Writing your Natural History Report T-minus 21 days

What should you be doing now?

Researching your topic

Use the library

Wikipedia is a good ***starting*** place, but not enough by itself

Search Google Scholar using keywords on your topic

Search through popular science magazines such as

Smithsonian

Scientific American

Discover

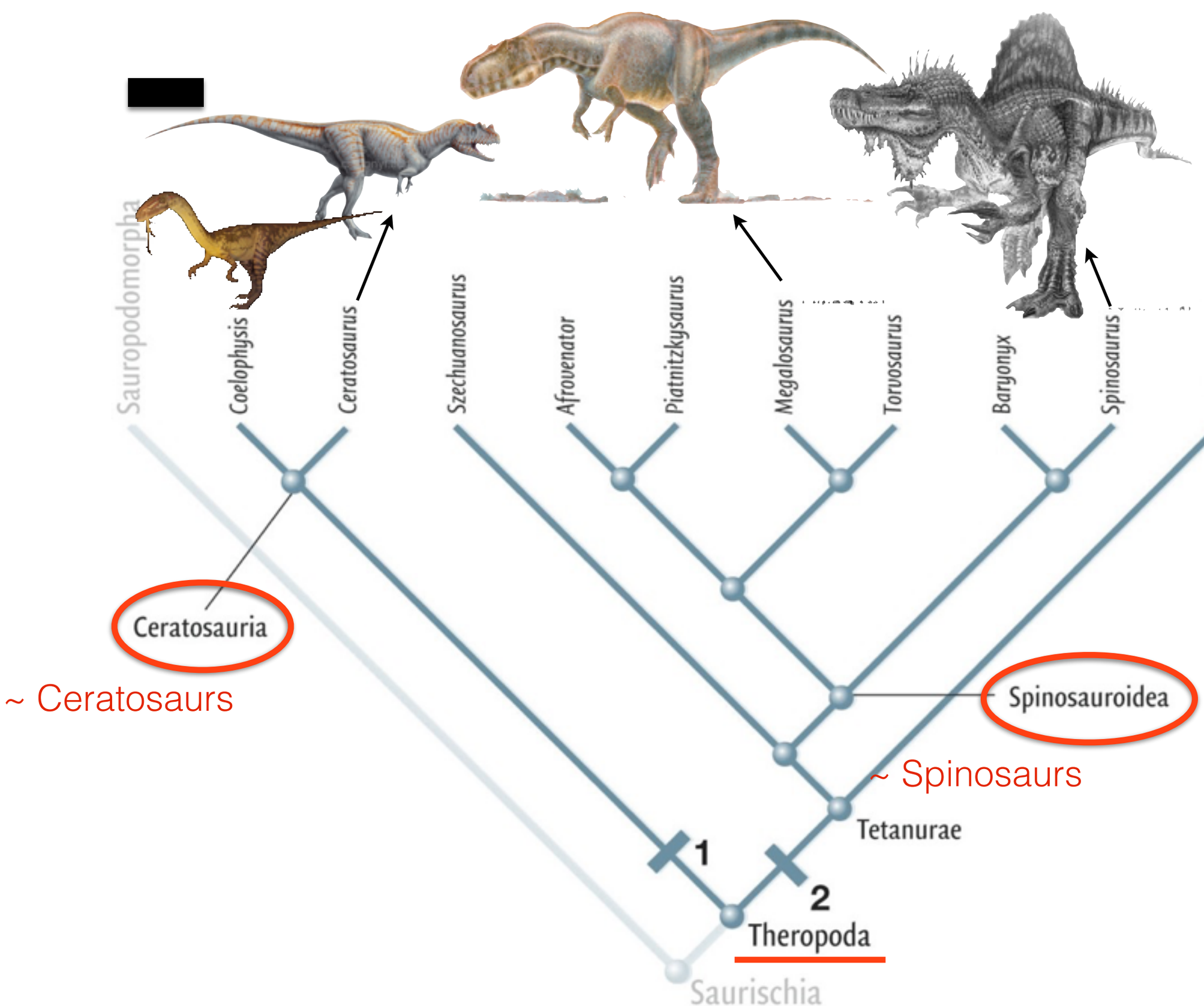
…these often have good general articles that might help orient you

Begin your outline

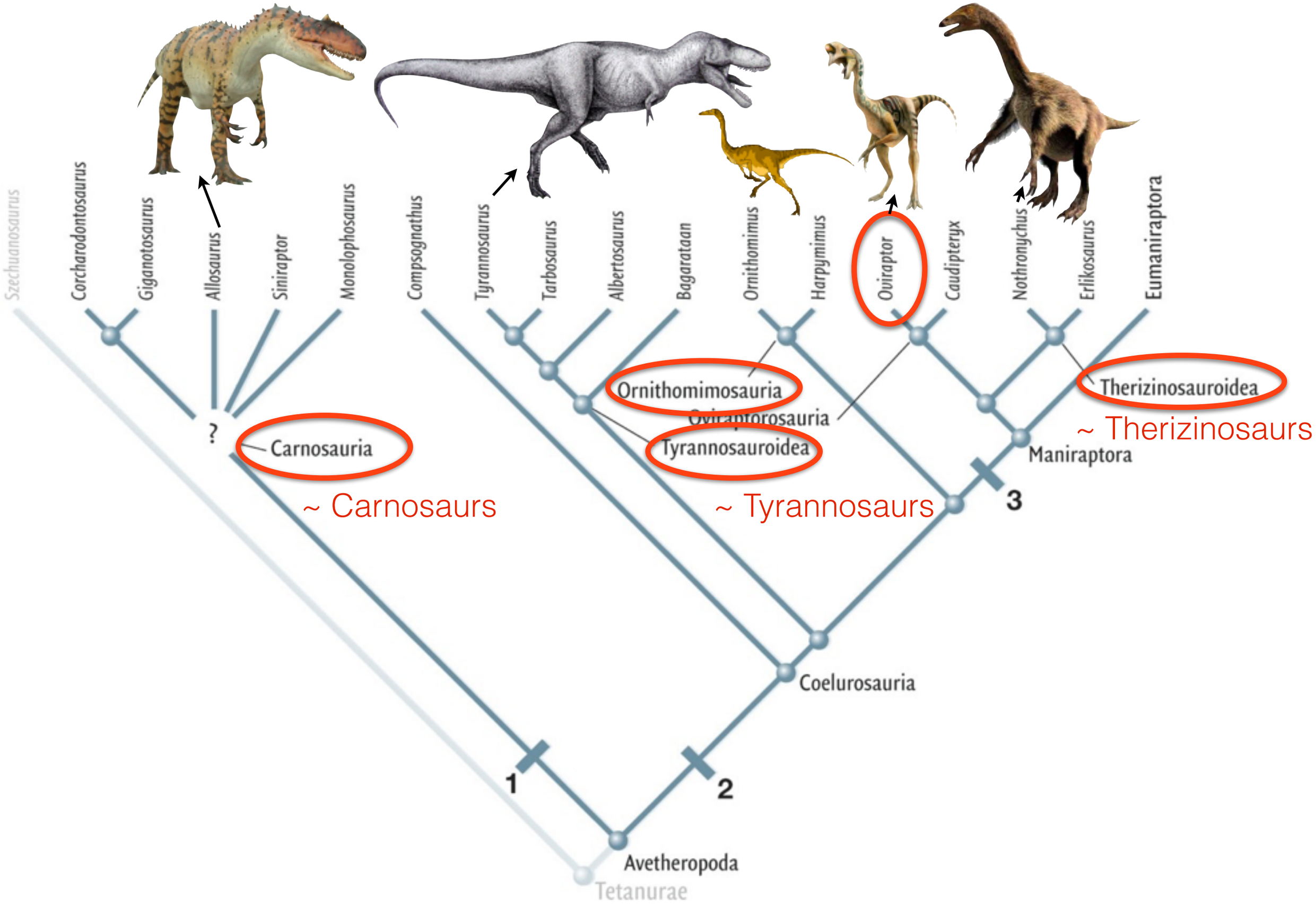
Start writing an outline EARLY… this will help direct your research, not to mention make the writing process much easier.

Fastovsky ch. 12

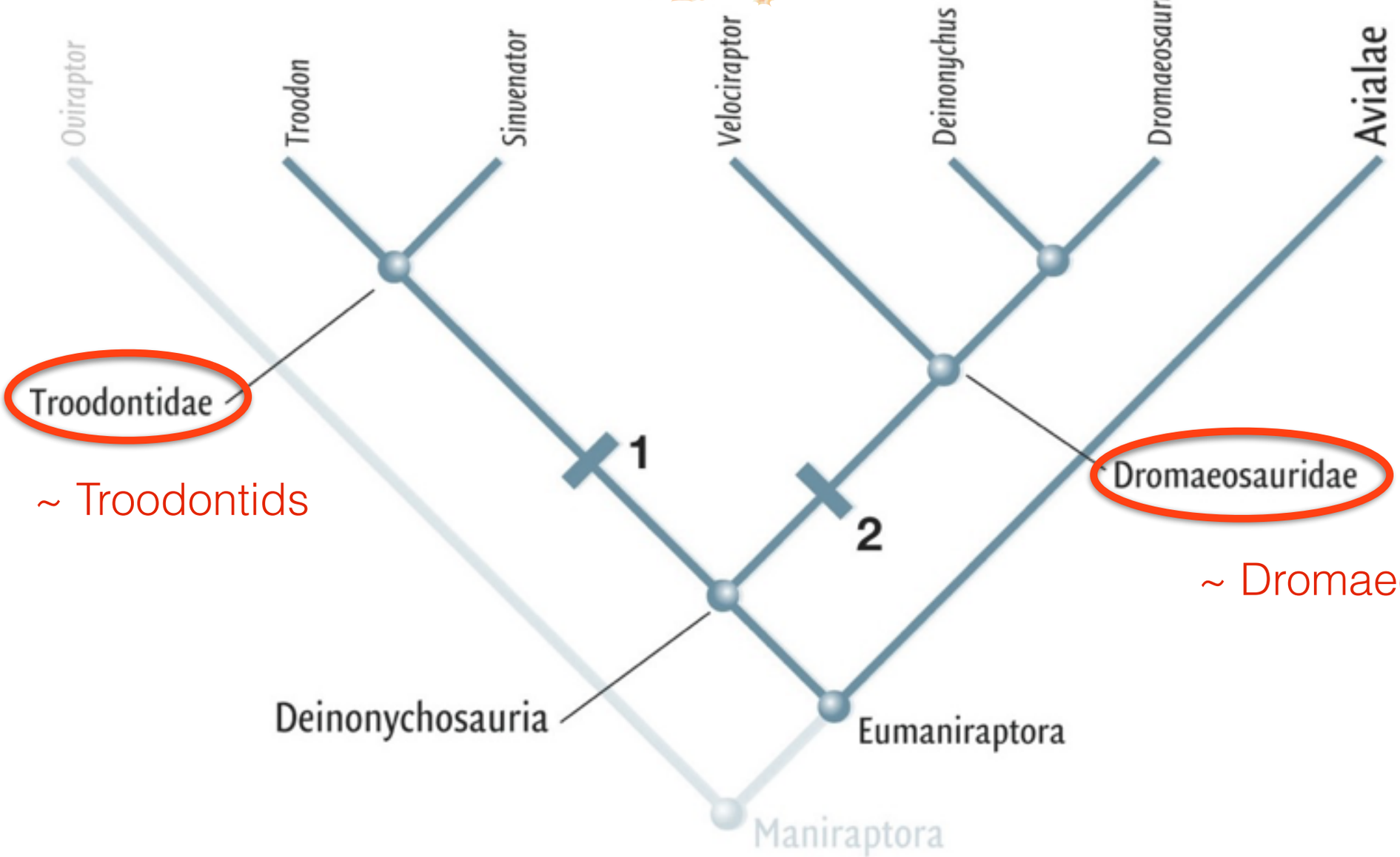
9	**3/14**	Dino physiology & ecology I.	Reproduction and growth	~~Brusatte Chpt 8~~	
	3/16	Dino physiology & ecology II.	Diet and food webs		
	3/18	Dino physiology & ecology III.	Some like it hot: endothermy vs. ectothermy		
S9		**Physiology and ecology**	**HW4: TBA**		
			SPRING BREAK		
10	**3/28**	Theropods	Basal theropods	Fastovsky Chpt 9	
	3/30	Theropods	The strange: Spinosaurus, Oviraptor, and Therozinosaurs		
	4/1	Theropods	Derived theropods: brawn and brains		
S10		**Theropods**	**HW5: TBA**		**Homework 4 due**
11	**4/4**	Origin of birds I	From theropods to Avialae	Fastovsky Chpt 10	
	4/6	Origin of birds II	Feathers and flight		
	4/8	Prepare for Exam III			
S11		**Review for Exam III**	**HW6: TBA**		**Homework 5 due**
12	**4/11**	**Exam III**			



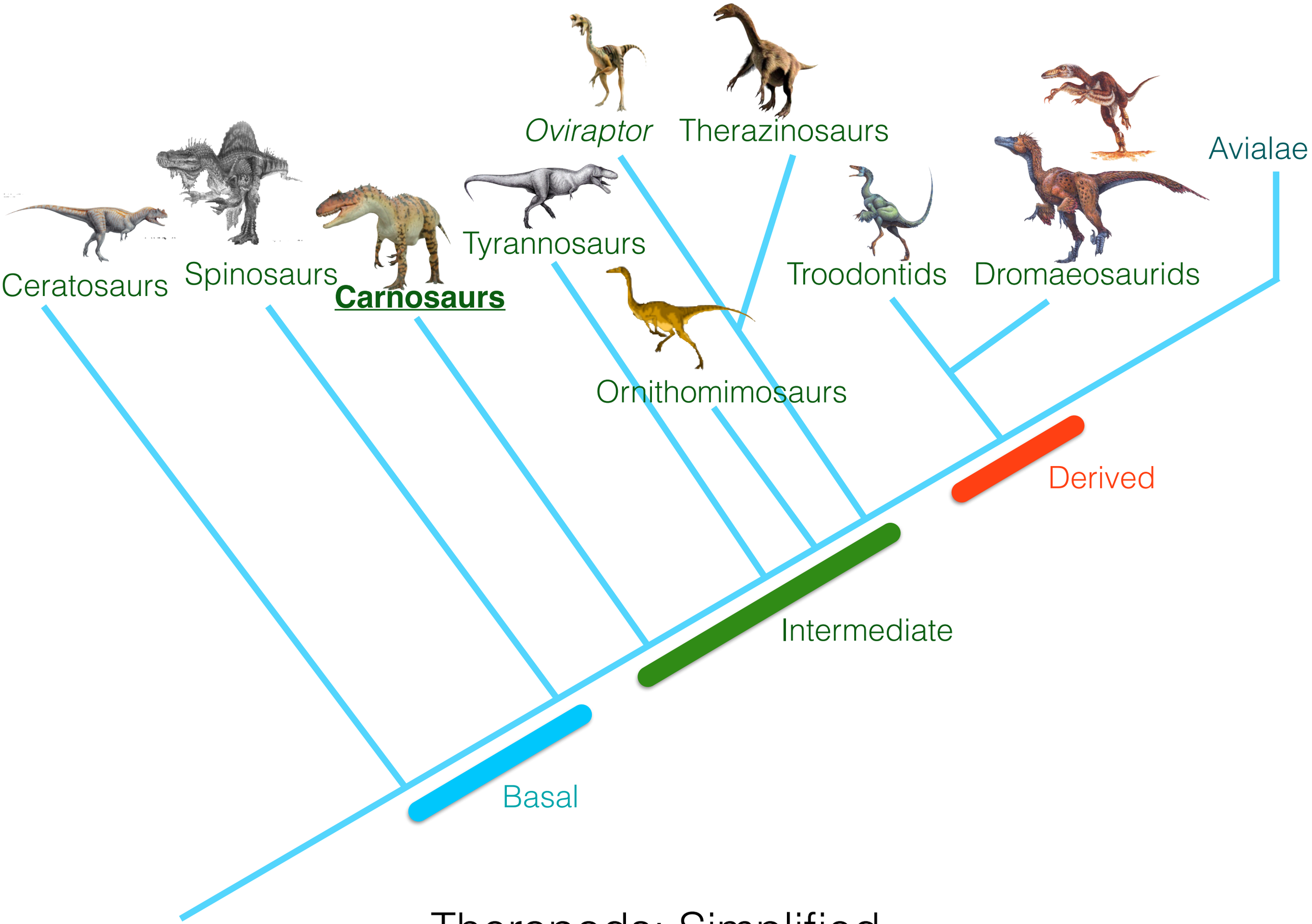
Basal Theropods



Intermediate Theropods

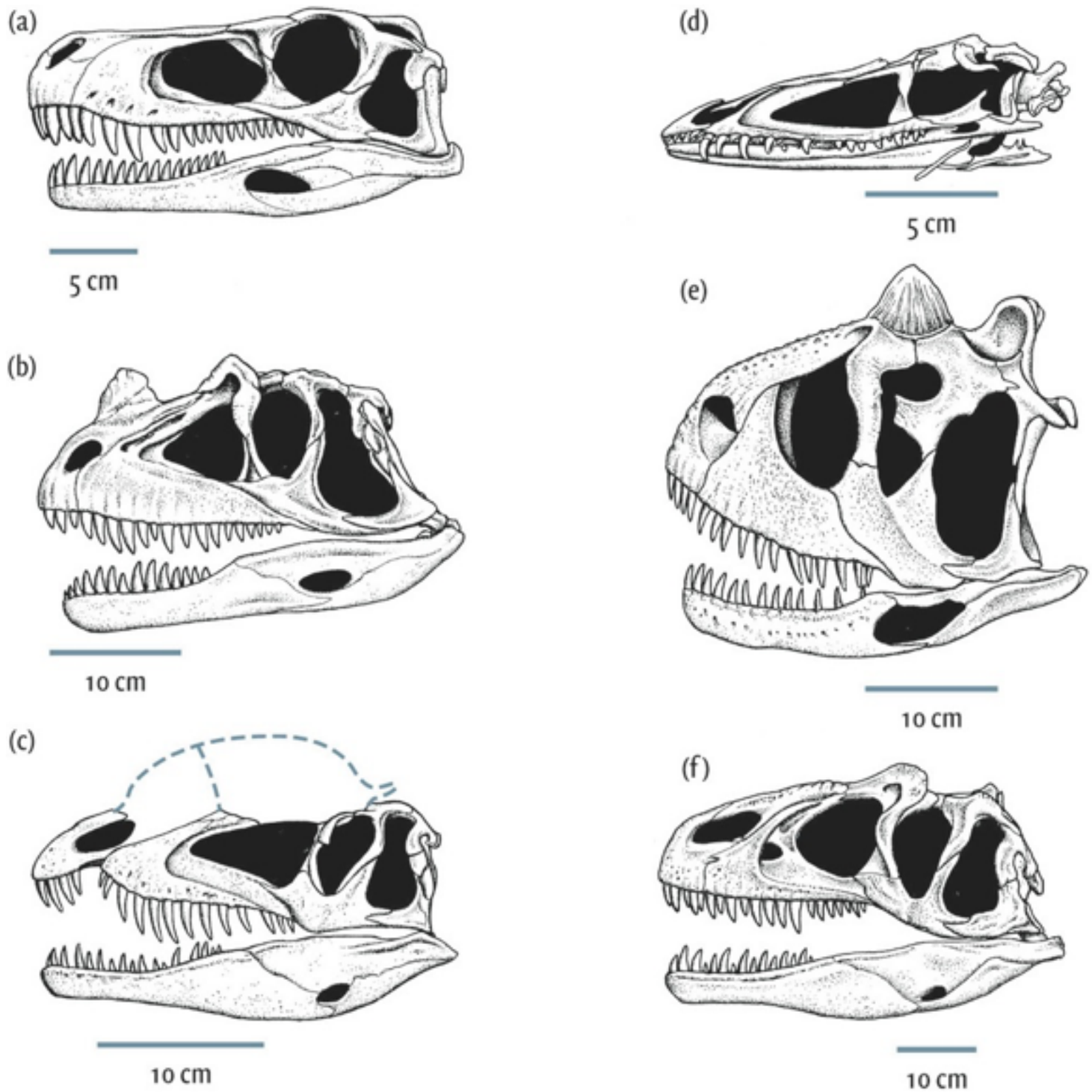


Derived Theropods



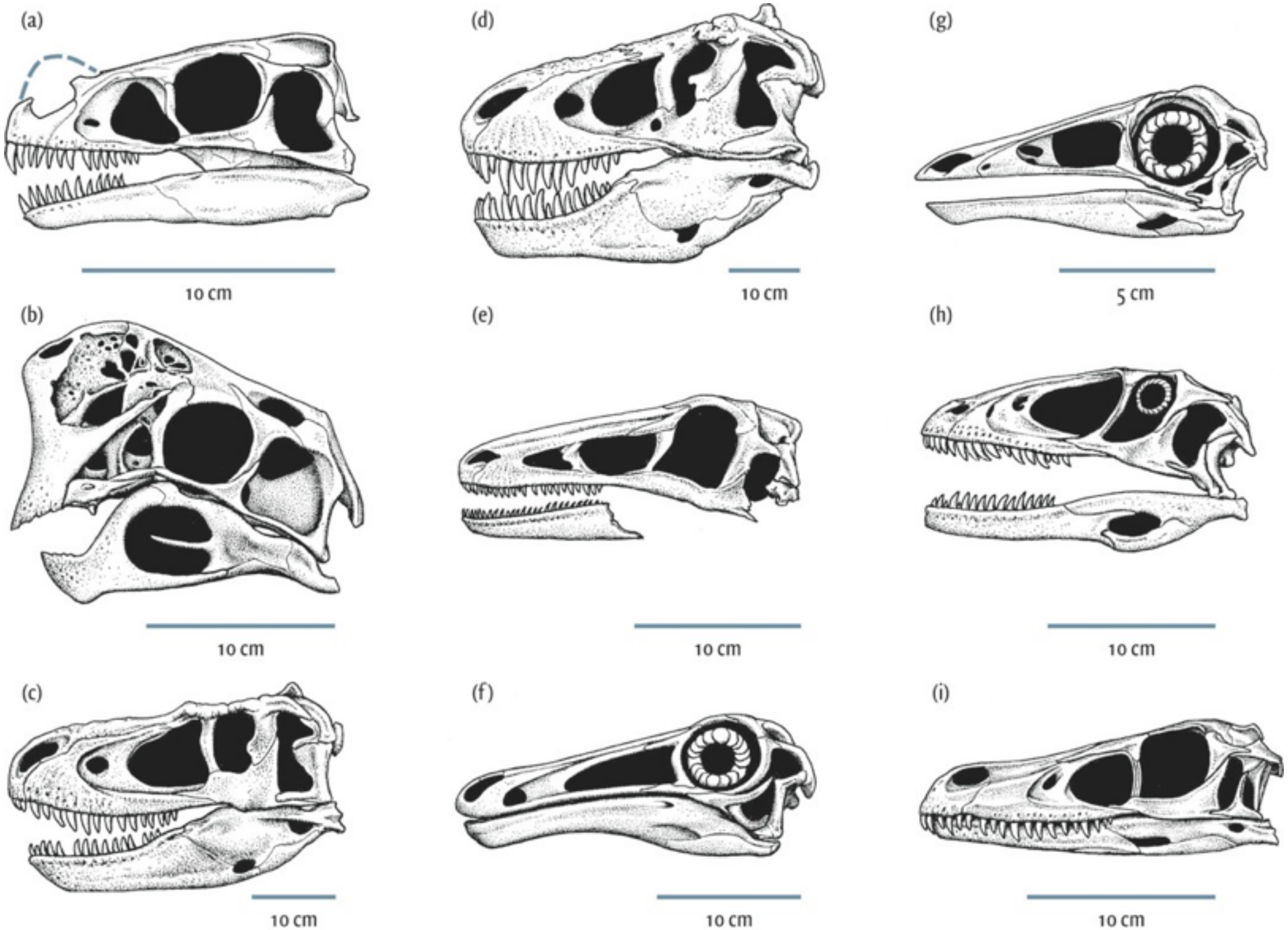
Theropods: Simplified

Theropod Skulls



Robust

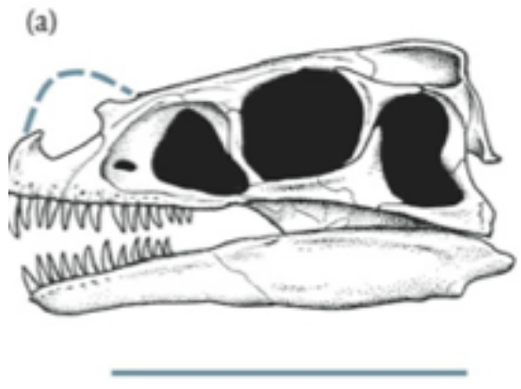
Theropod Skulls



Gracile

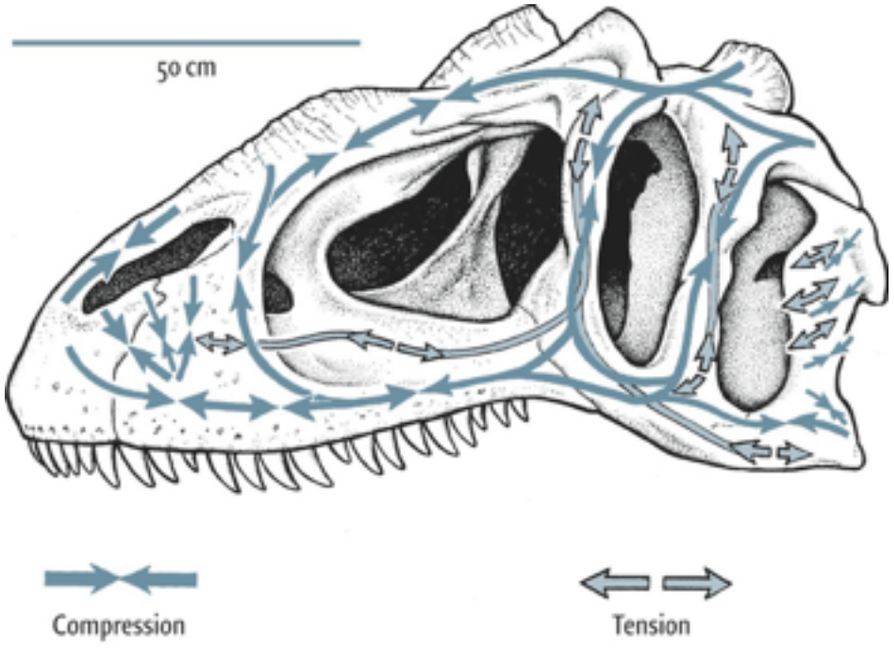
Theropod Skulls

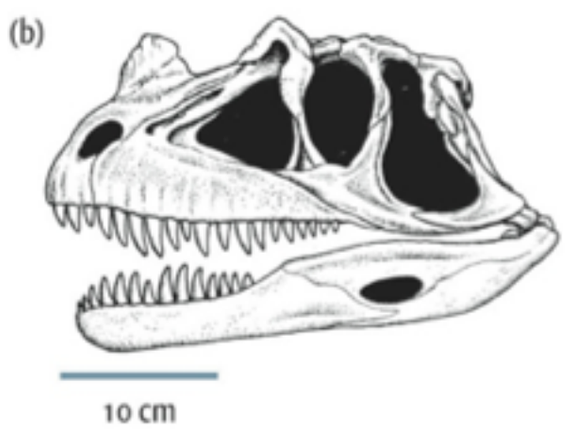
Air sacs in antorbital fossa ~ lateral aspects of skull (primitive characteristic lost in Ornithischia)
Also found in Theropods, Sauropods, Pterosaurs, and Crocodylians
Pneumatization of snout
<u>Accessory antorbital openings</u>

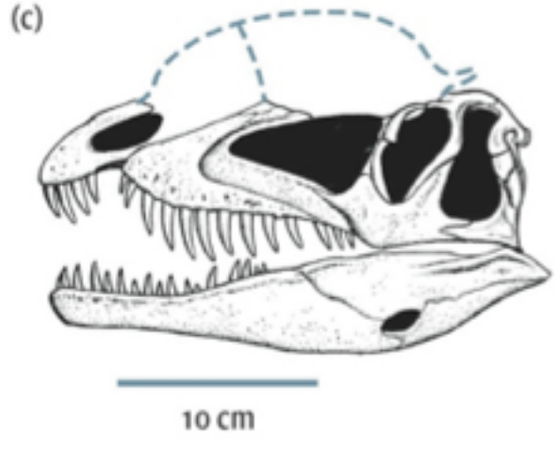


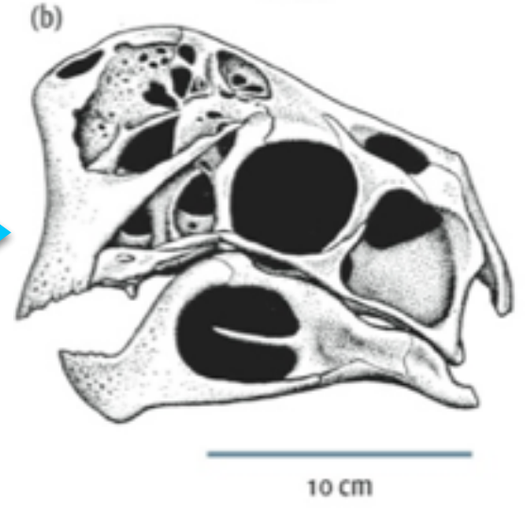
Why?
Potentially > respiratory efficiency

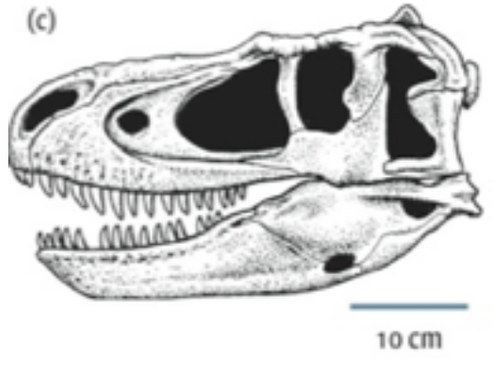
Early forms: brute force
Later forms: Thrashing/tearing











a

b

−3.4×10^7 2.4×10^7 8.3×10^7 1.4×10^7 2.0×10^8

Pa

0

comp. increasing tension

5.1×10^7 −2.3×10^6 −5.5×10^7 −1.1×10^8 −1.6×10^8

Pa

0

tens increasing compression

c

d

Tension

Compression

Theropods: Evolutionary Trends

SKULL

Pneumatization of snout

Accessory antorbital openings

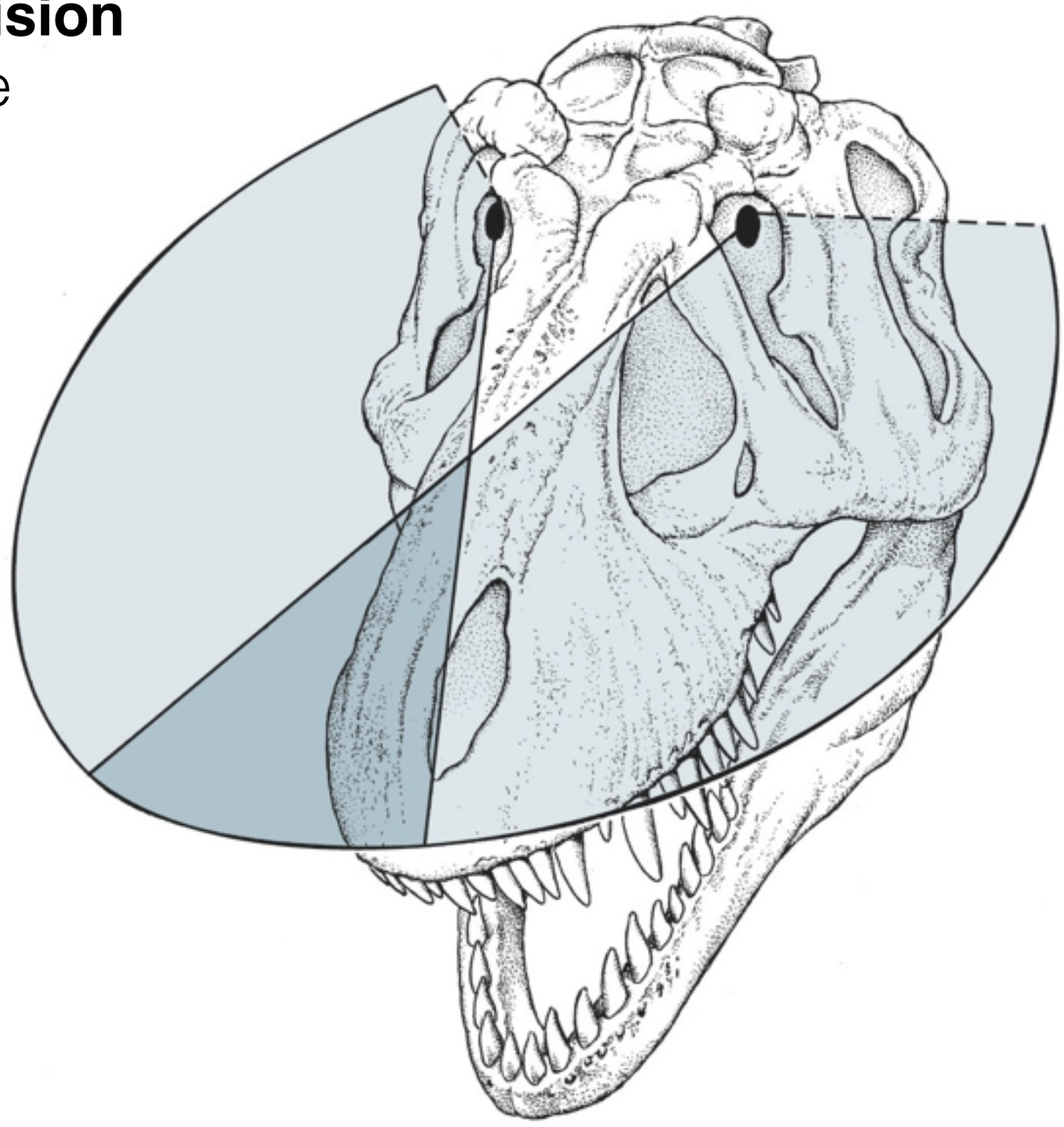
Stereoscopic Vision

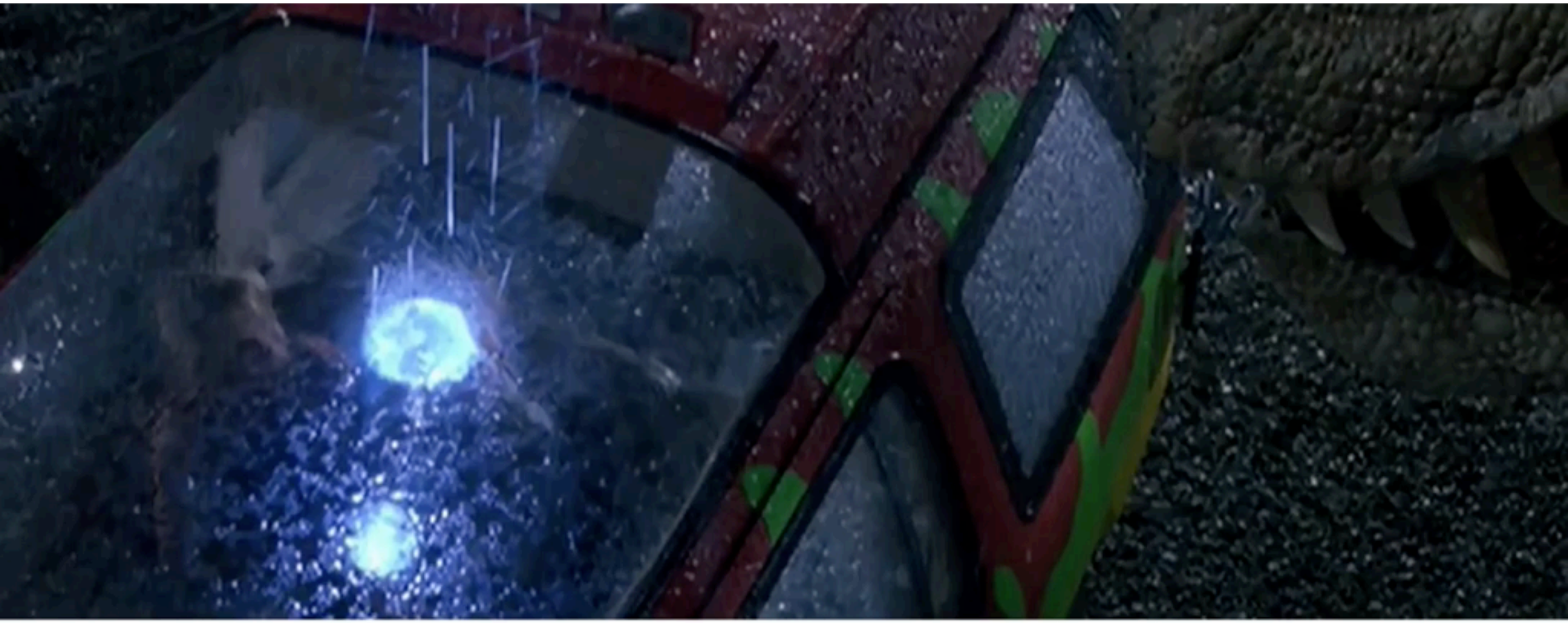
Larger Brain size

AXIAL SKELETON

Finger Elongation

Limb Elongation (faster)





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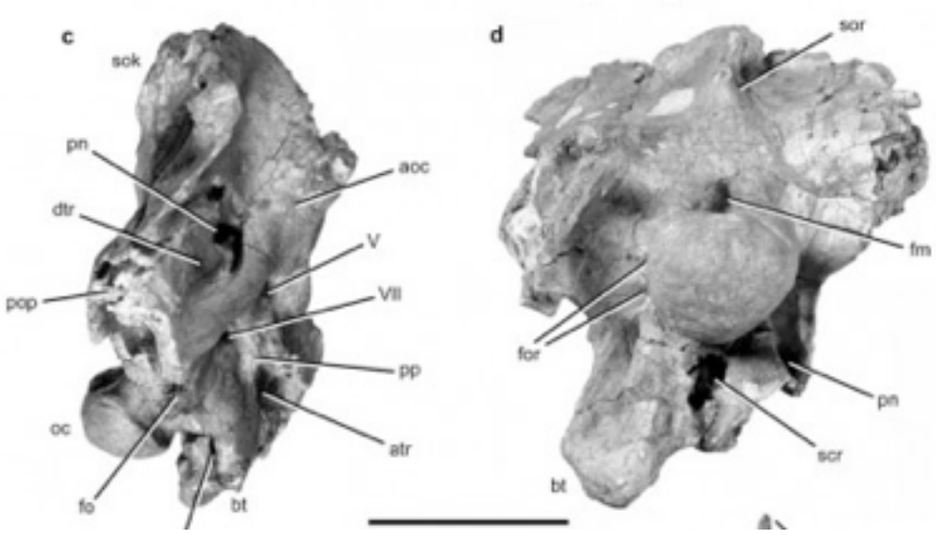
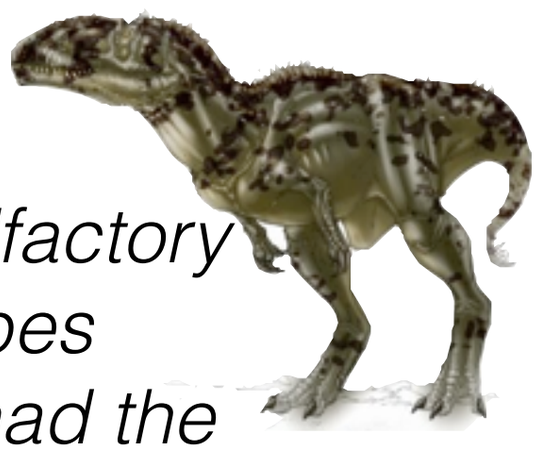


Shauchilong



Emphasize olfactory and visual lobes

Troodontids had the largest relative brain size of any dinosaur

AXIAL SKELETON

Finger Elongation

Limb Elongation (faster)

Theropods: Evolutionary Trends

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Pneumatization of snout
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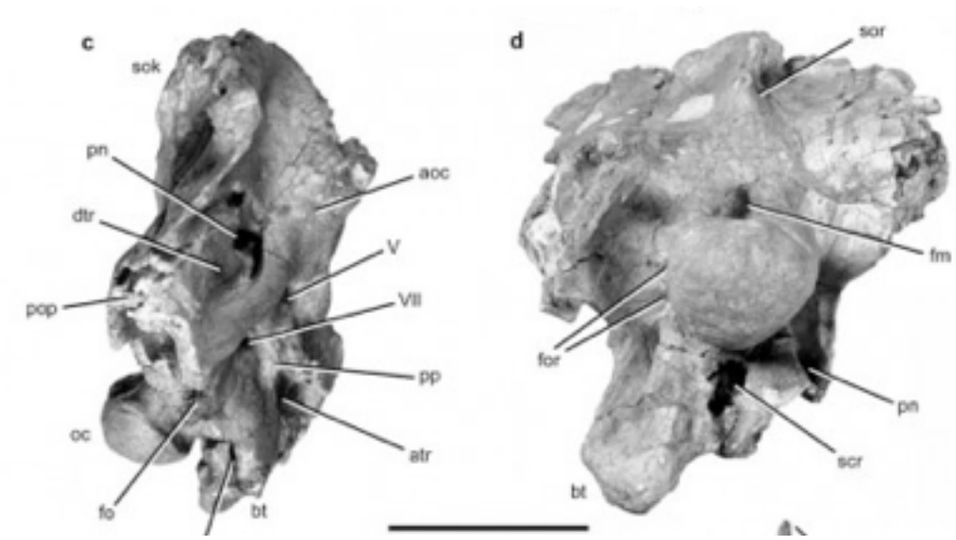

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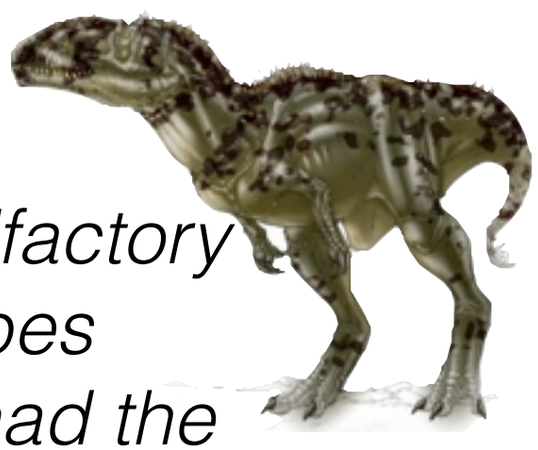

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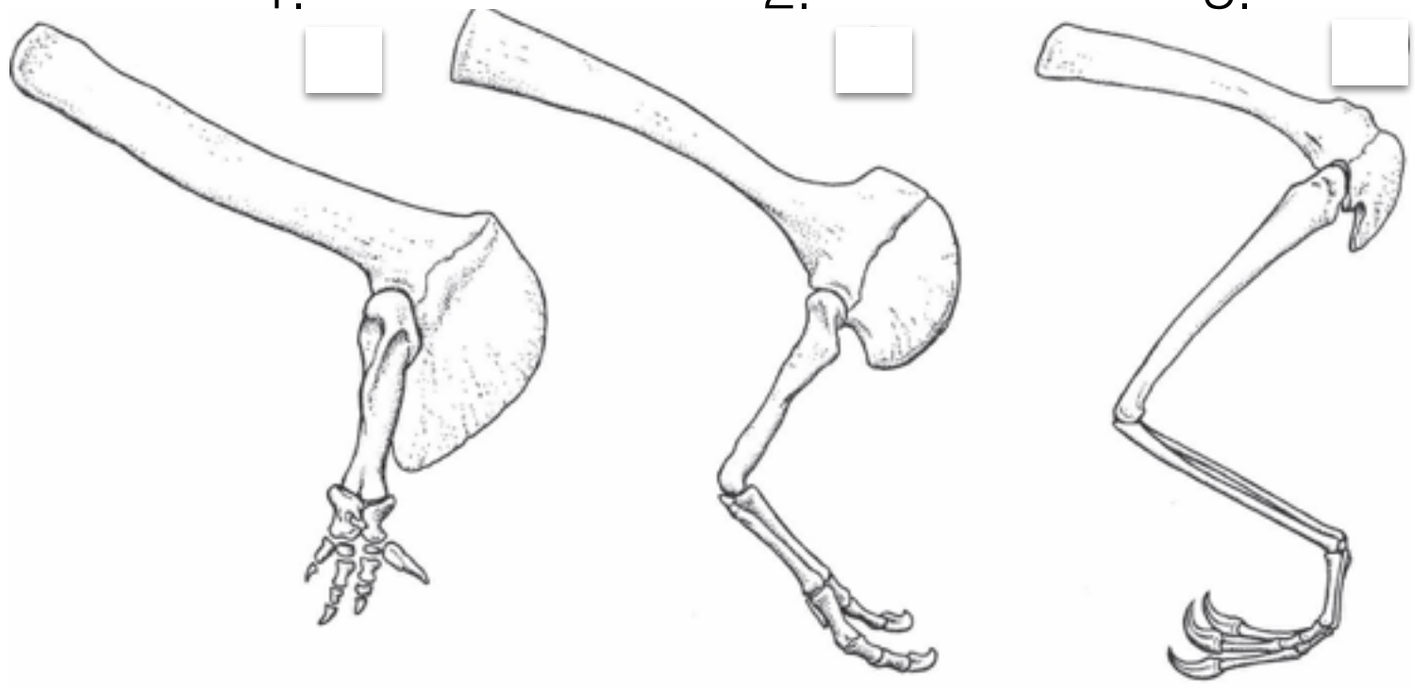
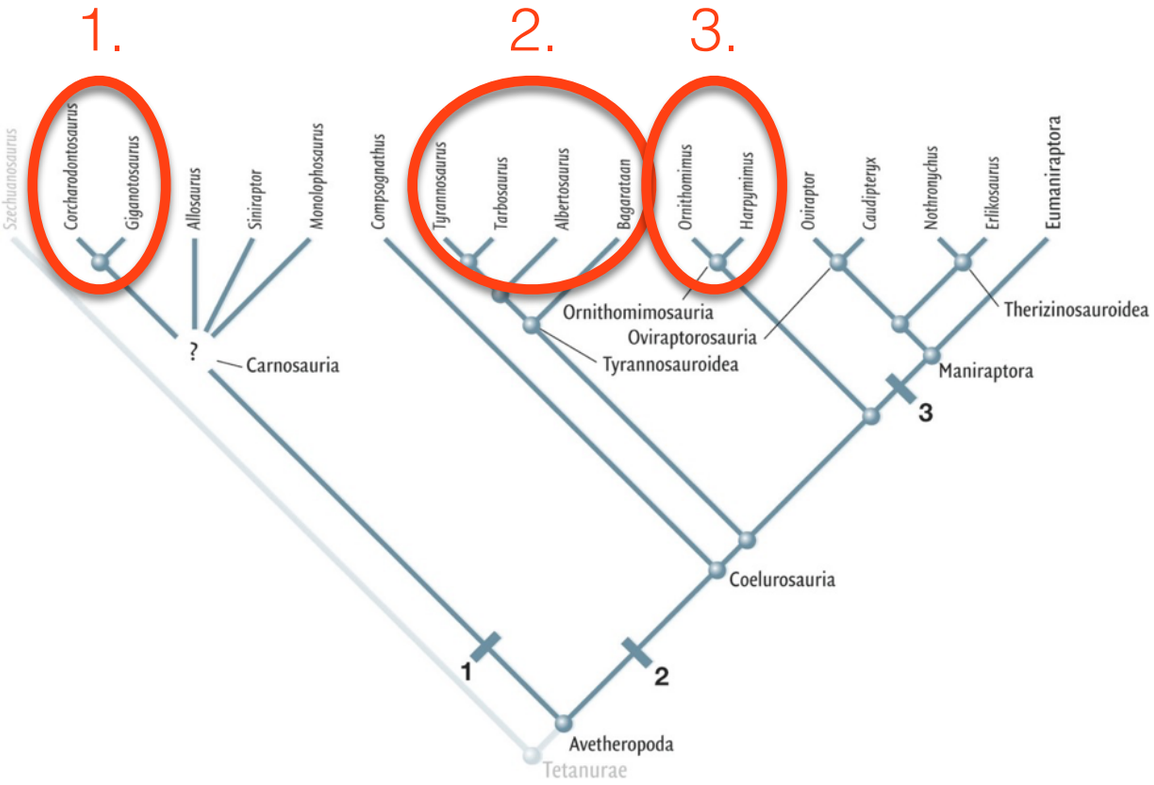
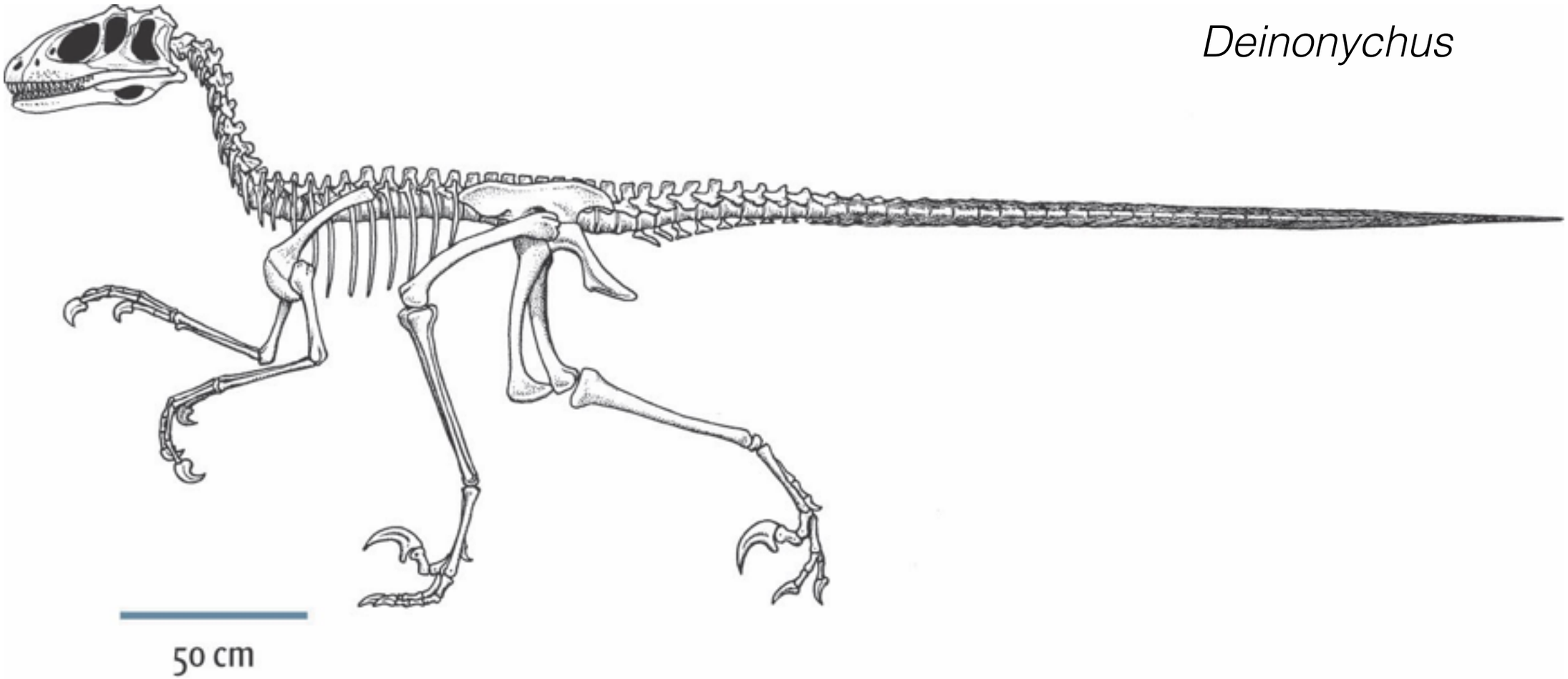
1. 2. 3.



Ceratosaur Tyrannosaur Ornithomimid



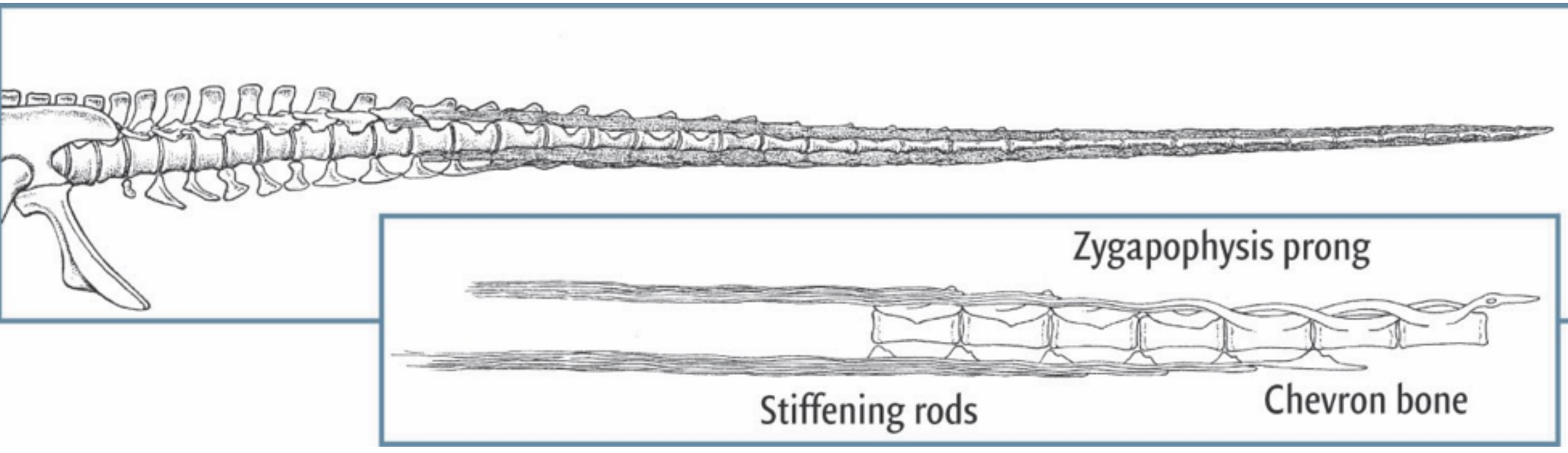
Theropods: Balance and speed



Deinonychus

Near horizontal vertebral column
Center of gravity positioned at hips
    allowed for quick pivoting
Some derived theropods had tails stiffened by elongate processes on neural arches
    Tail flexible at base for dynamic counter balance (cheetah)

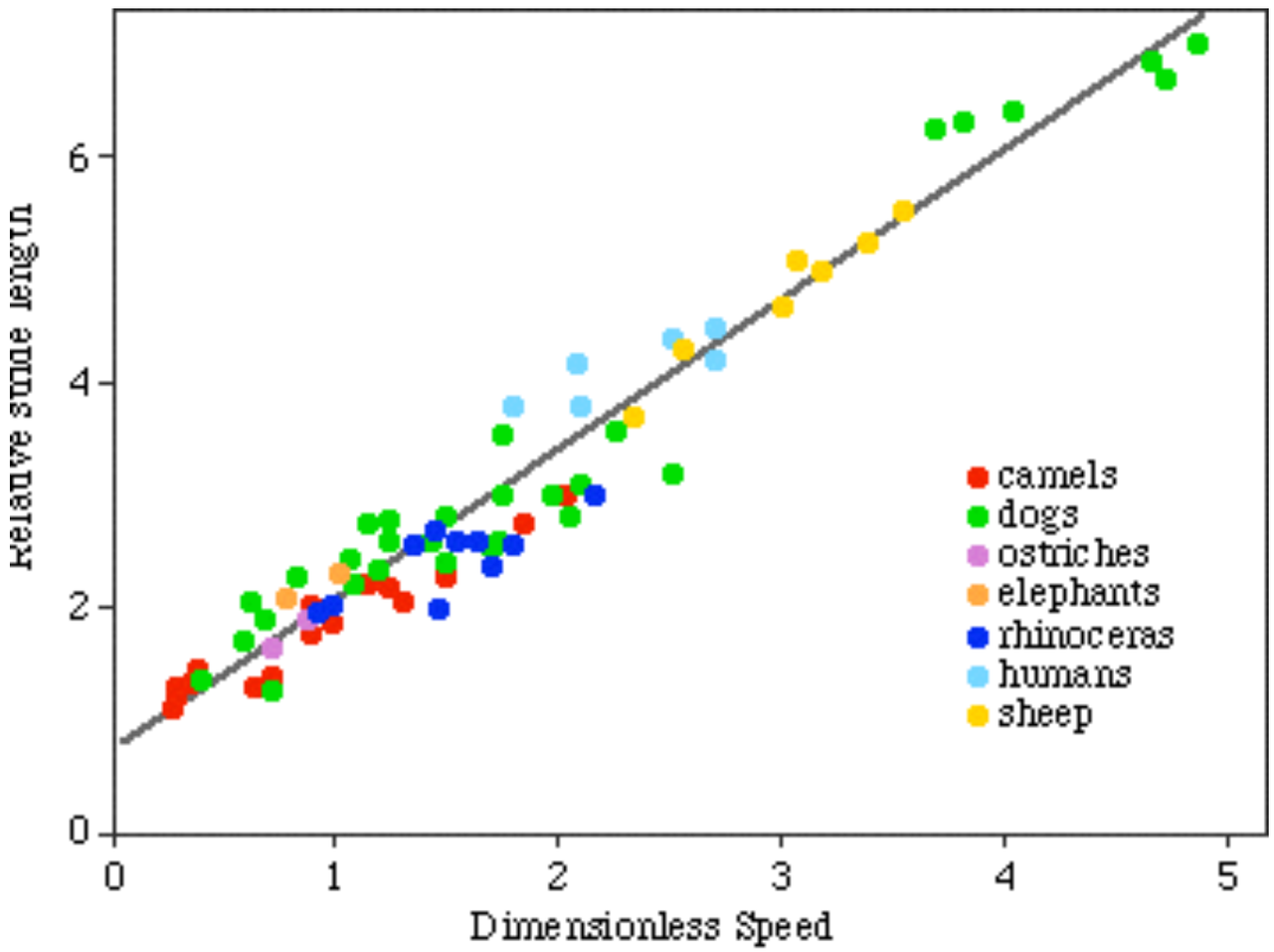
Theropods: Balance and speed

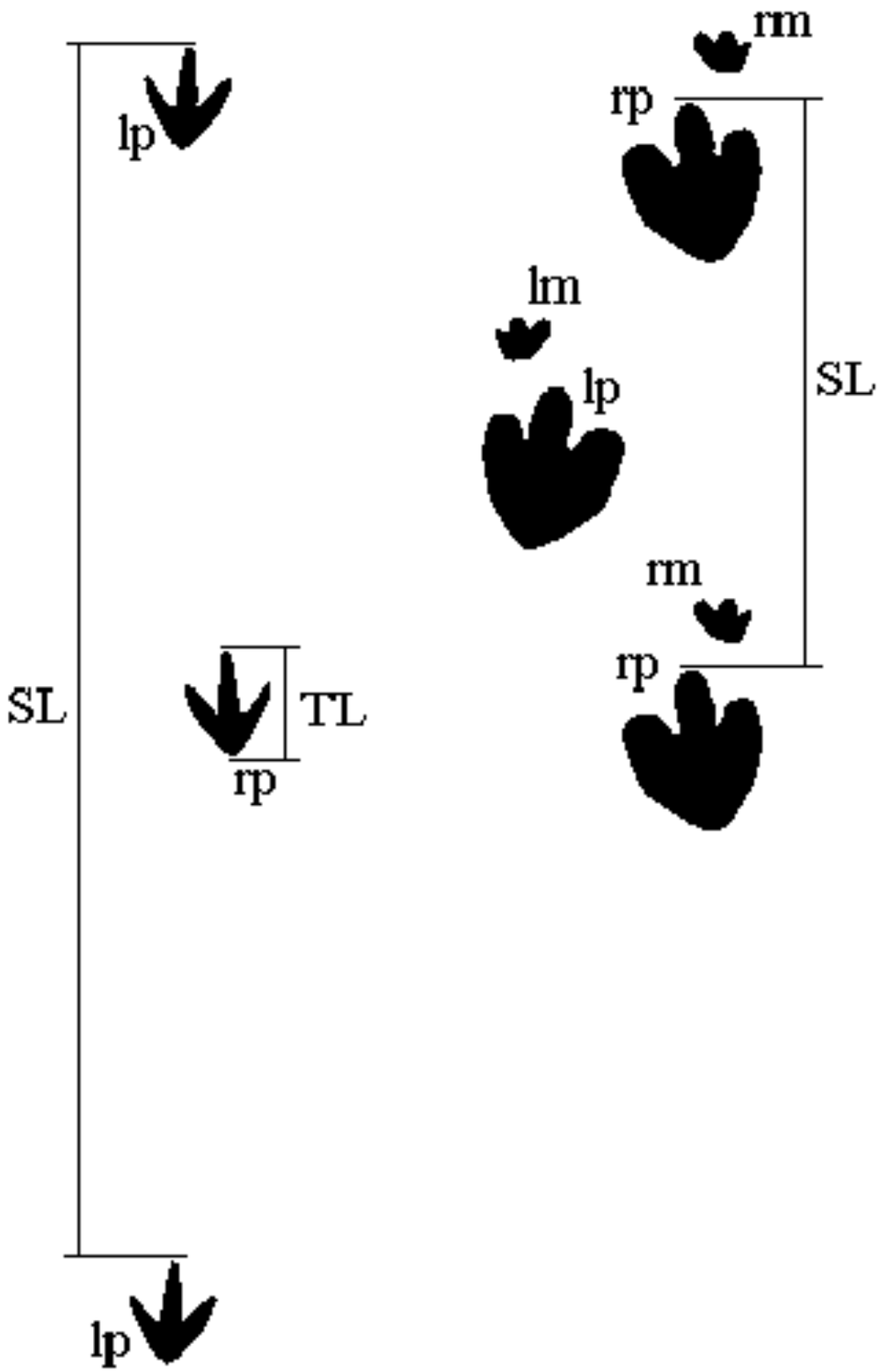


Persistence hunting: a bipedal invention

BBC

Theropods: Balance and speed



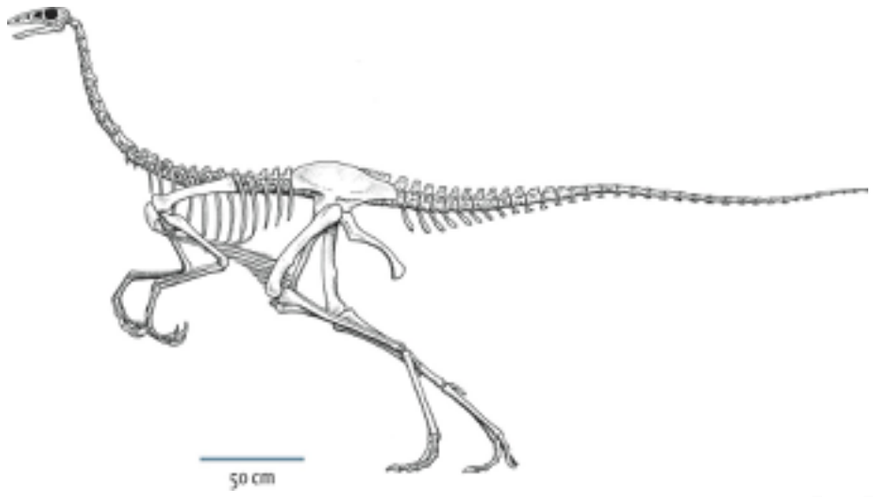


Locality	Est. Leg Length	Speed (km/hr)	Gait
large theropod	2.0	8	walk
small theropod	1.0	13	run
large sauropod	3.0	3.6	walk
small sauropod	1.5	4.0	walk
ornithopods	0.14-1.6	15.5-17.3	run
small theropods	0.13-0.22	11-12.6	run
small theropods	1.0	30-40	fast run
human runner	1.1	36	sprint
race horse	1.6	61.2	fast run
ostrich	1.5	54	fast run

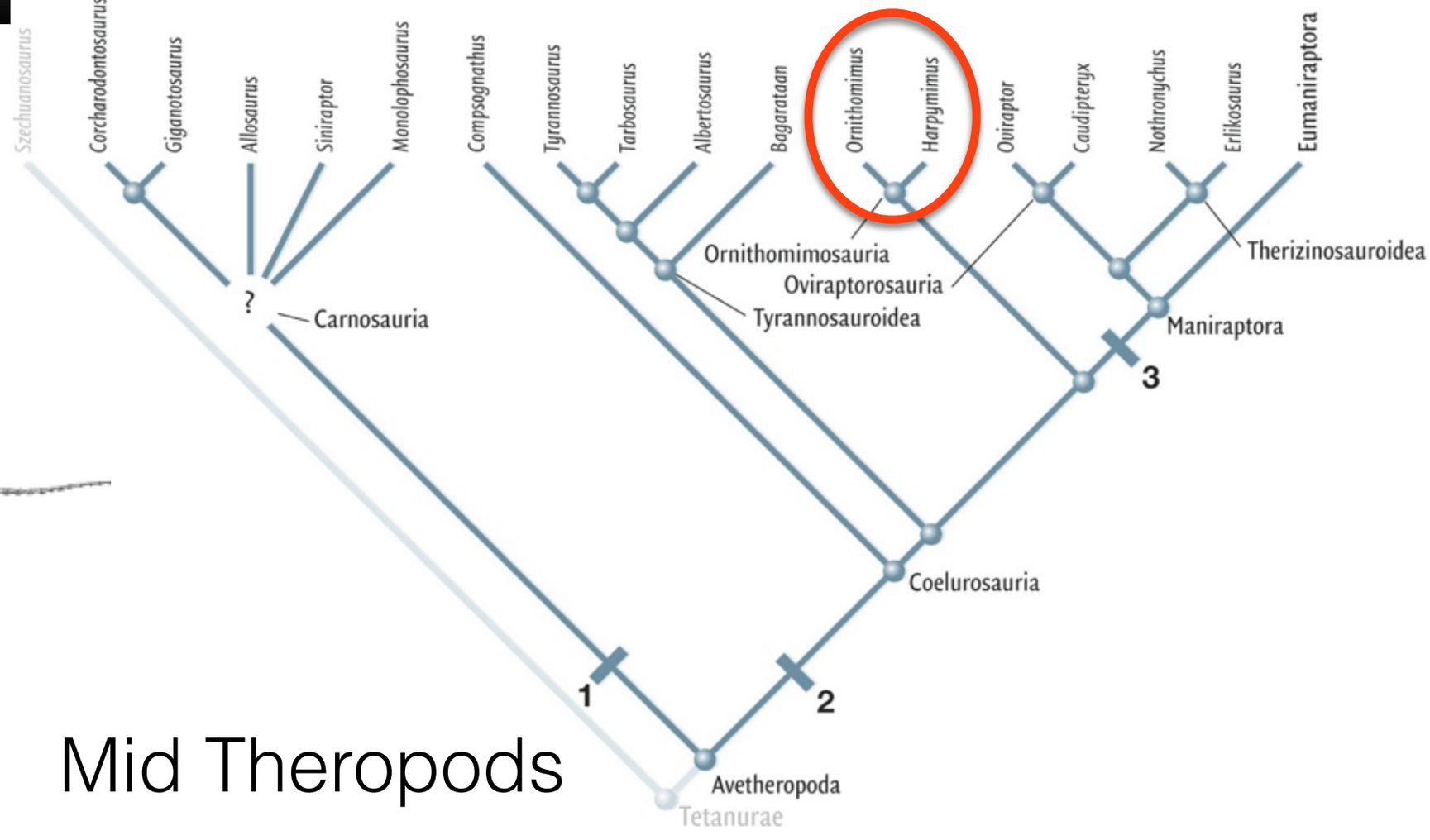
4.9 mph
8 mph
2.24 mph
2.48 mph
9.9 mph
7.4 mph
25 mph
22 mph
40 mph
33.5 mph (50 mph).... Cheetah: 75 mph

Theropods: Balance and speed
Ornithomimids

Cheetah speed? 80 mph



Struthiosaurus

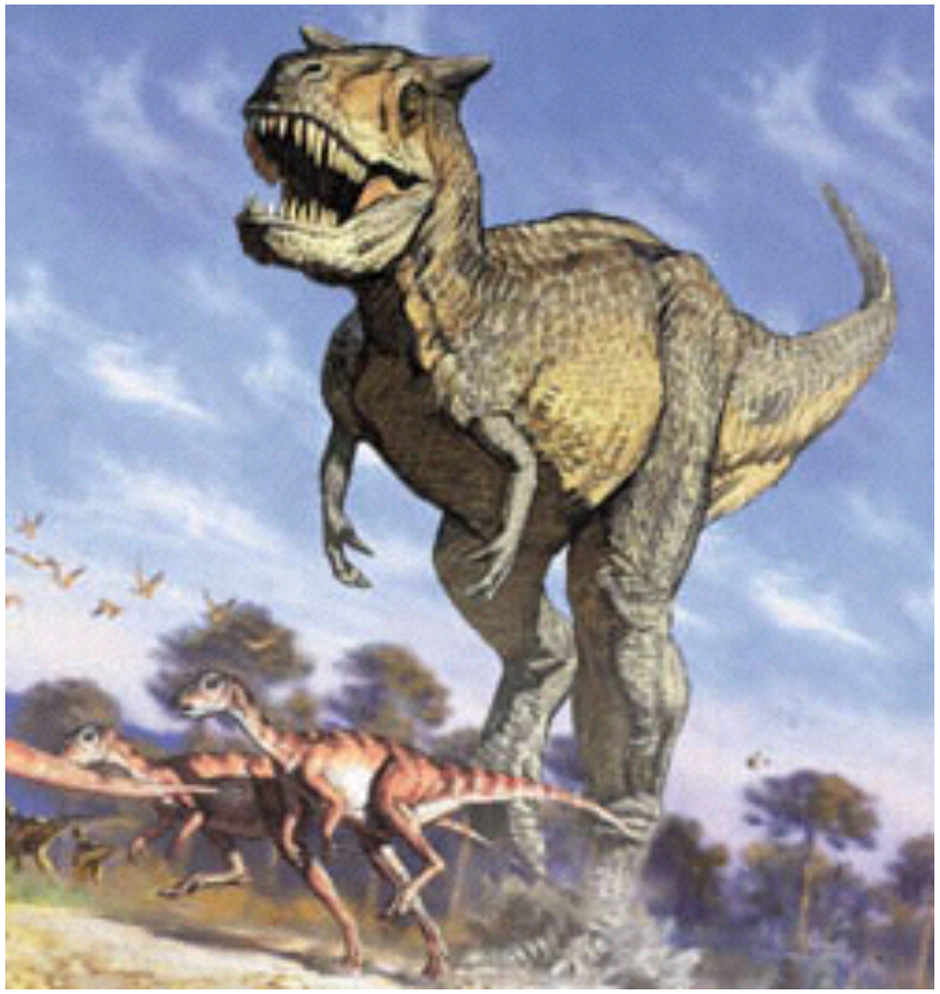


Mid Theropods

MOVIECLIPS.com

Theropods: Specializations
Cranial Ornamentation

Ceratosaurus: Nasal Horn



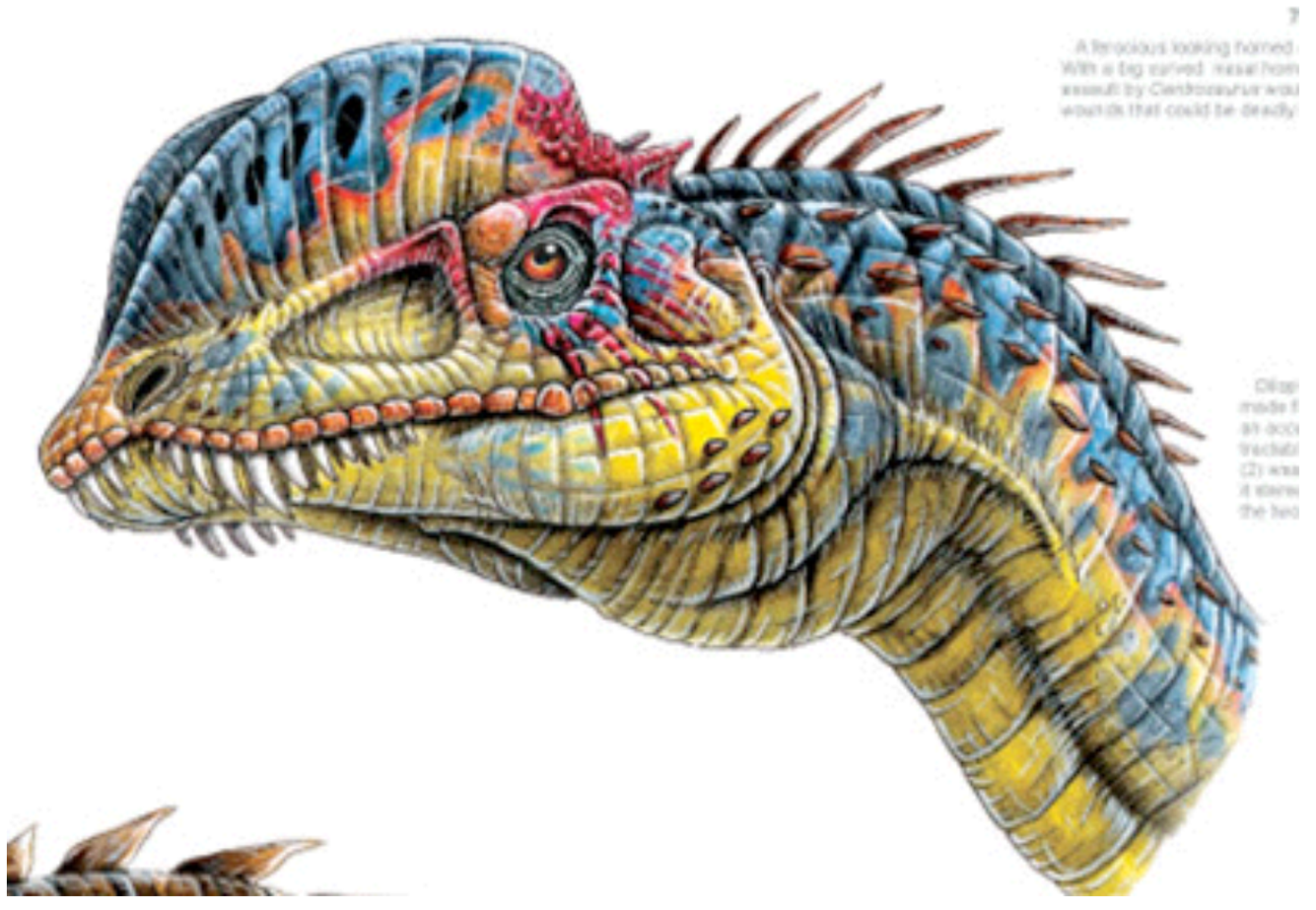
Carnotaurus: Above-Eye horns

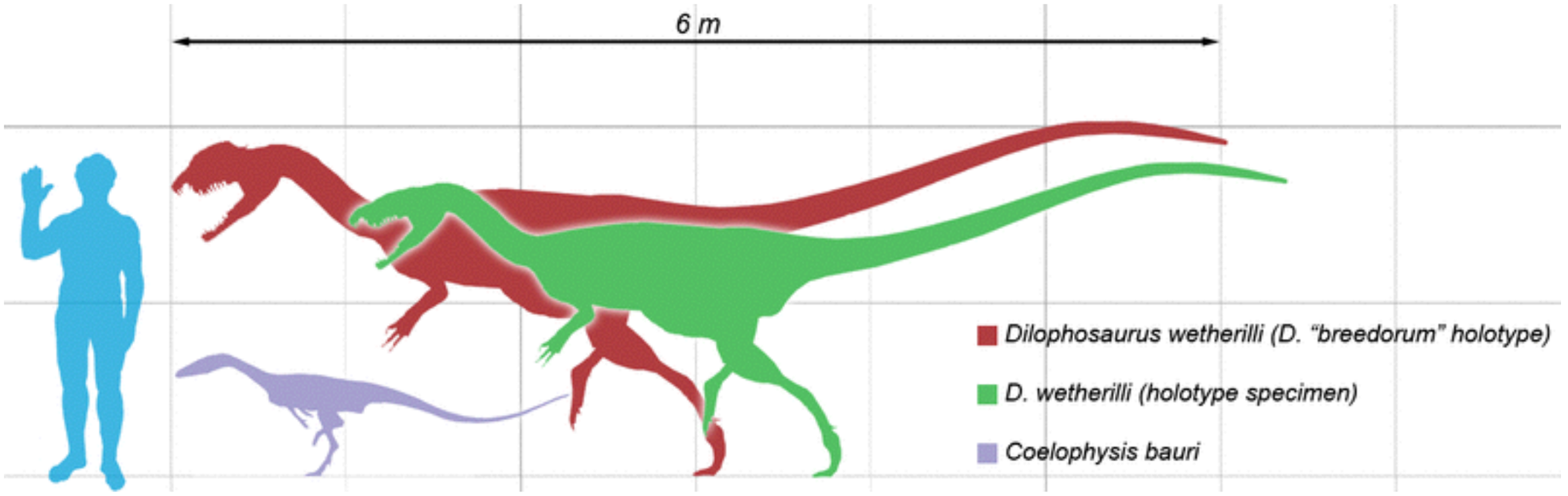
Allosaurus: Frontal-Eye horns

Tyrannosaurus: Rugosities on head

The most famous crested theropod…

Theropods: Specializations
Cranial Ornamentation



No evidence for frill or venom glands

Dilophosaurus: Basal Theropod