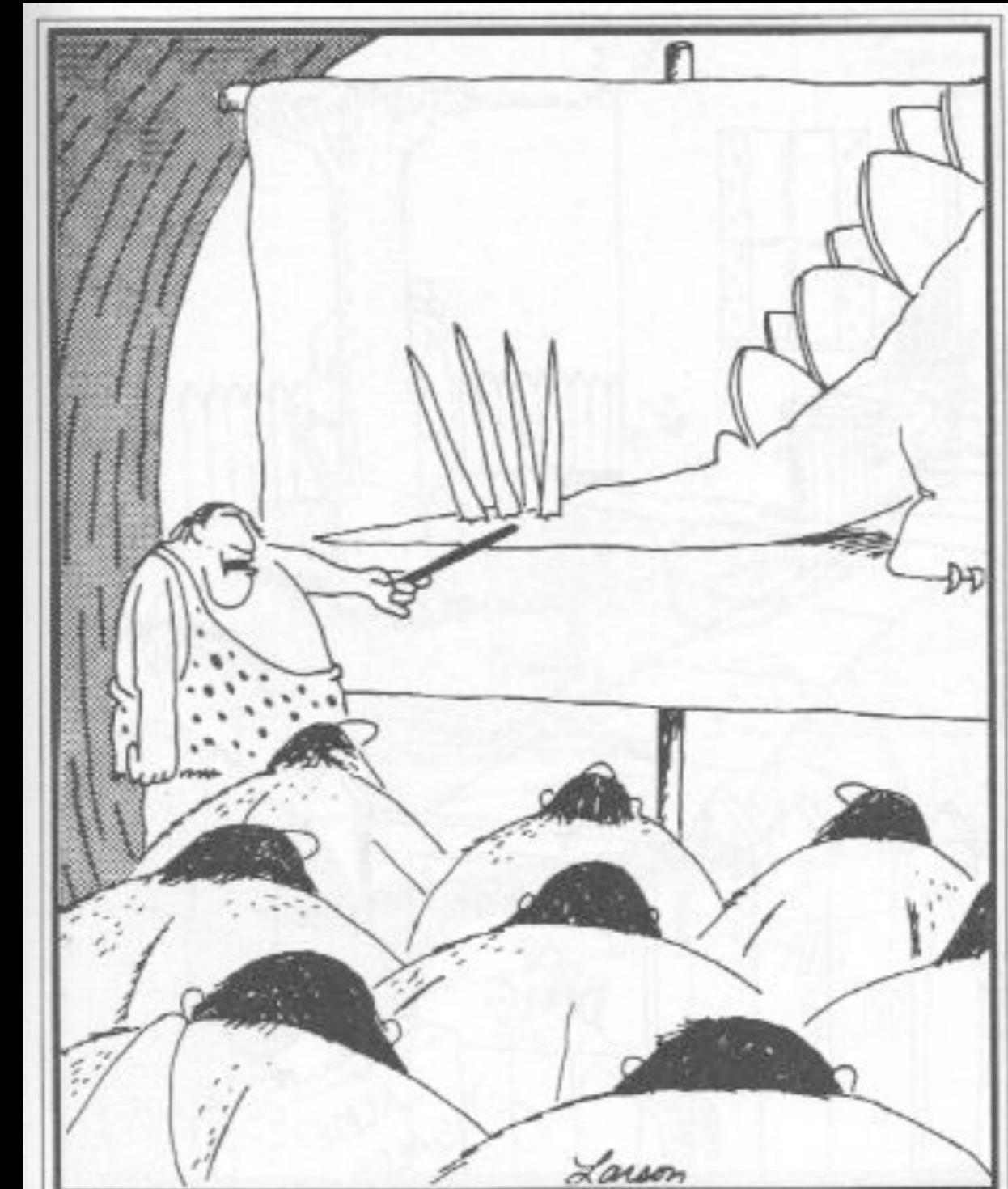


*Huayangosaurus*

15 ft long



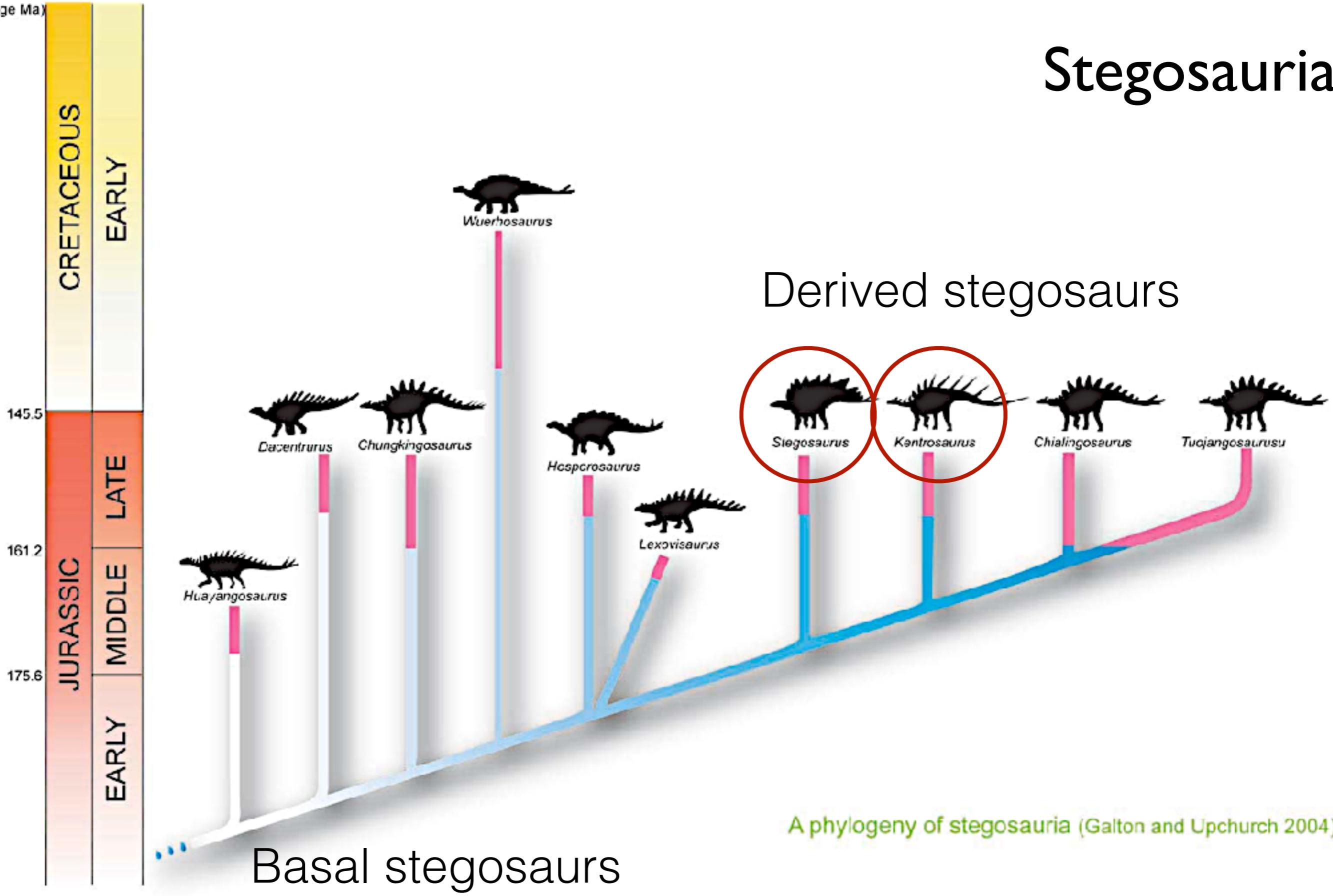
# Dermal Armour? The Thagomizer

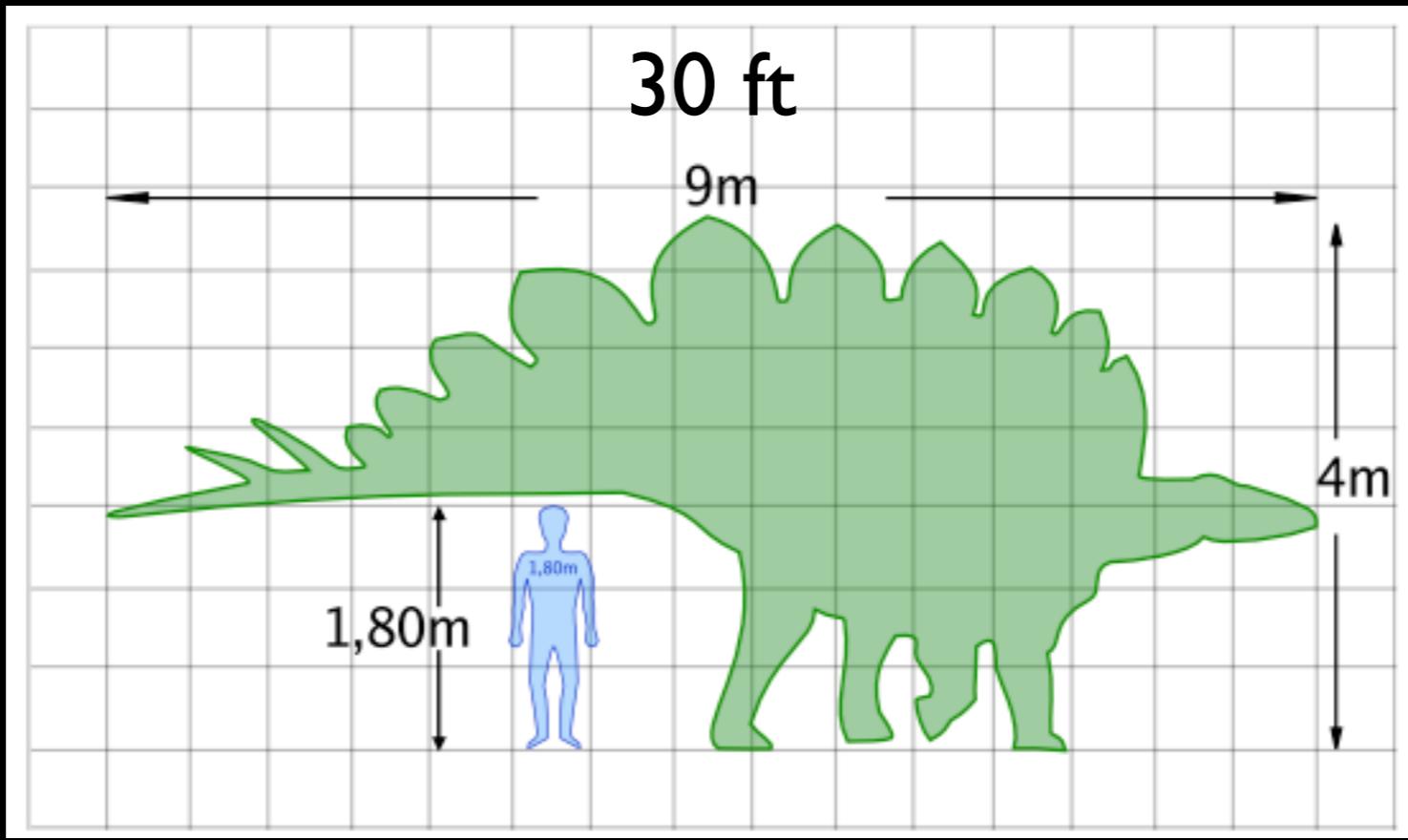
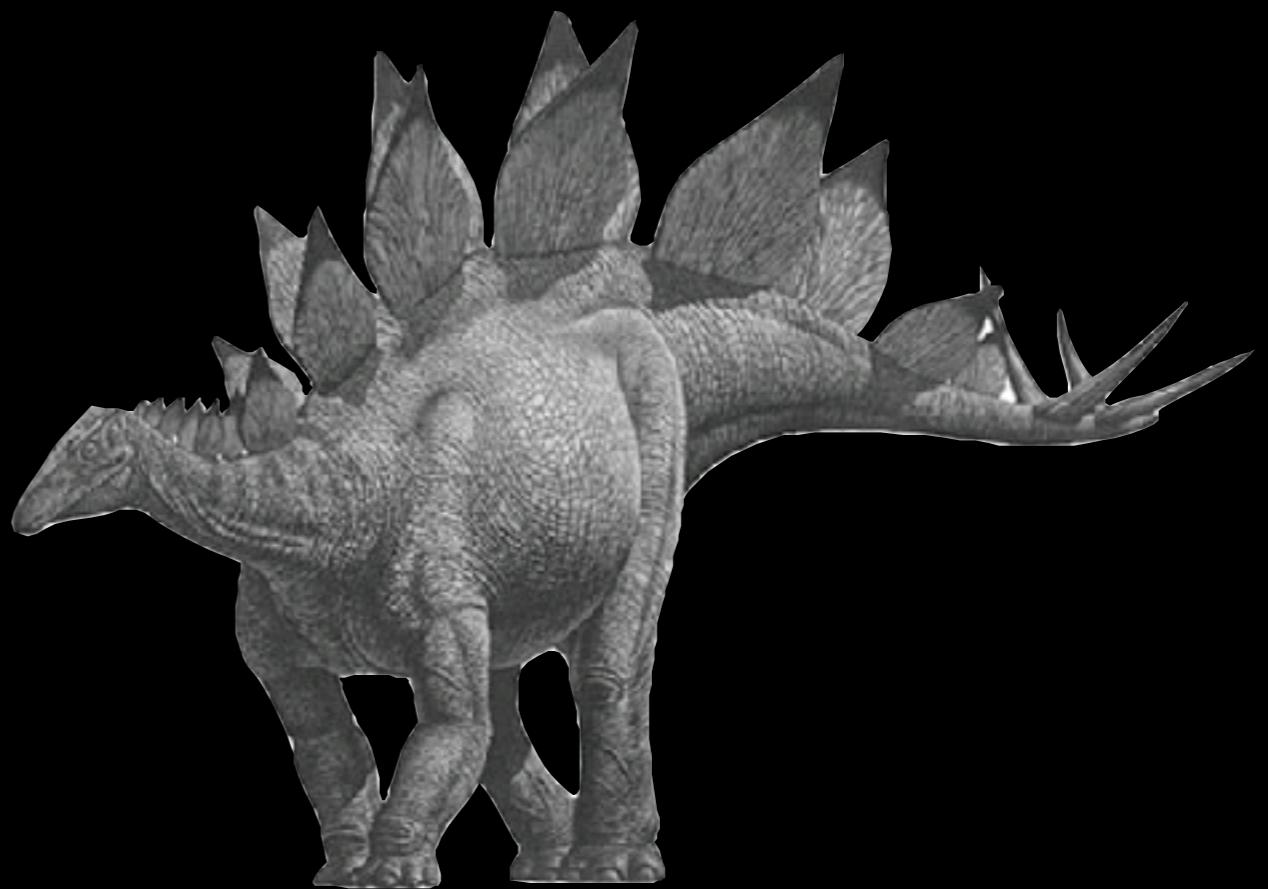
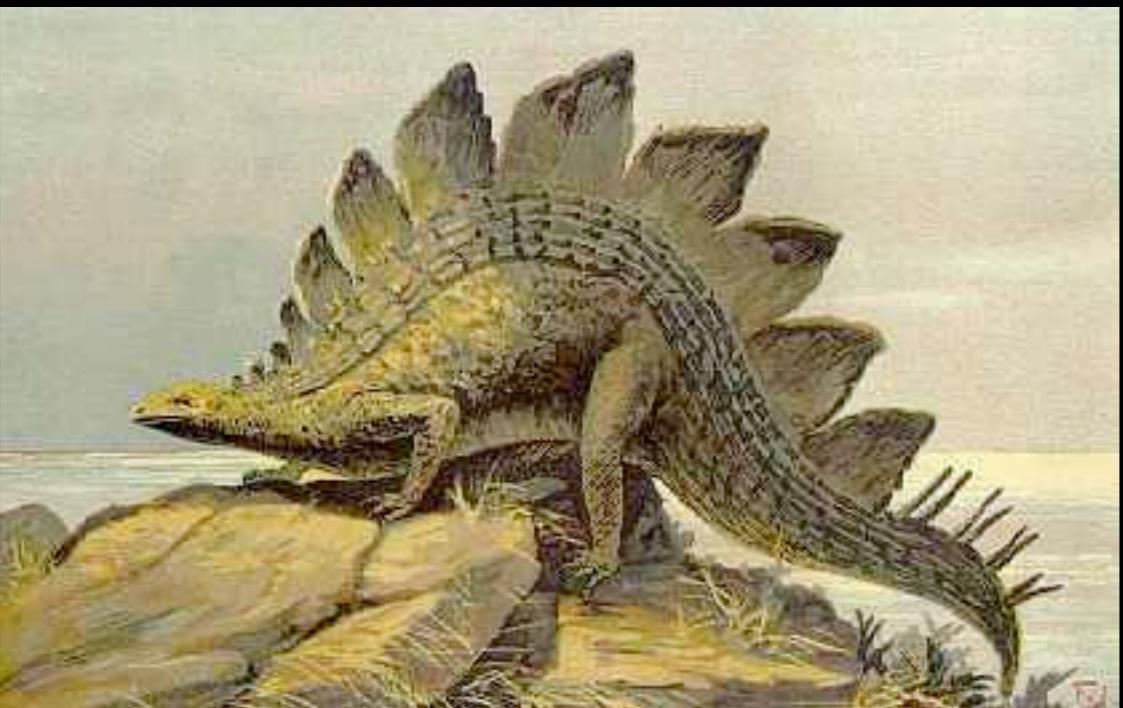


"Now this end is called the thagomizer . . . after the  
late Thag Simmons."

(Age Ma)

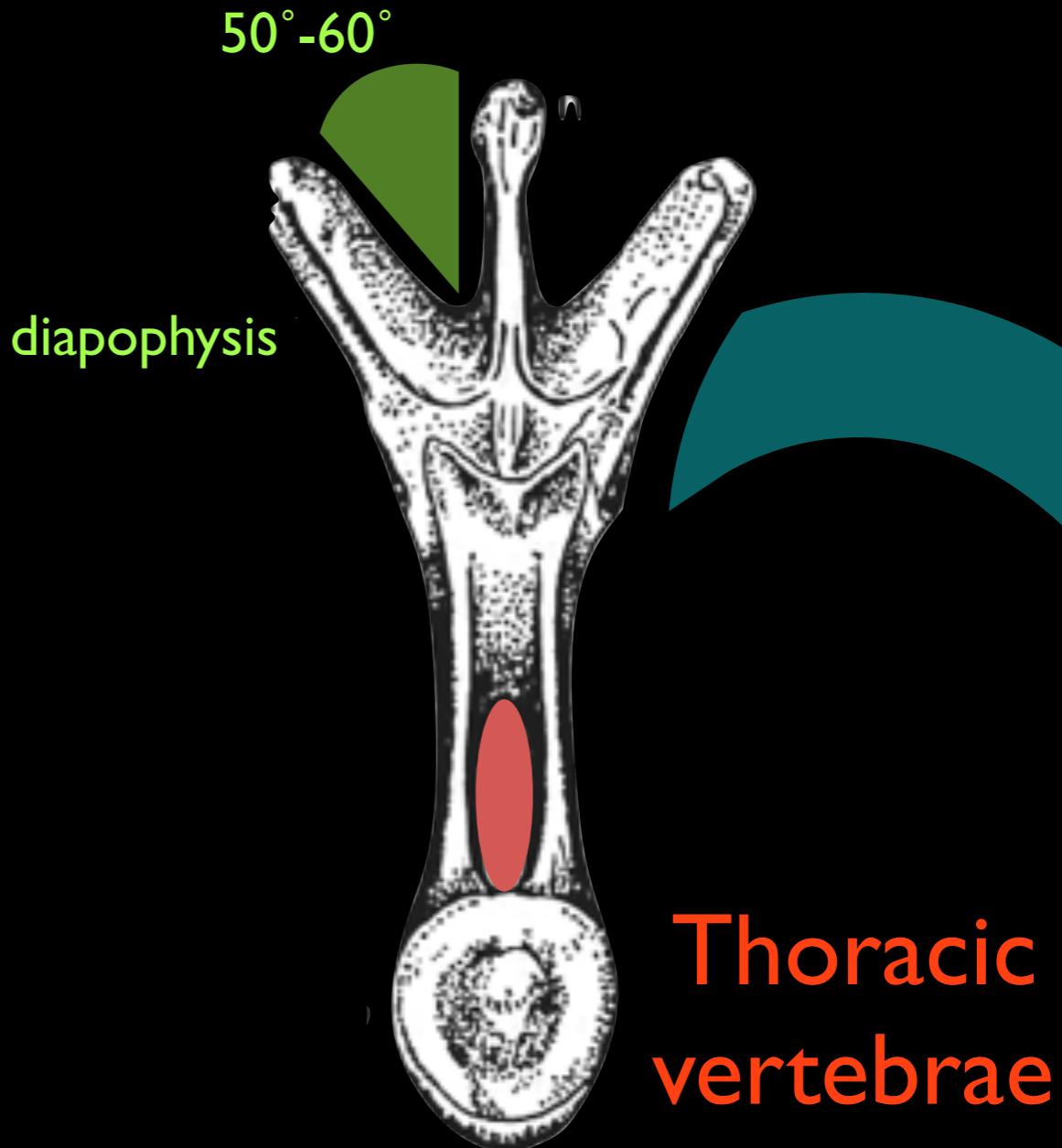
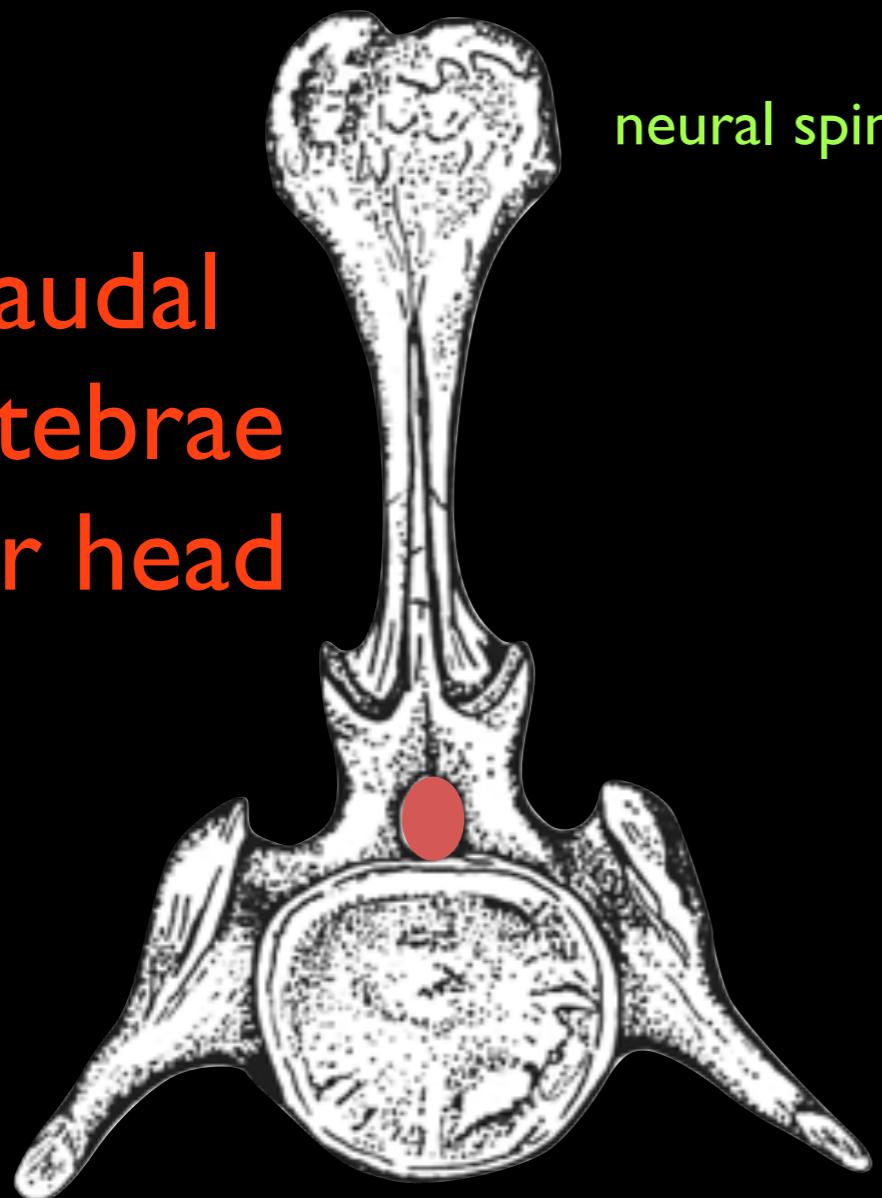
# Stegosauria





Lost World Clip  
22:15-

Caudal  
vertebrae  
near head



*Expansion of gut cavity provided by dorsally elongated vertebral centrum*

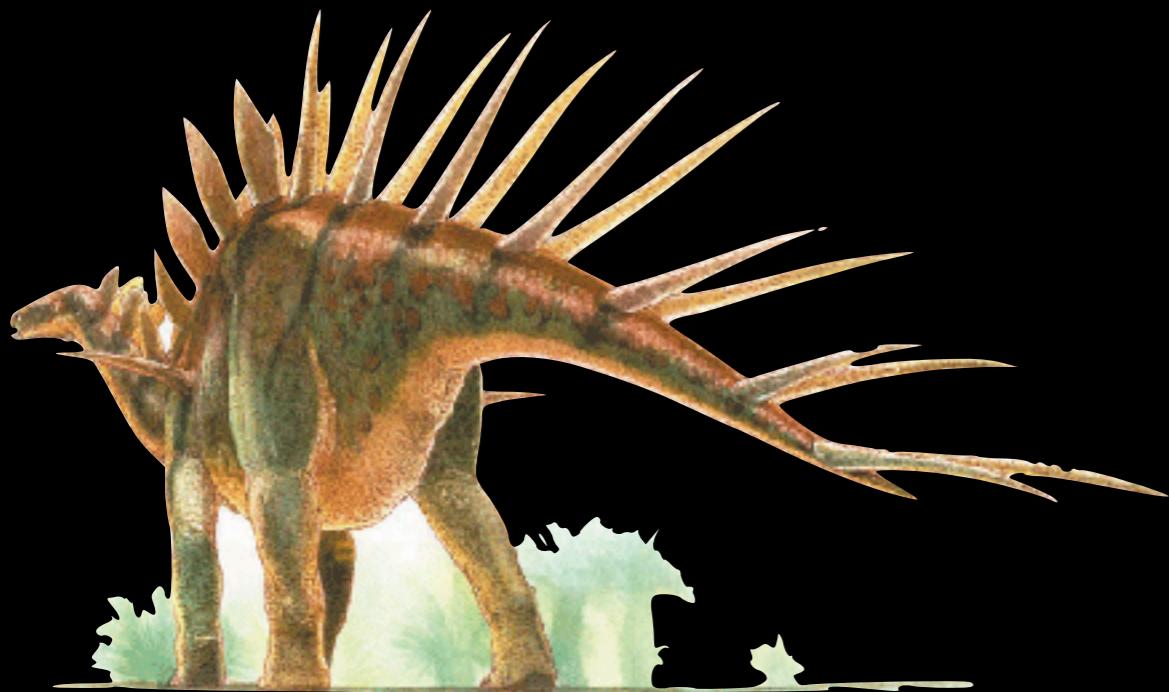
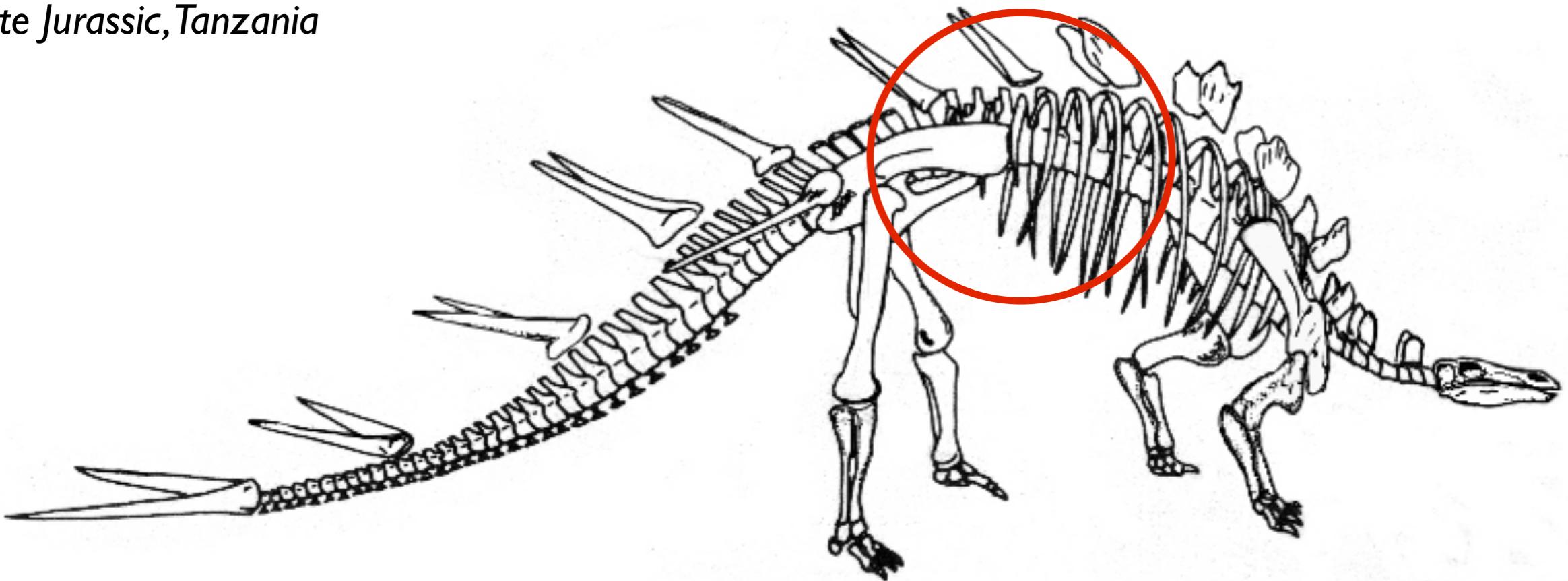
*This also provided support for osteodorms and for the hip, as the femur was elevated above the shoulders and supported most of the weight*

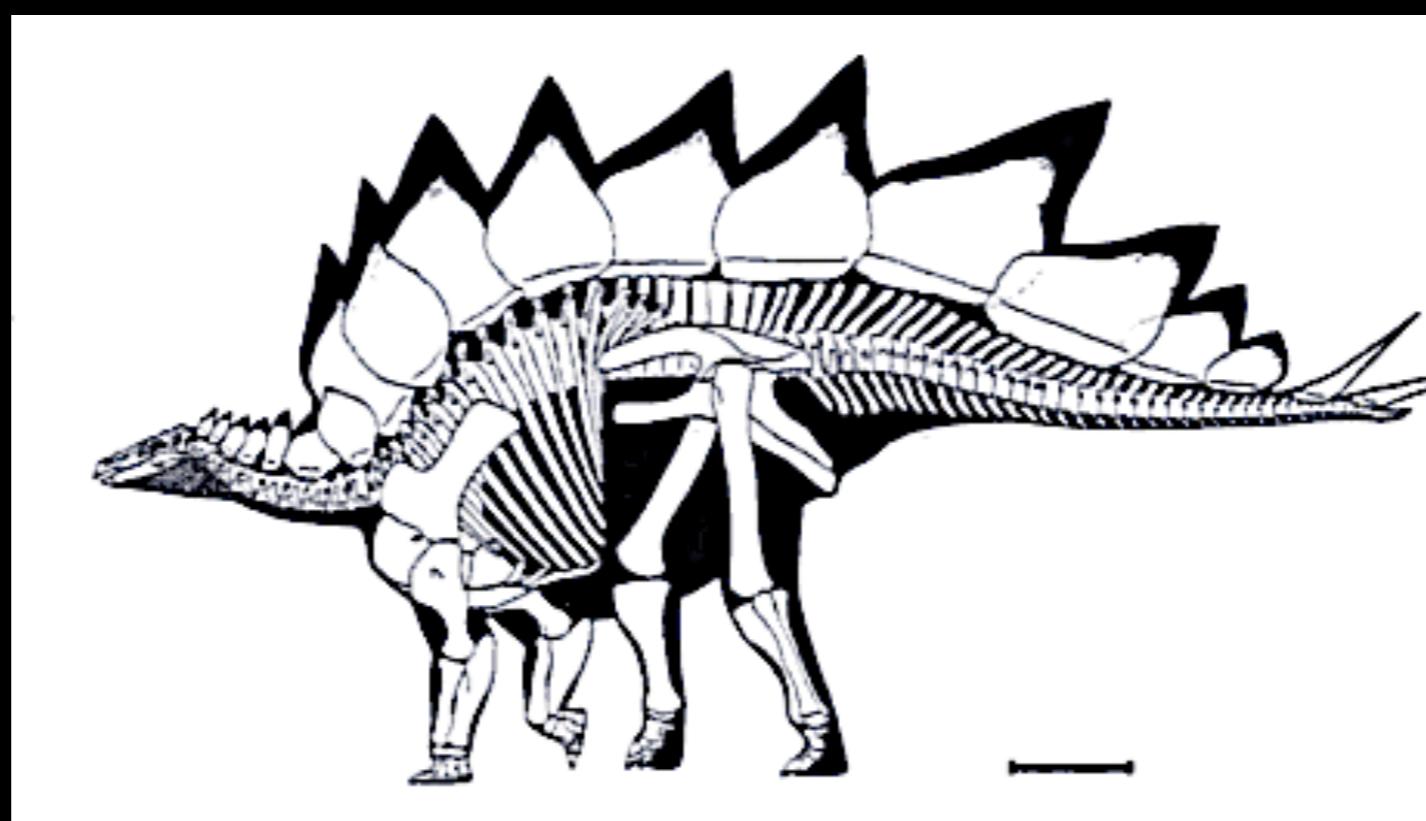
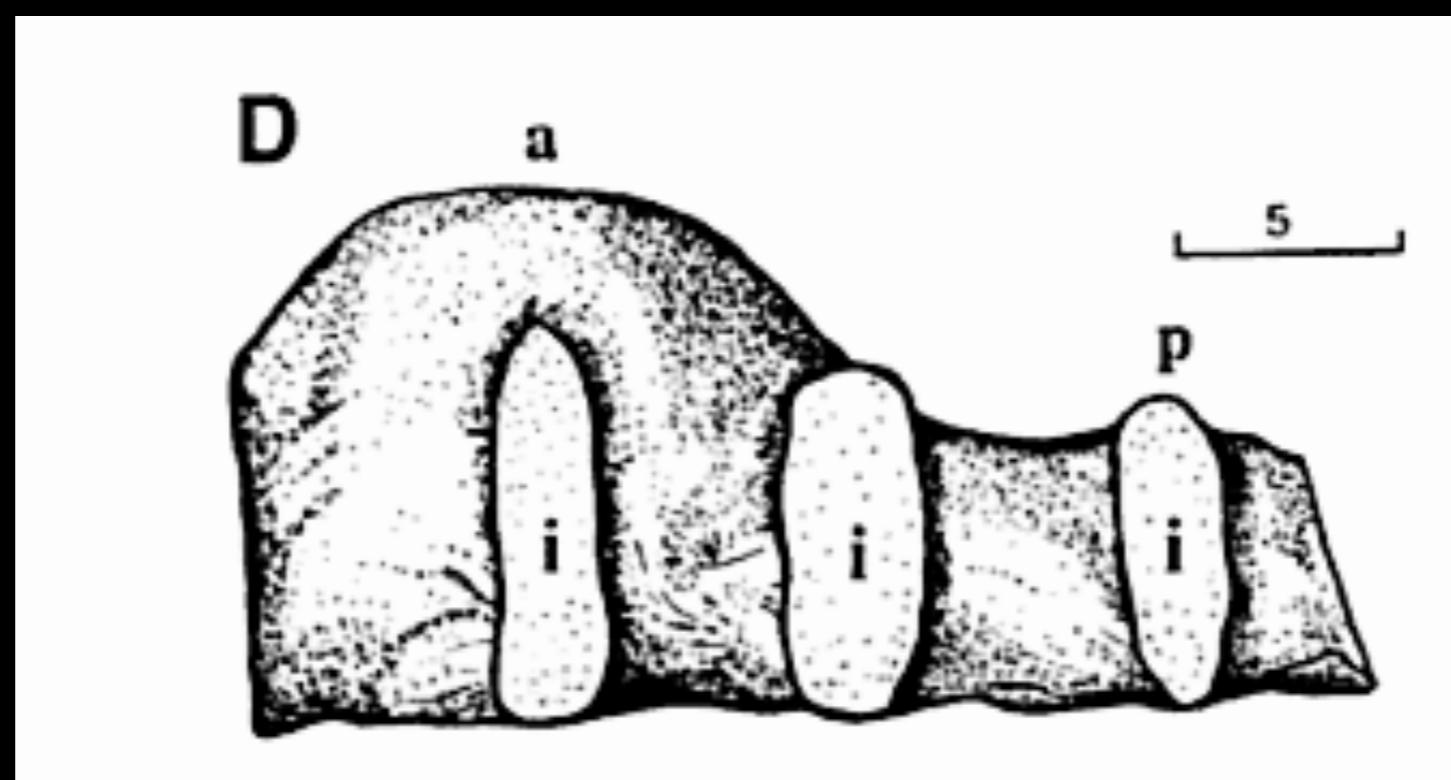
# Shared, derived traits of Stegosauria

*Kentrosaurus*

15 ft long

Late Jurassic, Tanzania





# Diet



Stegosaurus



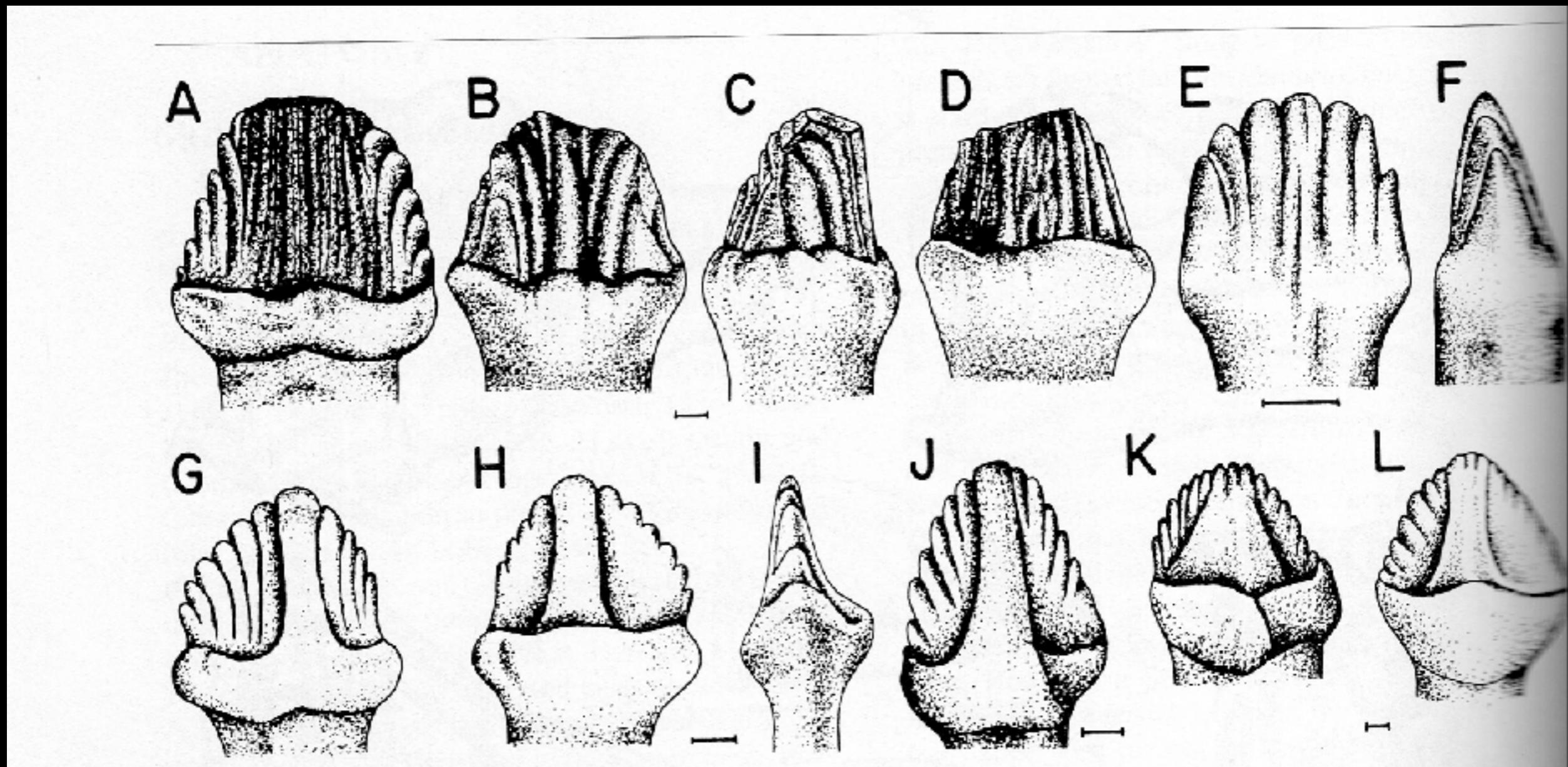
*Inset tooth row: implies cheeks ~ it's a Genosaur!*

*Low coronoid process*

*Teeth are small, simple, triangular*

*Spaces btw teeth... not an efficient grinder*

*Teeth lack regular worn surfaces*



*Teeth of stegosauran dinosaurs*

-basal ornithischian (as opposed to derived ornithischian)

-a small cry from carnivorous ancestors



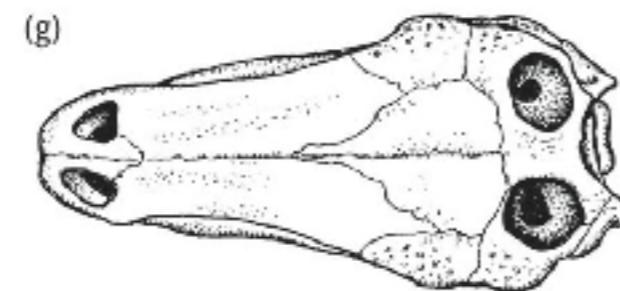
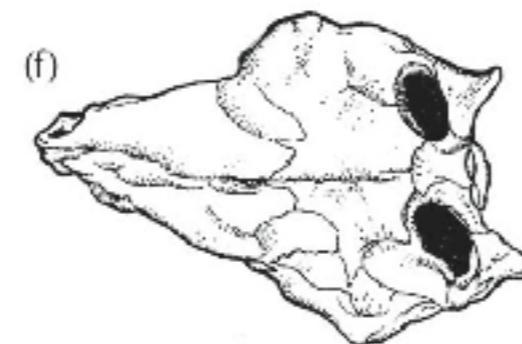
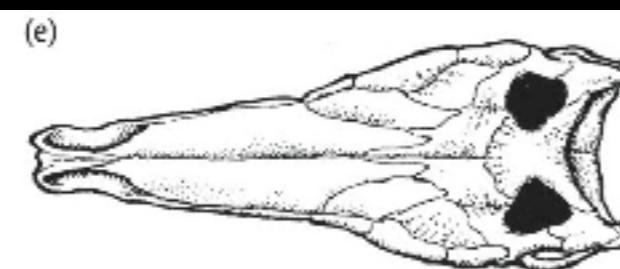
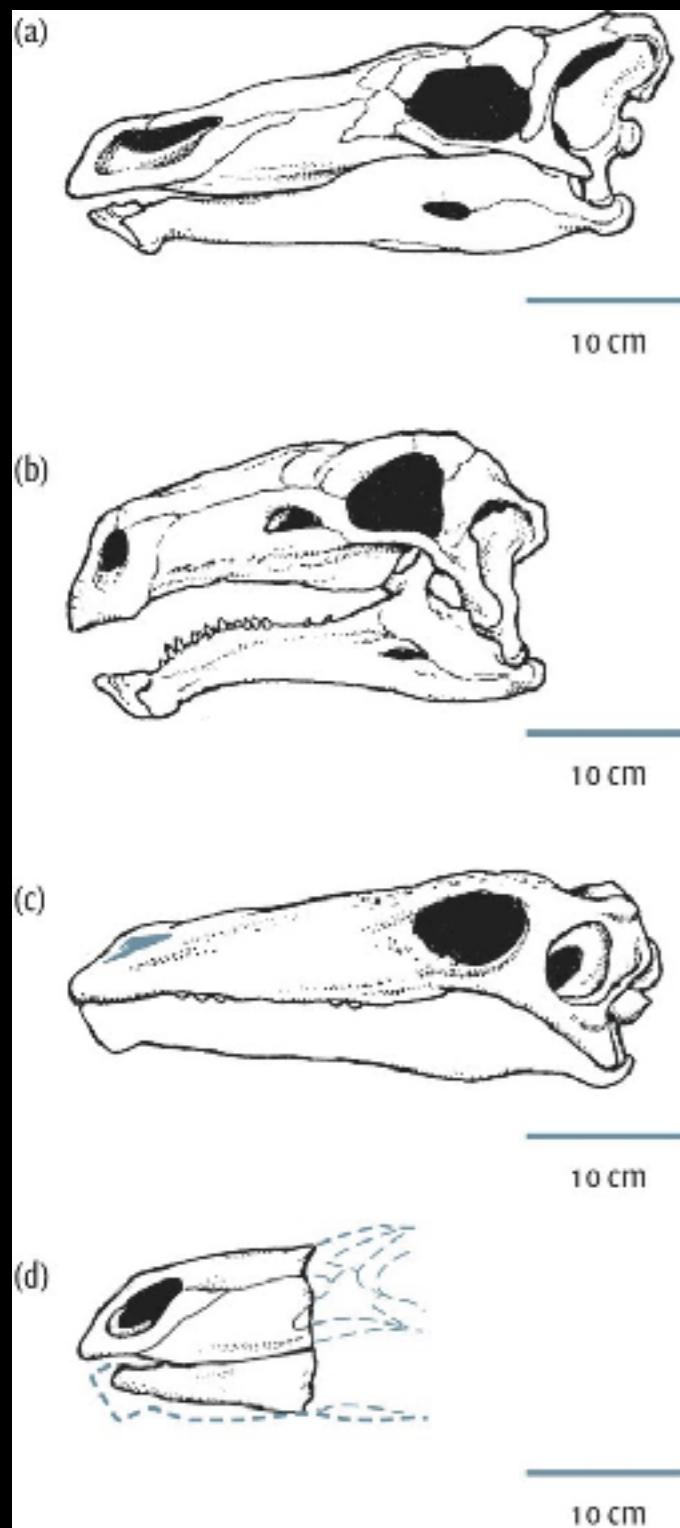
*Small modifications*

# Diet



*The story gets stranger yet...  
If they didn't chew, maybe they processed it all in their gut.  
Typically, you find gastrolithes with dinosaurs that process their  
food this way.... but no gastrolithes  
So what did they eat?*

# Diet



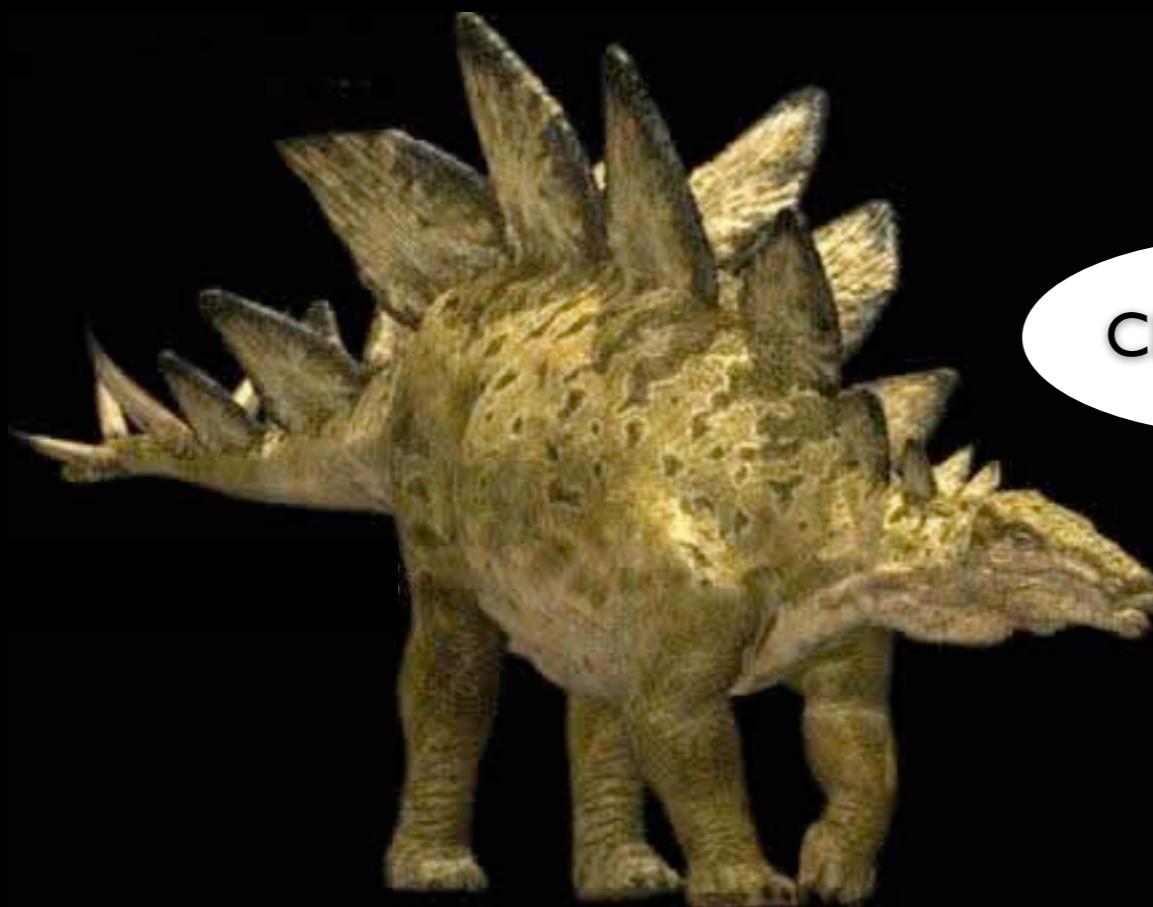
Narrow jaws => selective feeding  
Wide jaws => generalist feeding



'Black' Rhino

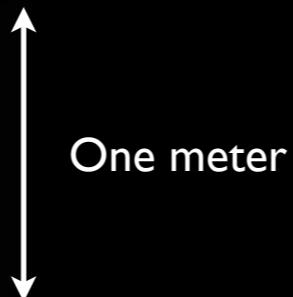
'White' Rhino

# Diet



*Stegosaurus*

Clever girl...



*Kanyesaurus westicus*



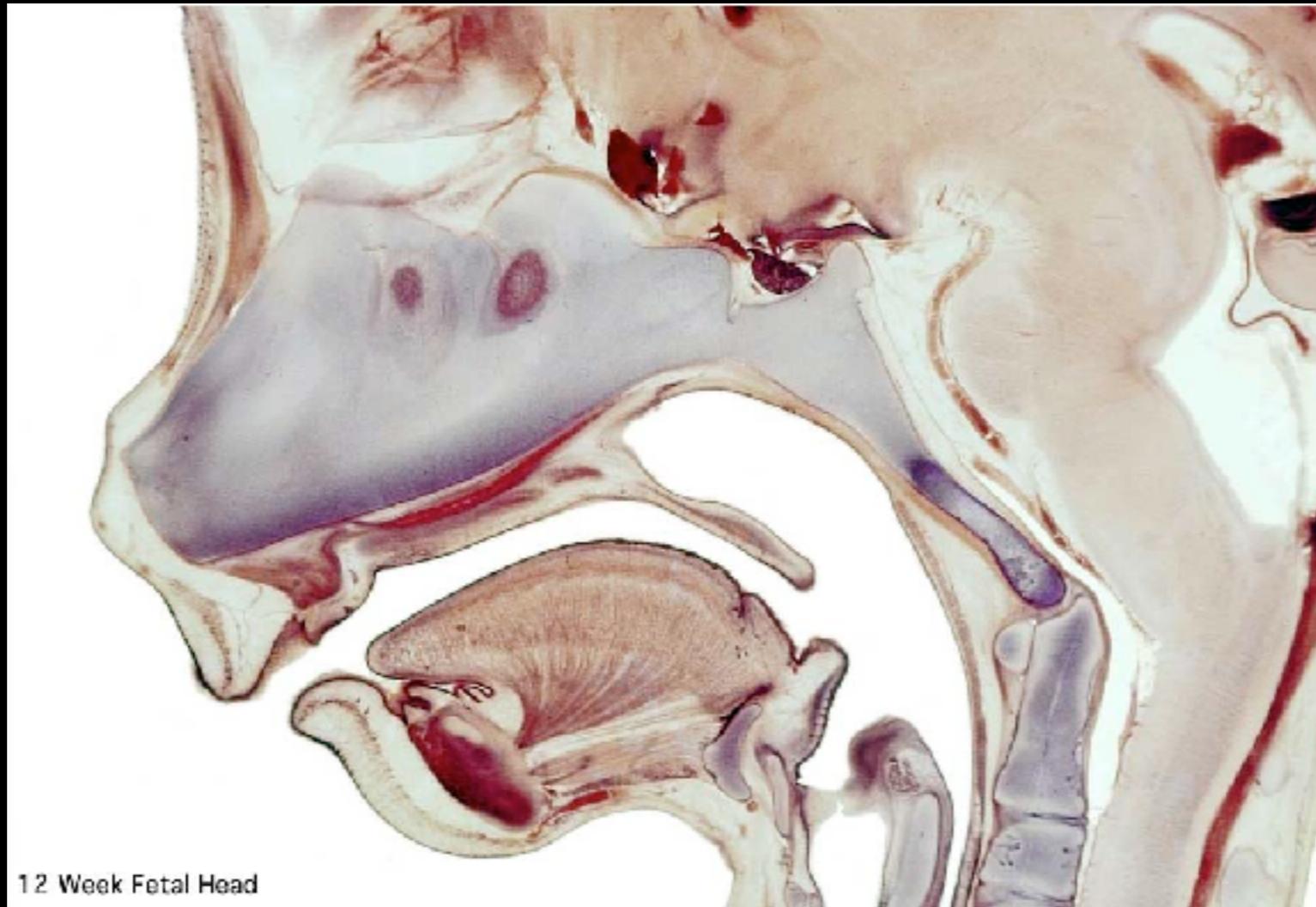
*Likely low-browsers*

*Ferns, cycads, herbaceous gymnosperms*

*This is just based on 'height'*

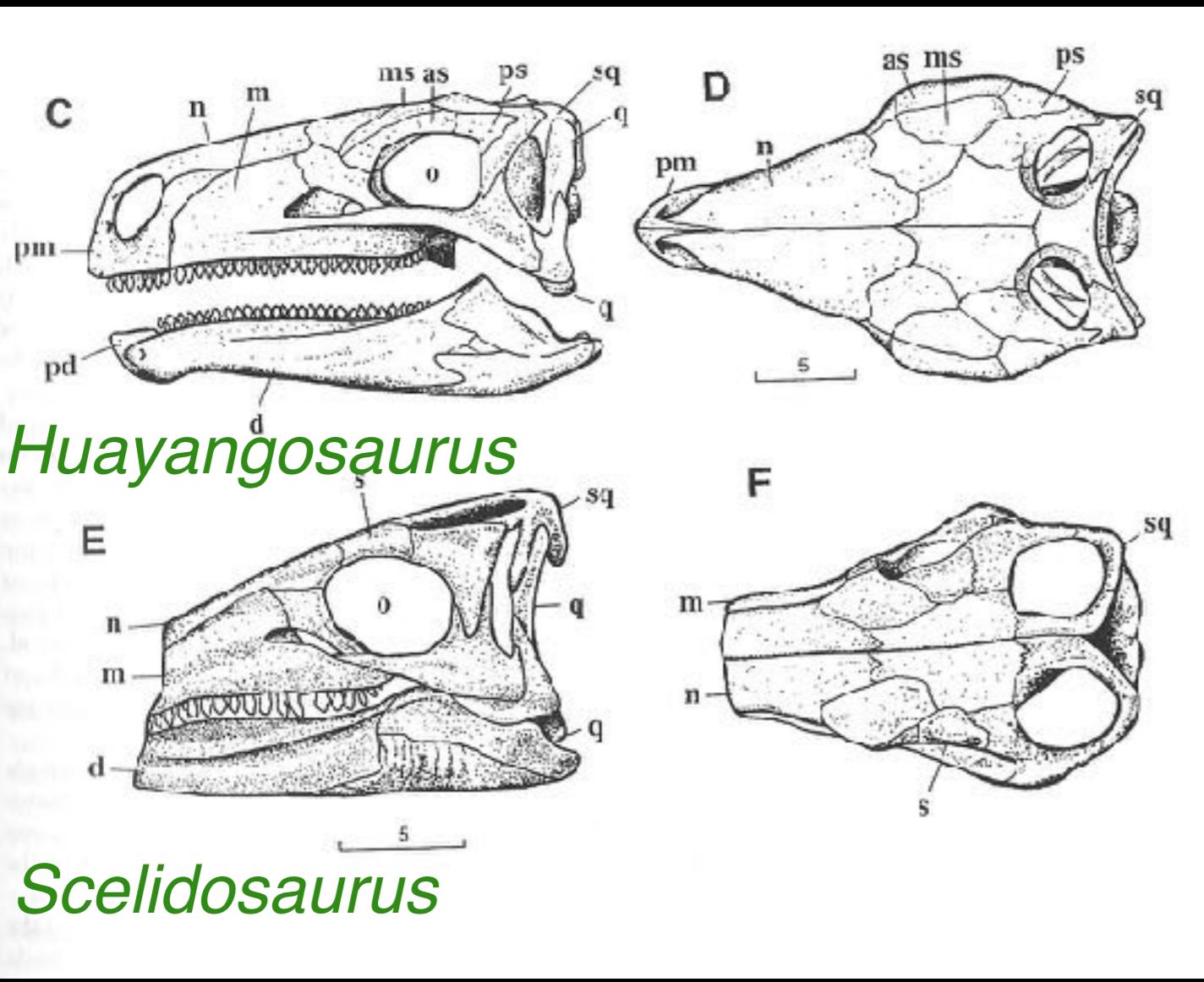


## Medial Plane

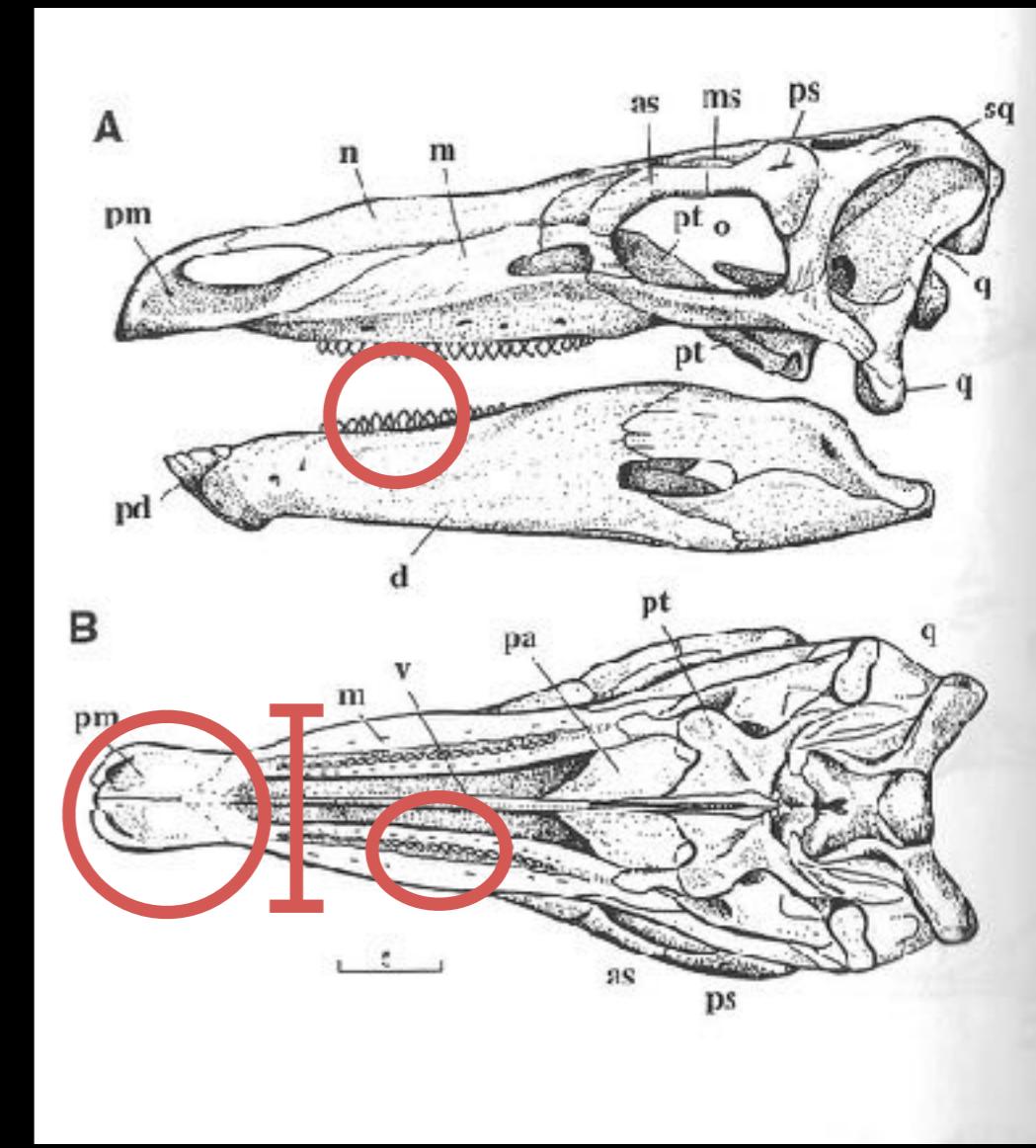


12 Week Fetal Head

*Median keel along the length of the palate  
probably supported a soft secondary palate; may  
have separated the dorsal nasal passages from the  
mouth- **breathe while you chew!***

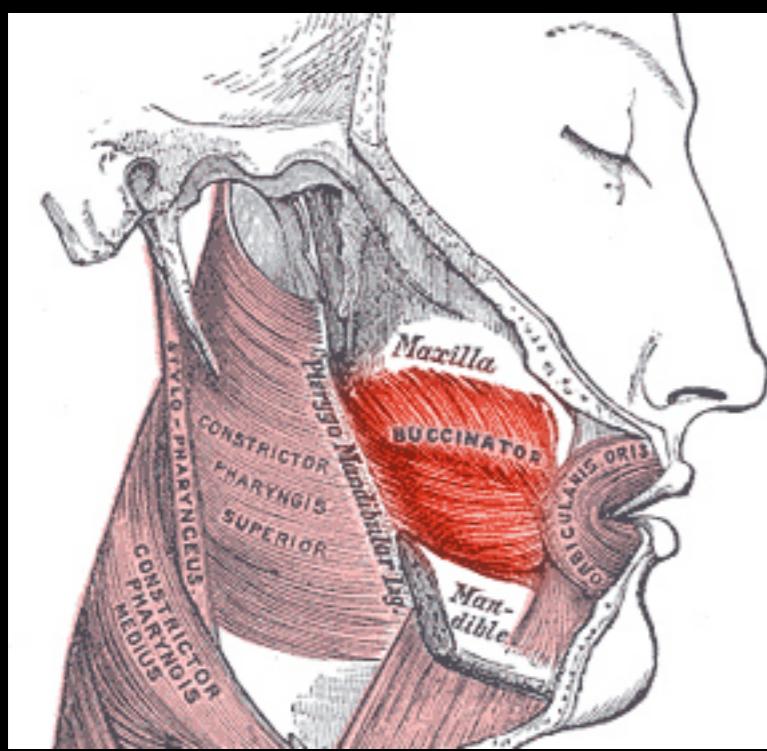


# *Huayangosaurus*



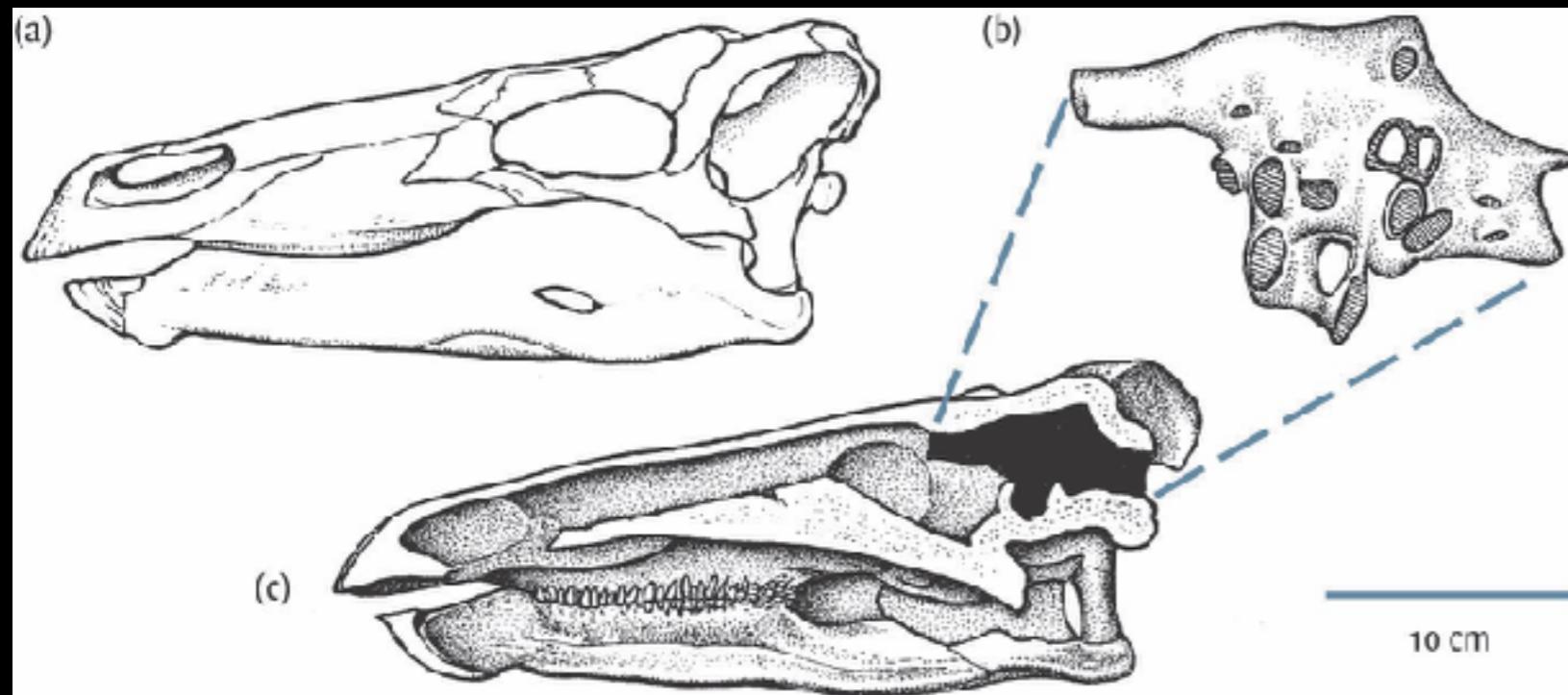
# *Scelidosaurus*

# *Stegosaurus*



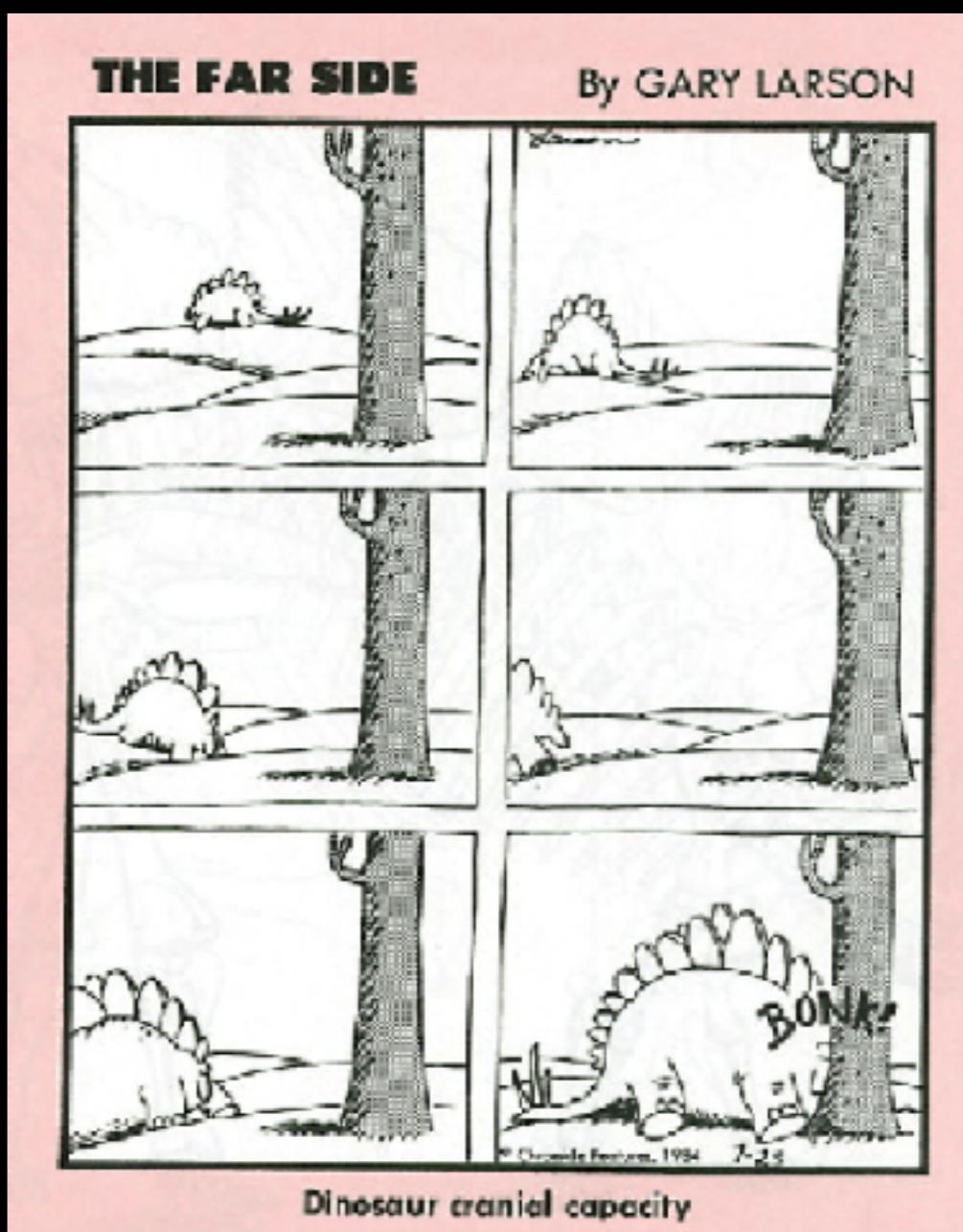
Cheeks:  
No reptile has ever had a ‘buccinator’ muscle  
Answer: highly flexible tongue

# Brains

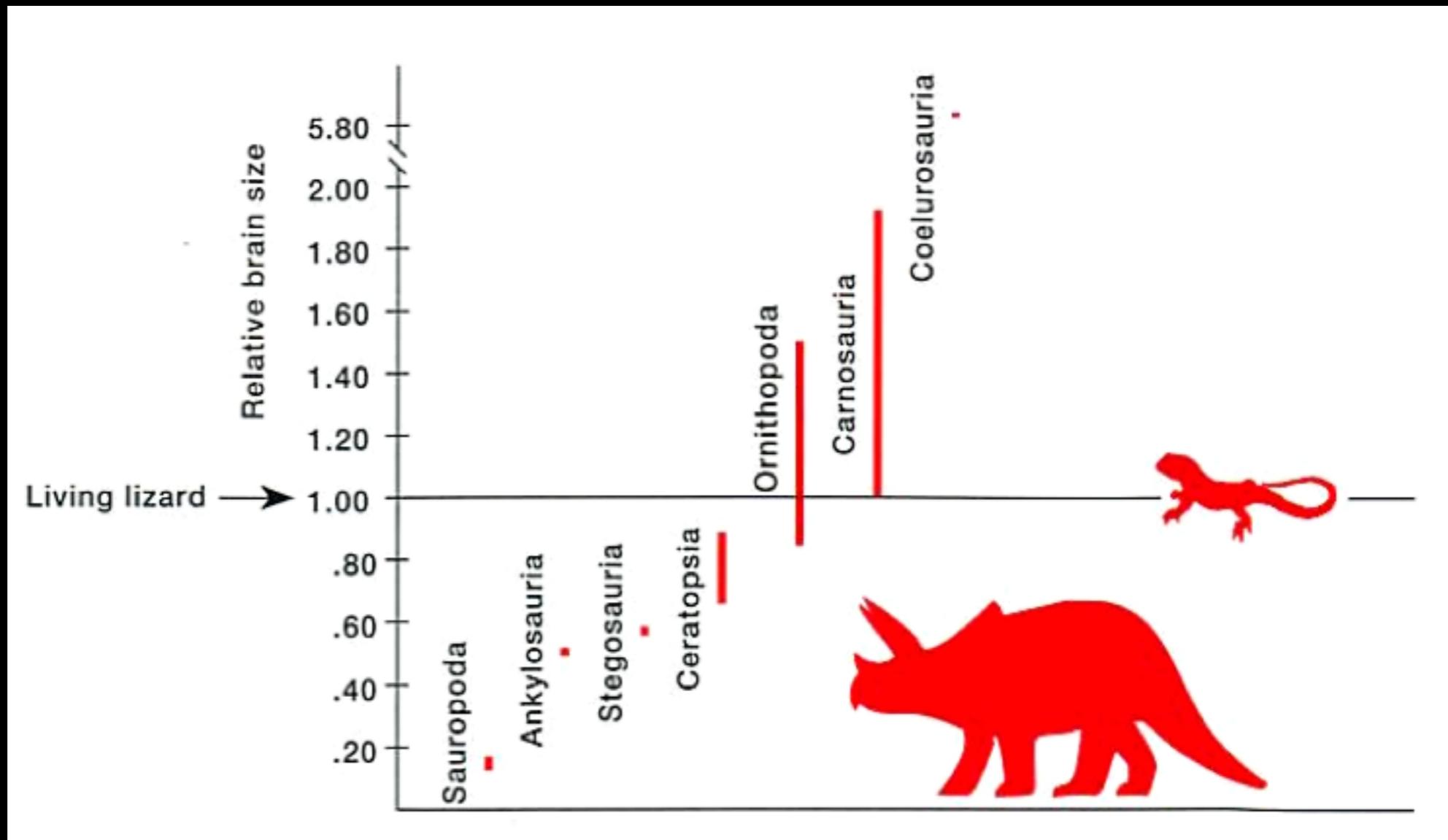


*0.001% of stegosaur body weight*

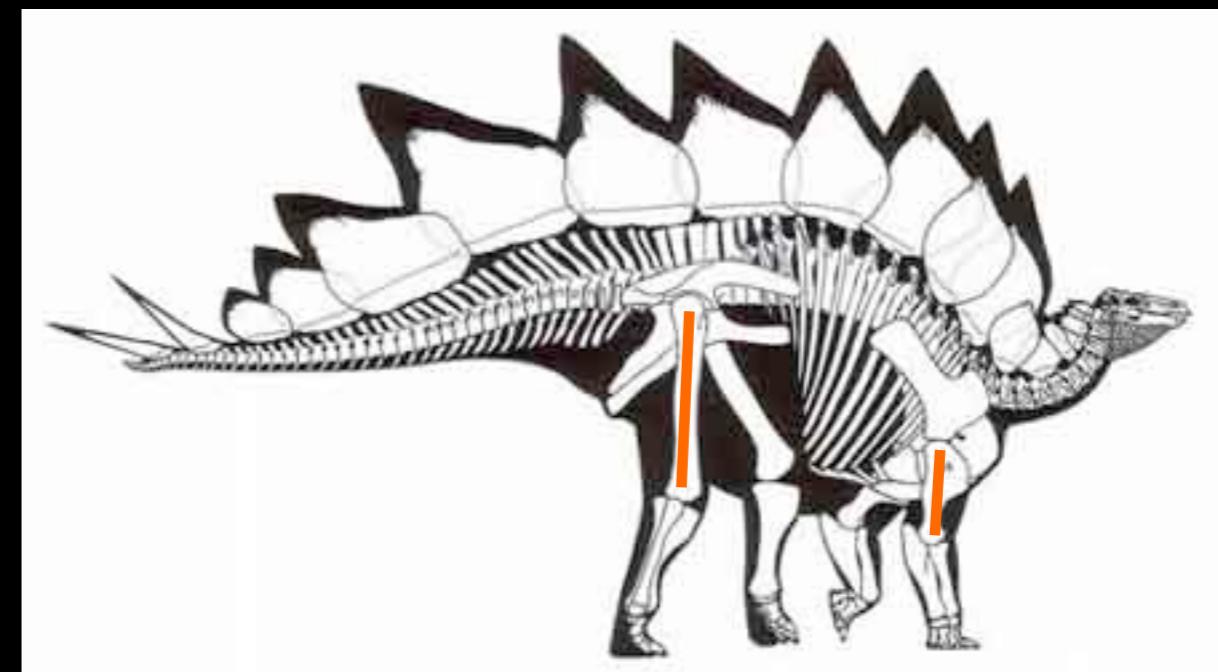
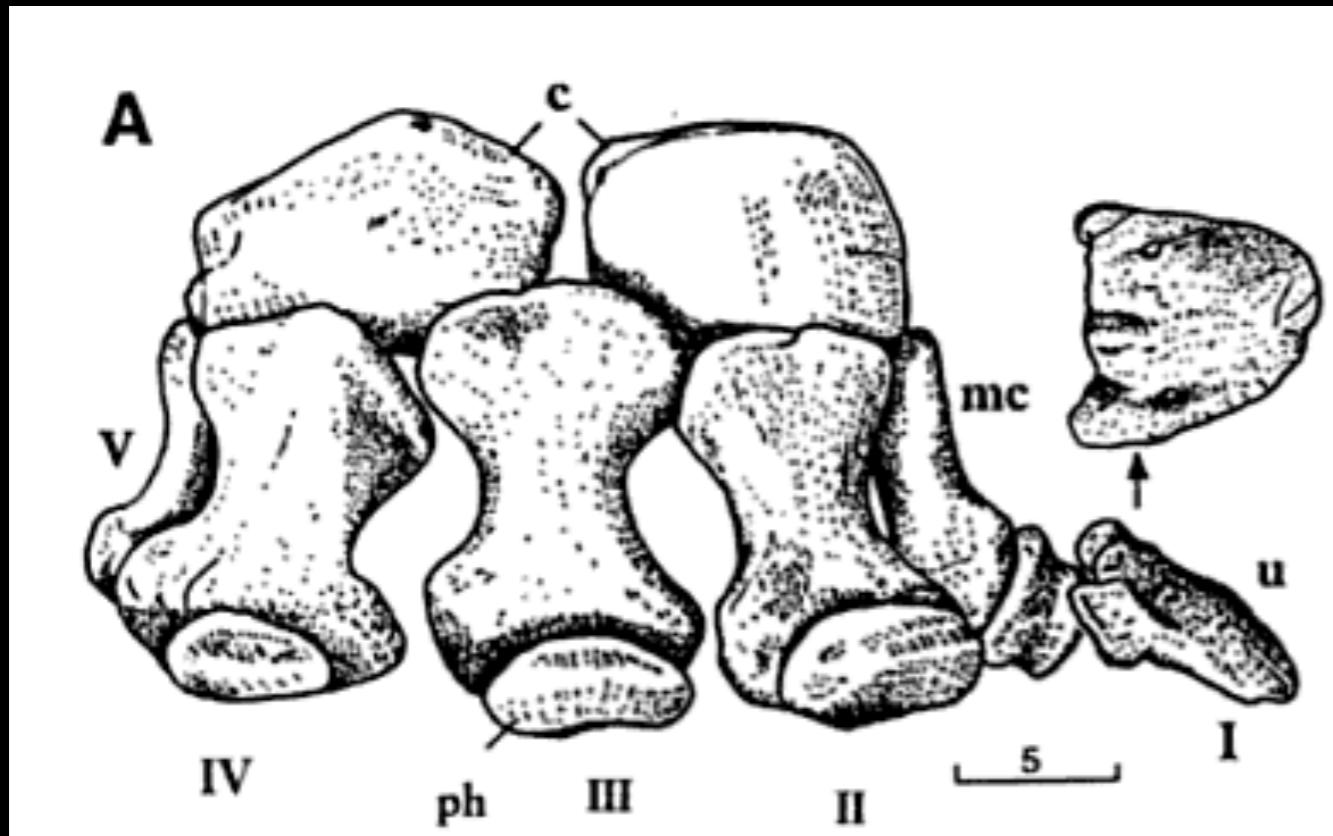
*Compared to 1.8% in humans (1000x larger per unit body weight!)*



## Encephalization index

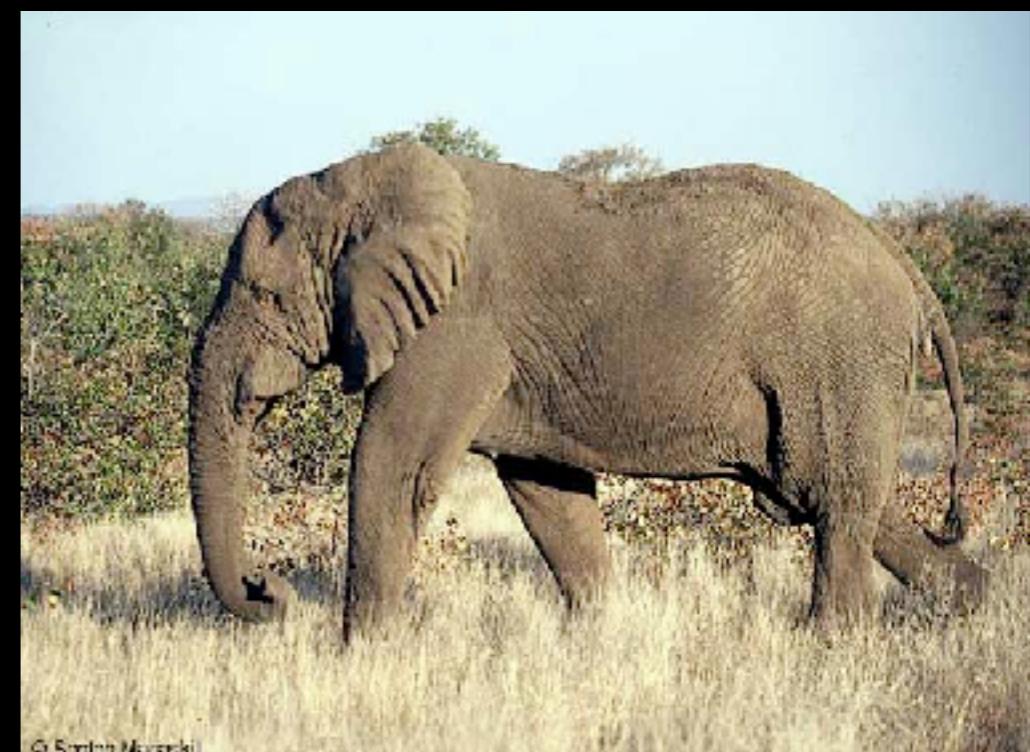


# Locomotion



*Elephantine hind feet  
Shin bones fused with astragalus/  
calcaneum (ankle bones)  
Femur: Long compared to humerus  
Columnar*

*Facultative Tripodality?  
Stocky forelimbs- could be used  
for turning/posturing (Bakker)*





# Dermal Armour?

Pattern of plates and spines is species-specific

Plates paired or staggered (*Stegosaurus*)

Plates were probably not for defense... not tough enough

Rotation? Surface markings => symmetrical.

Rotation unlikely

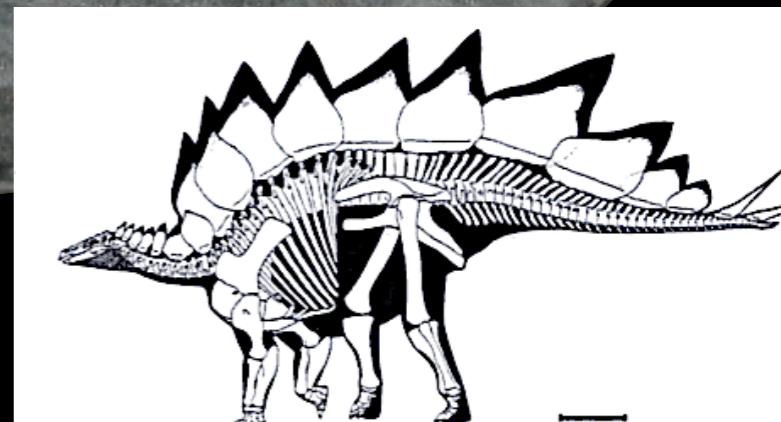
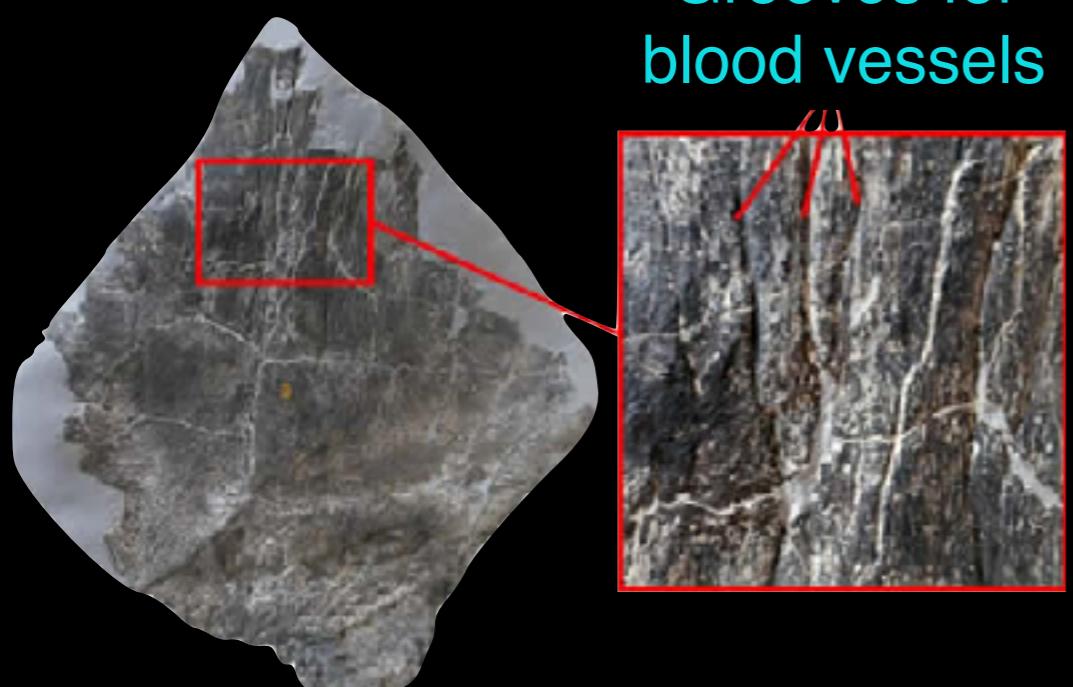
Potential uses:

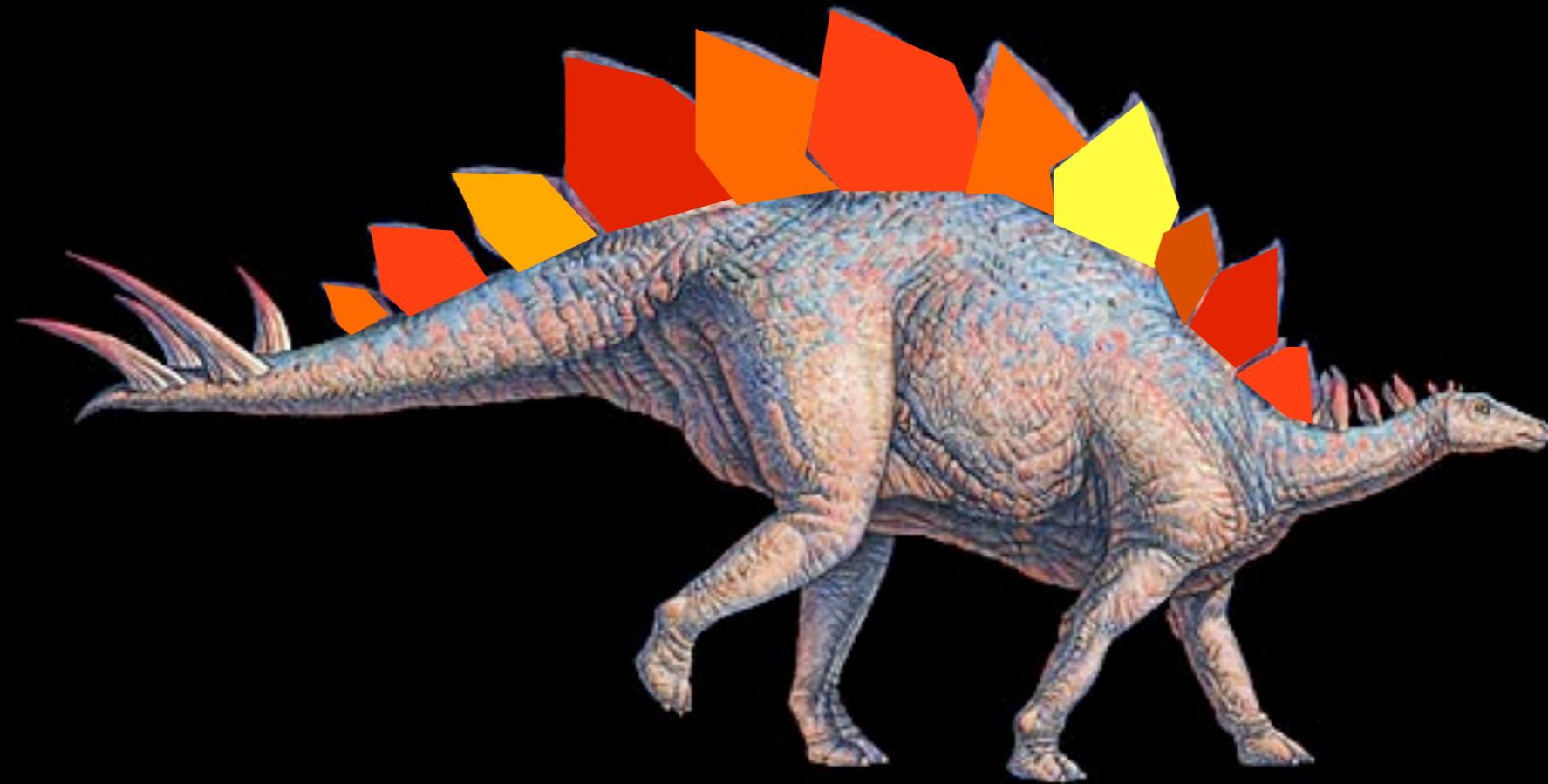
Thermoregulation? Warm up (ectotherms), Cool down (endotherms)

Signaling? positioned for maximal lateral visibility

Sexual Selection

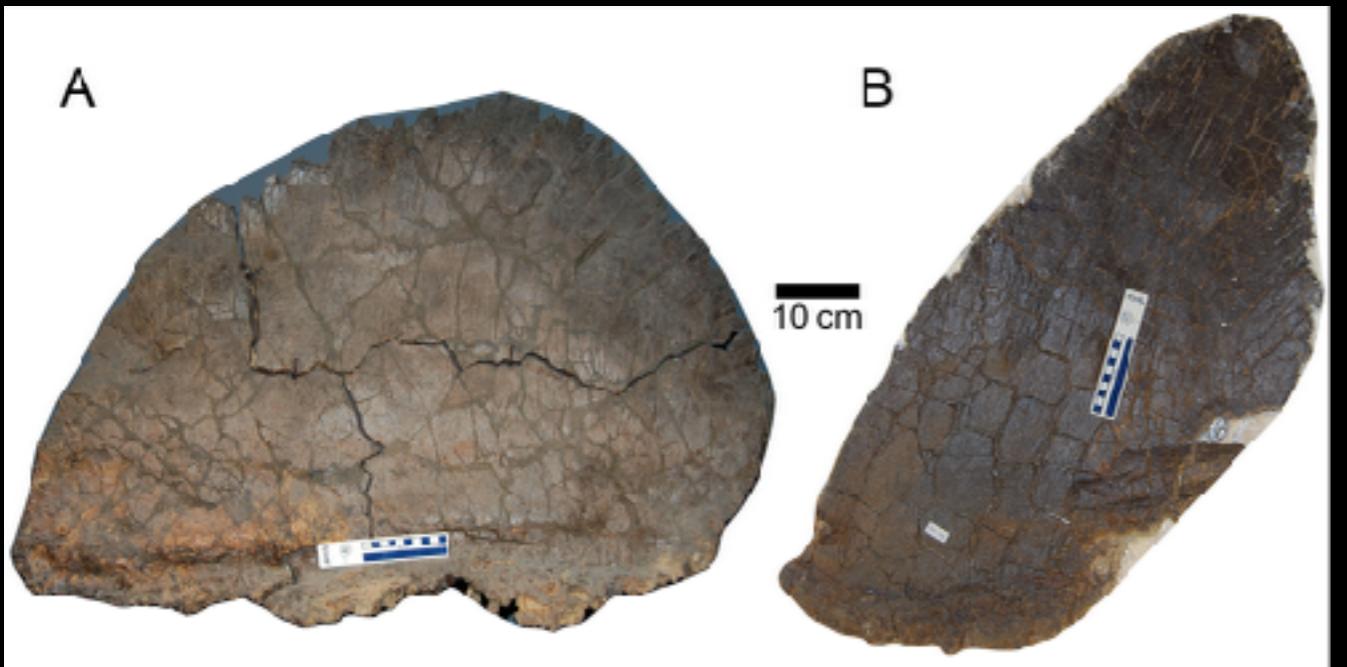
Mate Recognition



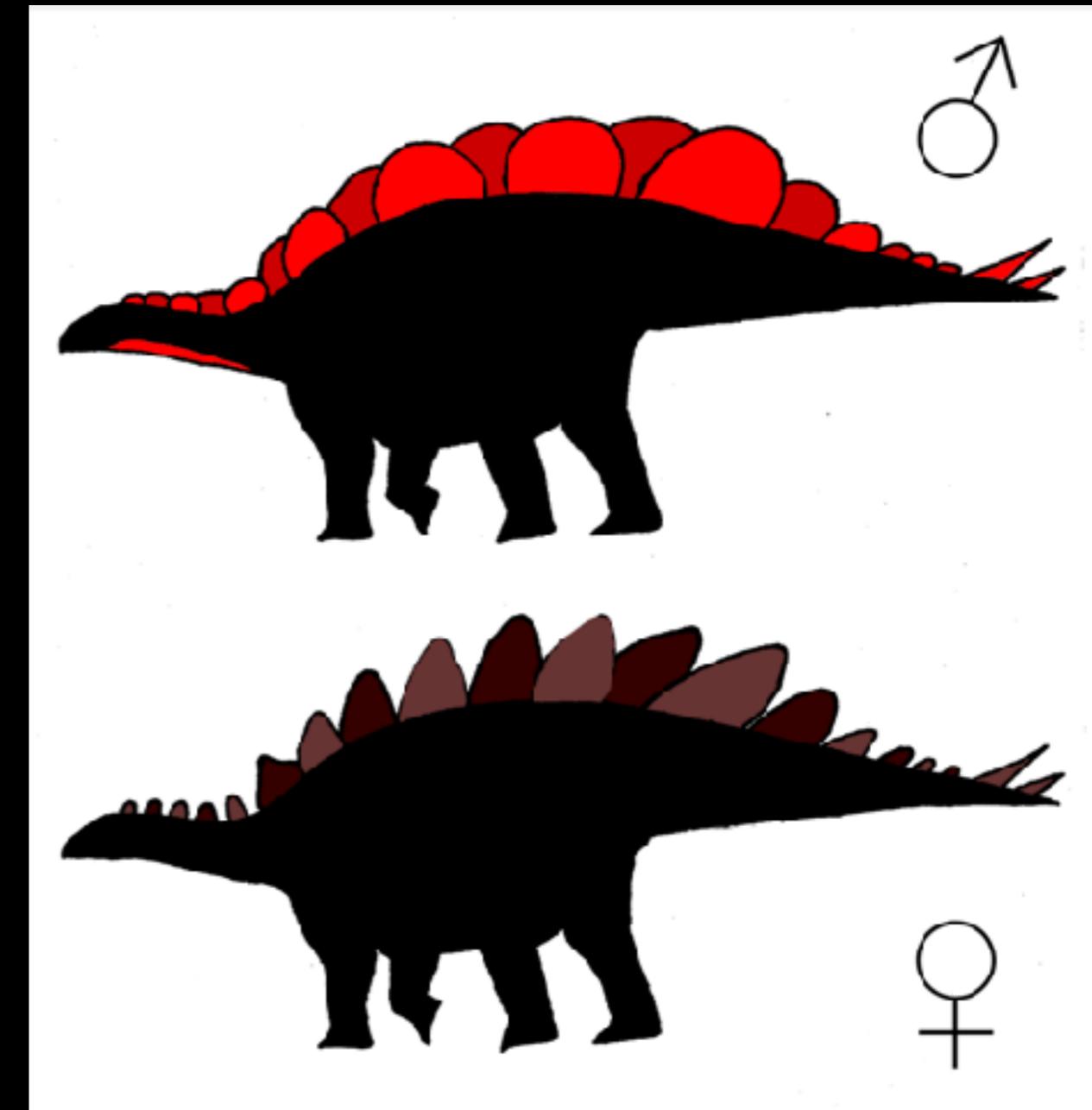


## Sexual dimorphism

Differences between males and females  
of the same species



**\*\*New finding\*\*  
published in 2015**

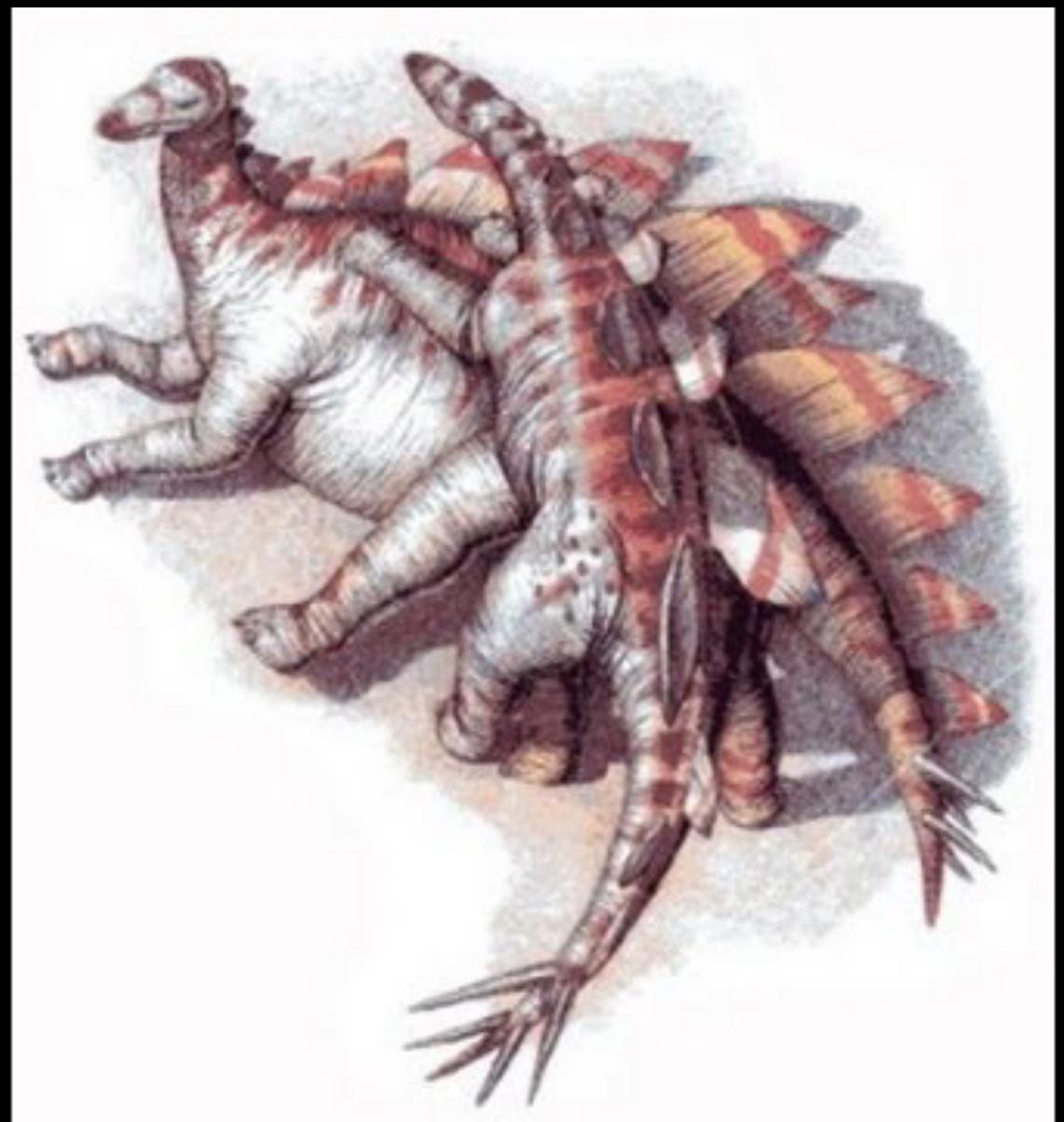


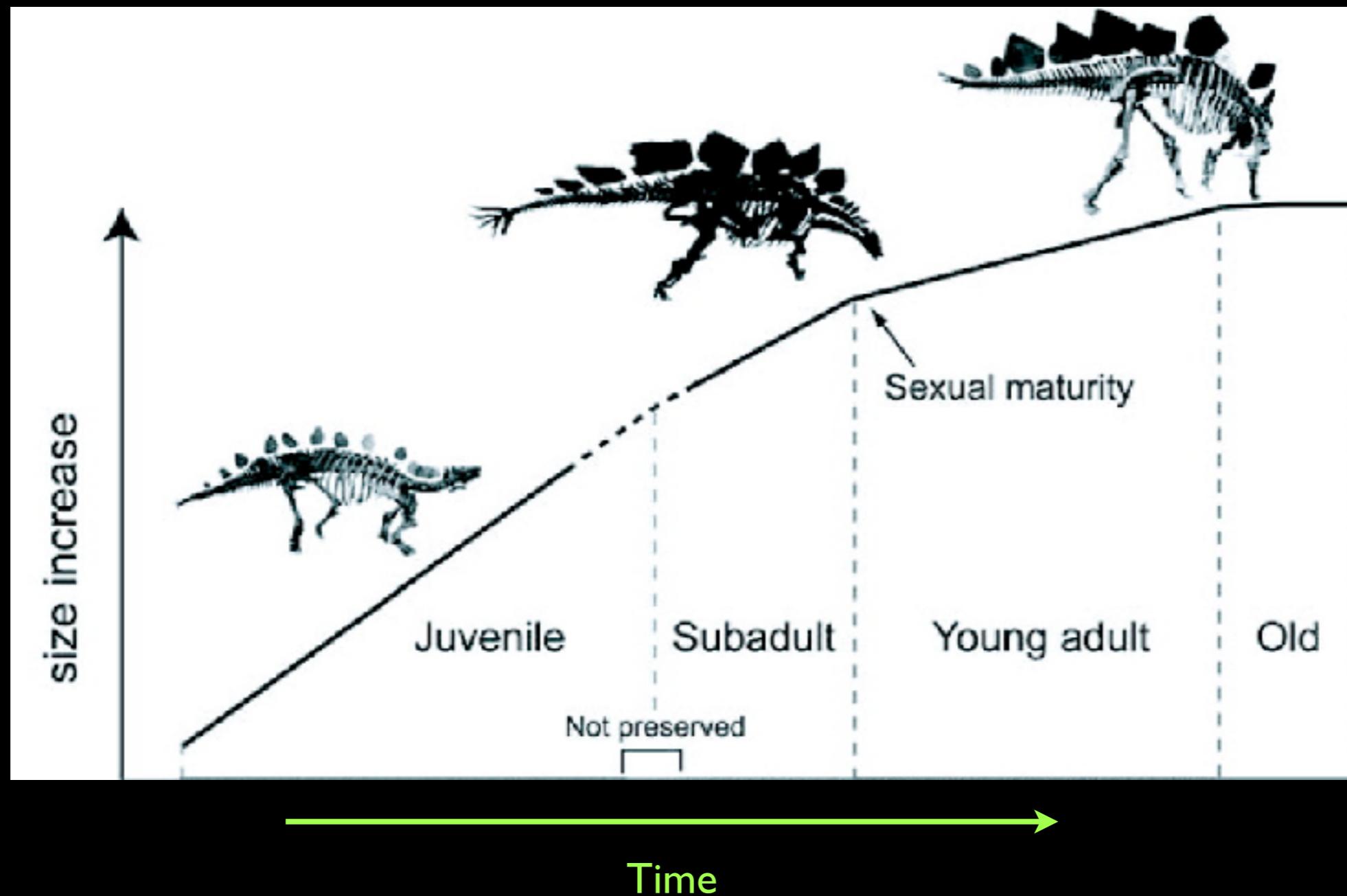
*Stegosaurus*  
Morrison formation, Colorado

## Dinosaur Sex

Figuring out how *Stegosaurus* even *could* have mated is a prickly subject. Females were just as well-armored as males, and it is unlikely that males mounted the females from the back. A different technique was necessary. Perhaps they angled so that they faced belly to belly, some have guessed, or maybe, as suggested by Timothy Isles in a recent paper, males faced away from standing females and backed up (a rather tricky maneuver!). The simplest technique yet proposed is that the female lay down on her side and the male approached standing up, thereby avoiding all those plates and spikes. However the *Stegosaurus* pair accomplished the feat, though, it was most likely brief—only as long as was needed for the exchange of genetic material. All that energy and effort, from growing ornaments to impressing a prospective mate, just for a few fleeting moments to continue the life of the species.

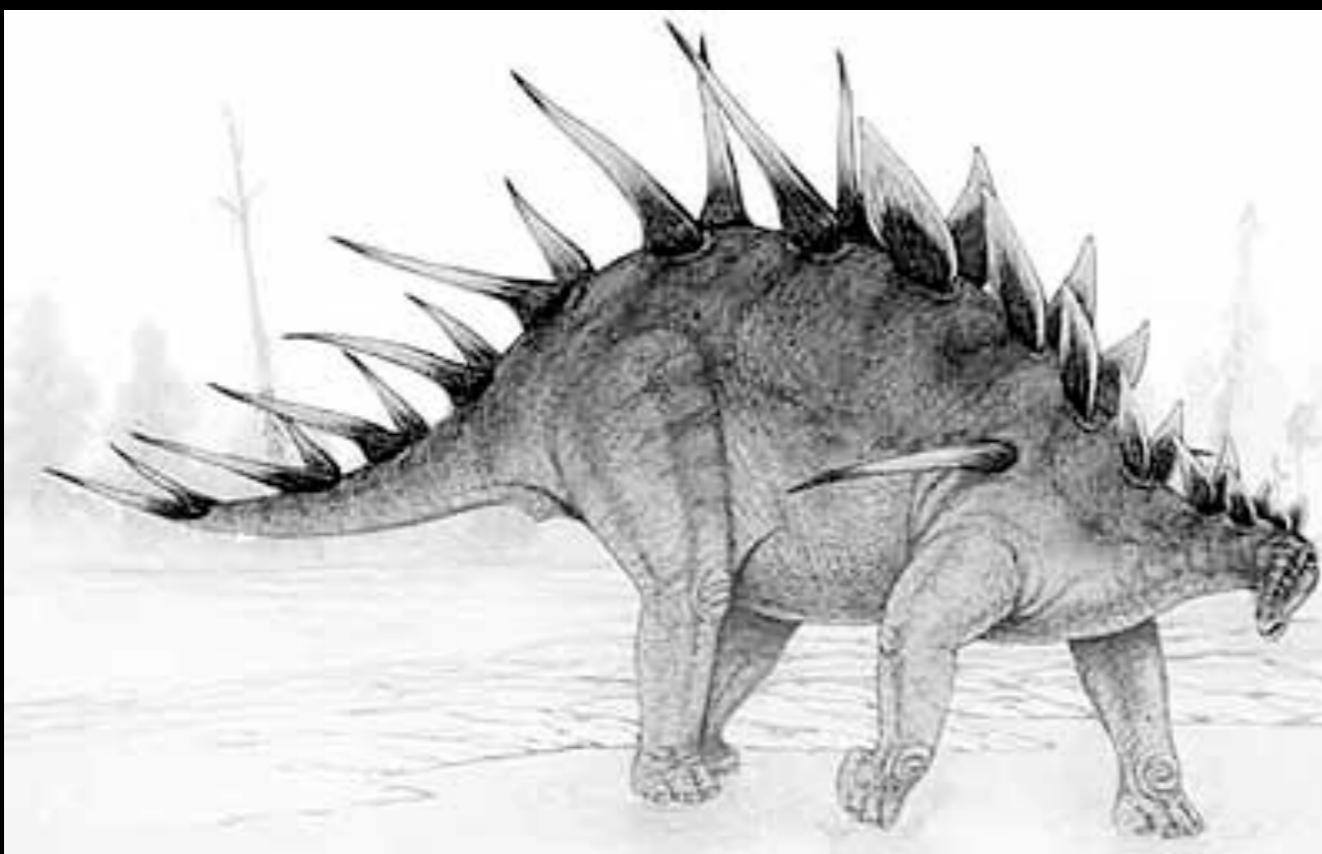
-Brian Switek



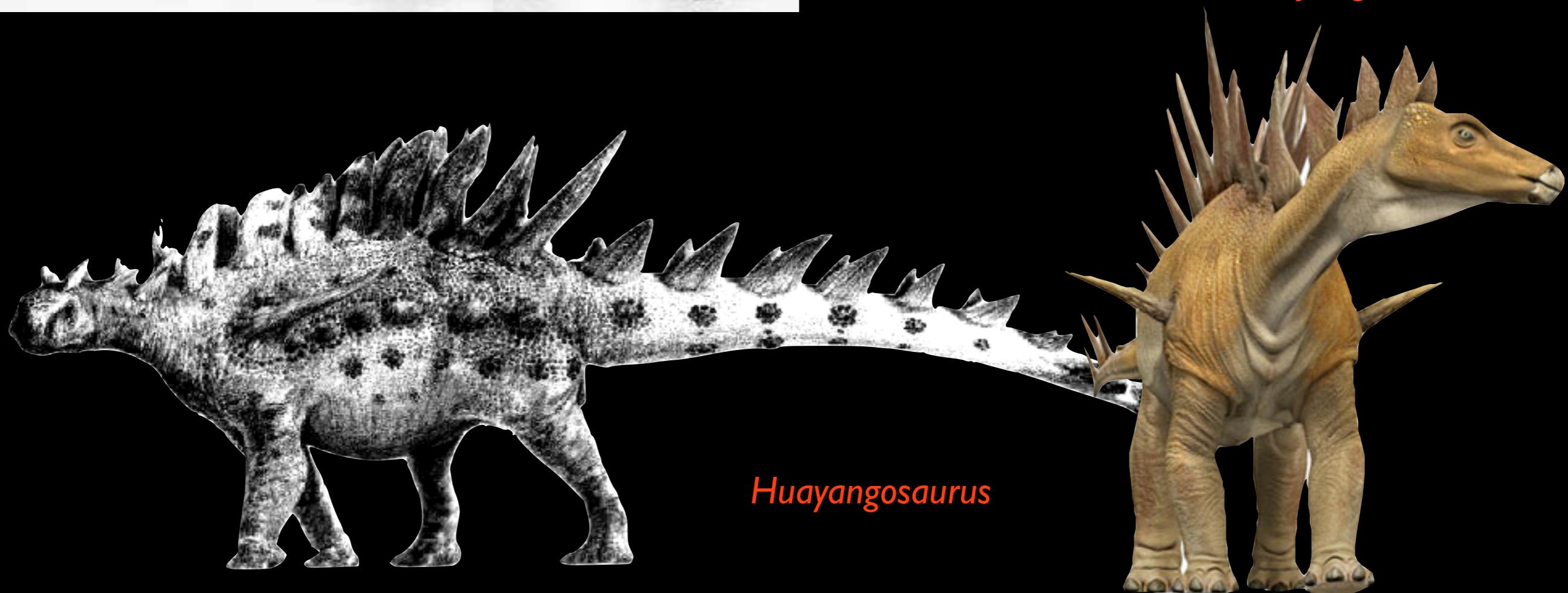


# Dermal Armour?

Parascapular spines  
Secondarily lost in *Stegosaurus*



*Kentrosaurus*



*Huayangosaurus*

*Tuojiangosaurus*







# Distribution in Space and Time

*Branched off: Early Jurassic*

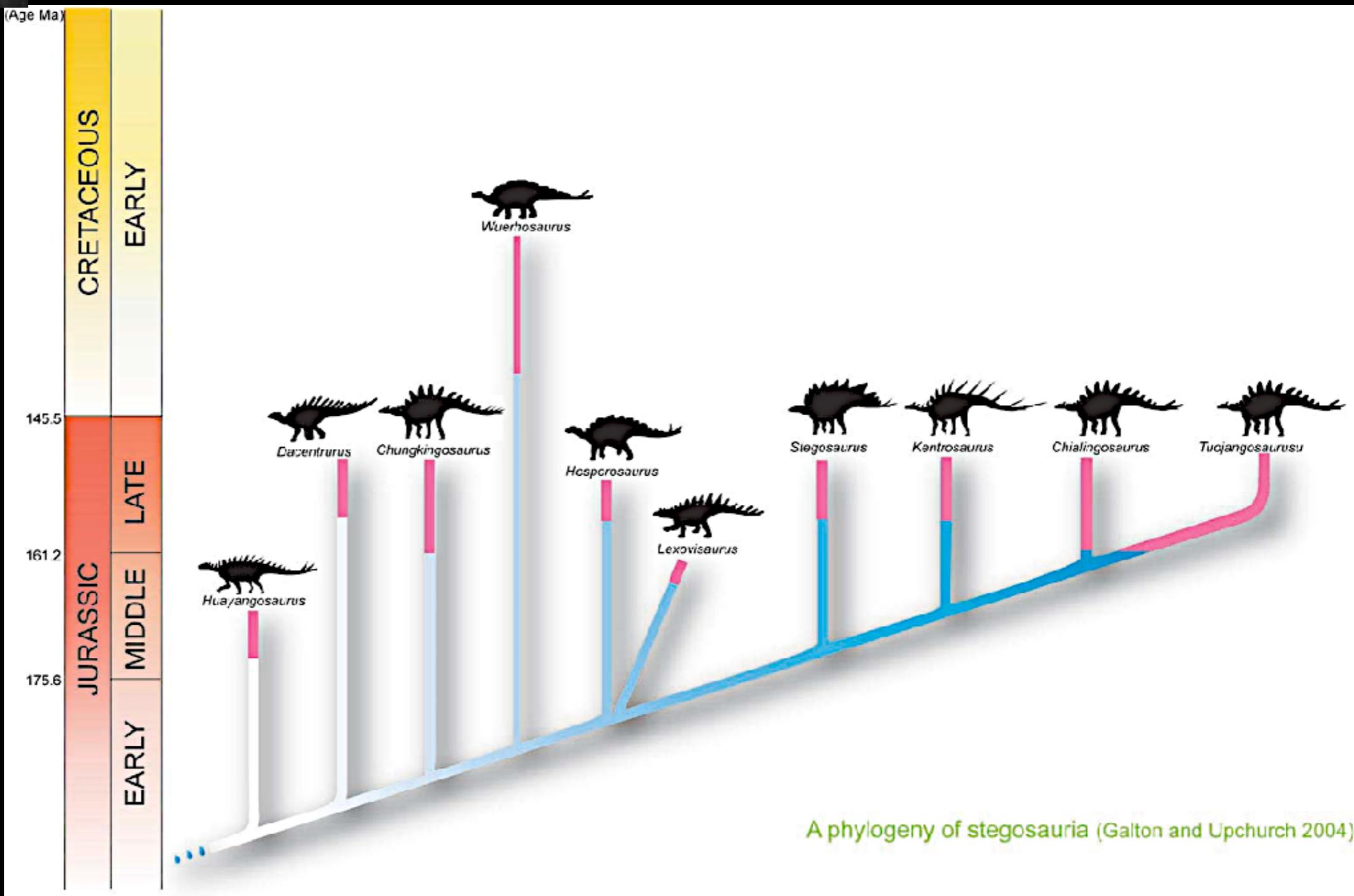
*Most abundant/diverse in Late Jurassic*

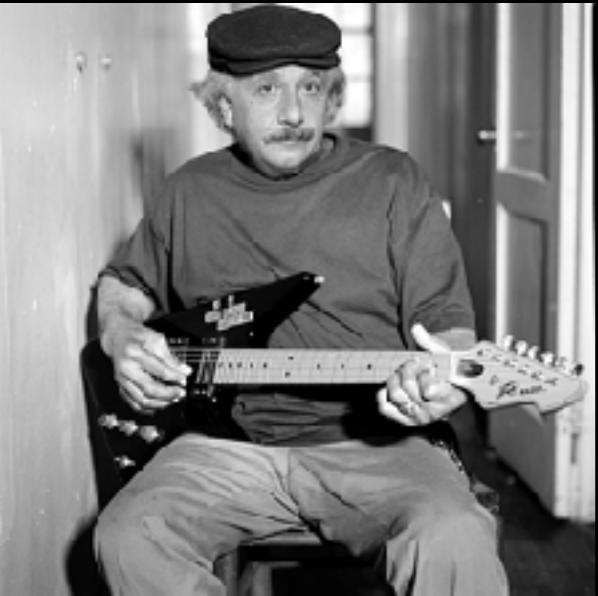
*Never very abundant compared to other  
herbivores*





# Distribution in Space and Time

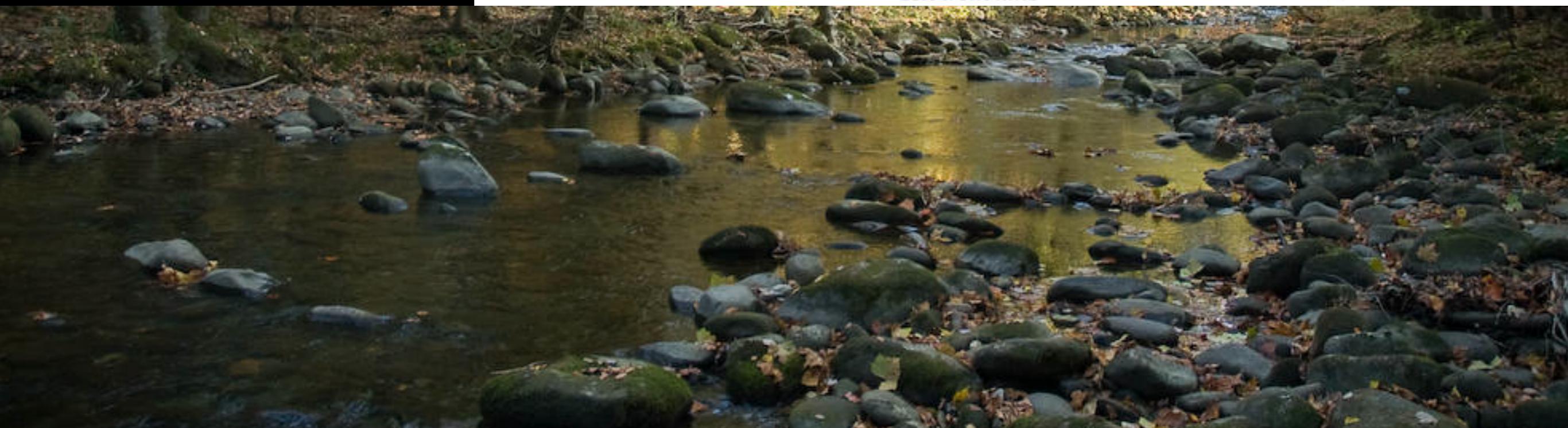
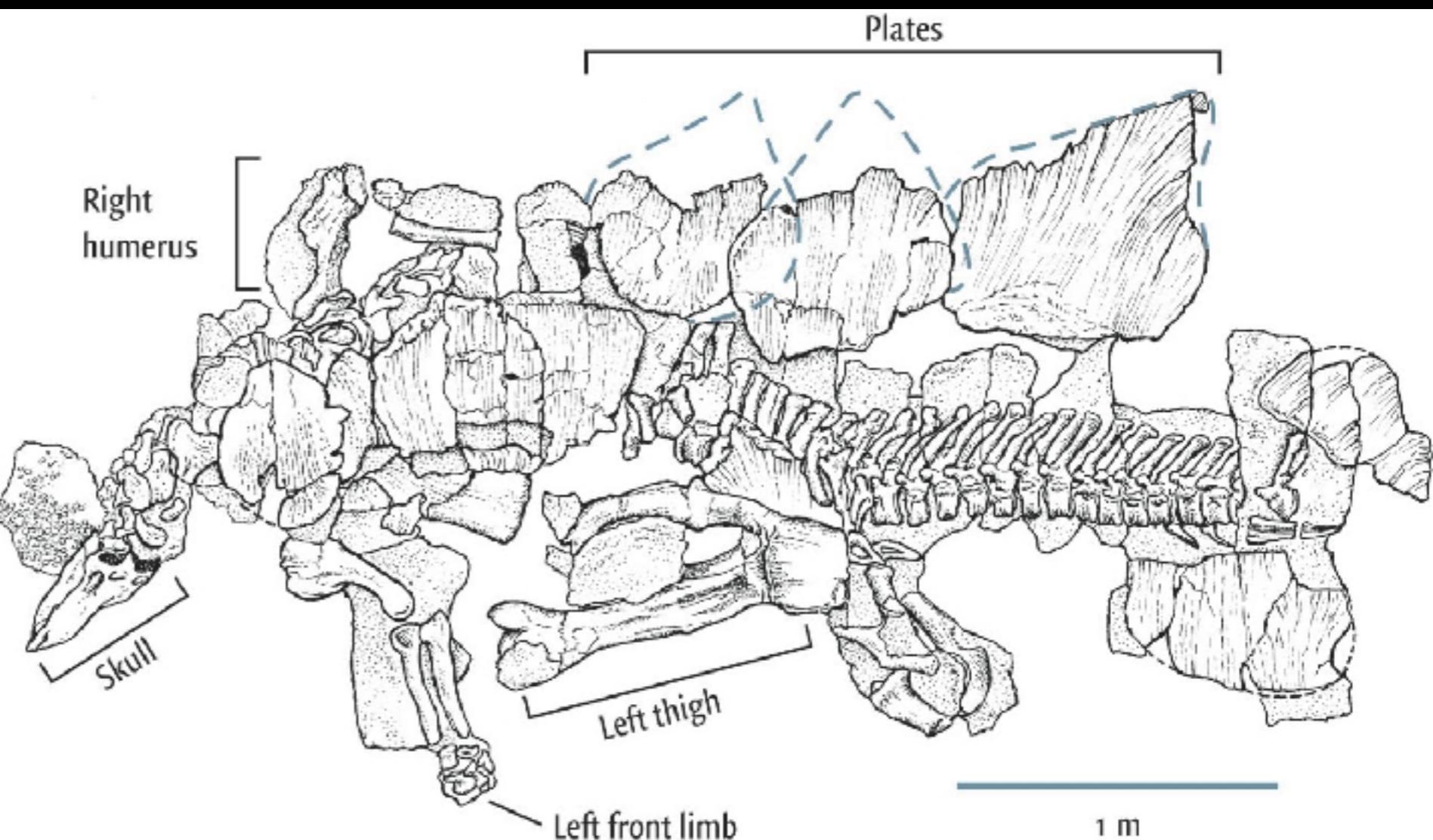




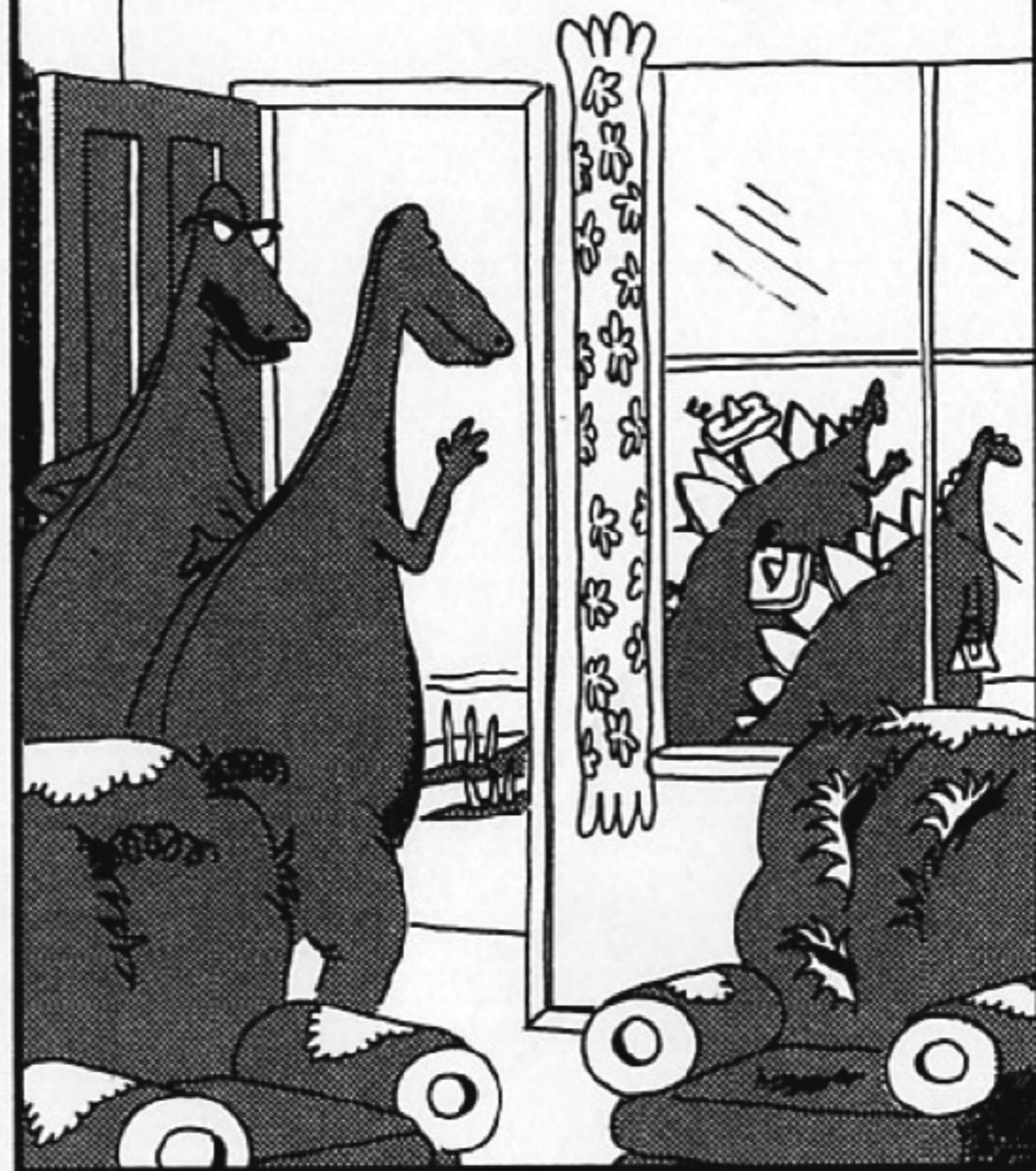
# Distribution in Space and Time

early Jur	mid Jur	late Jur	early Cret	late Cret
<b>Europe</b> <i>Emausaurus</i> <i>Scelidosaurus</i>	<b>Europe</b> <i>Lexovisaurus</i> <i>Omosaurus</i> <i>Stegosaurus</i>  <b>Asia</b> <i>Huayangosaurus</i>	<b>Europe</b> <i>Astrodon</i> <i>Dacentrurus</i> <i>Lexovisaurus</i> <i>Omosaurus</i>  <b>North America</b> <i>Diracodon</i> <i>Hesperosaurus</i> <i>Hypsirophus</i> <i>Stegosaurus</i>  <b>Africa</b> <i>Anthodon</i> <i>Chialingosaurus</i> <i>Chungkingosaurus</i> <i>Doryphorosaurus</i> <i>Paleoscincus</i> <i>Tuojiangosaurus</i>	<b>Europe</b> <i>Craterosaurus</i> <i>Regnosaurus</i>  <b>Africa</b> <i>Anthodon</i> <i>Paleoscincus</i> <i>Paranthodon</i>  <b>Asia</b> <i>Wuerhosaurus</i> <i>Monkonosaurus</i>	<b>Asia</b> <i>Dravidosaurus??</i>

# Distribution in Space and Time



Lanom



"Well, that does it! Look at our furniture!  
The Shuelers have visited us for the last time!"