

Lecture 16: Cretaceous 3

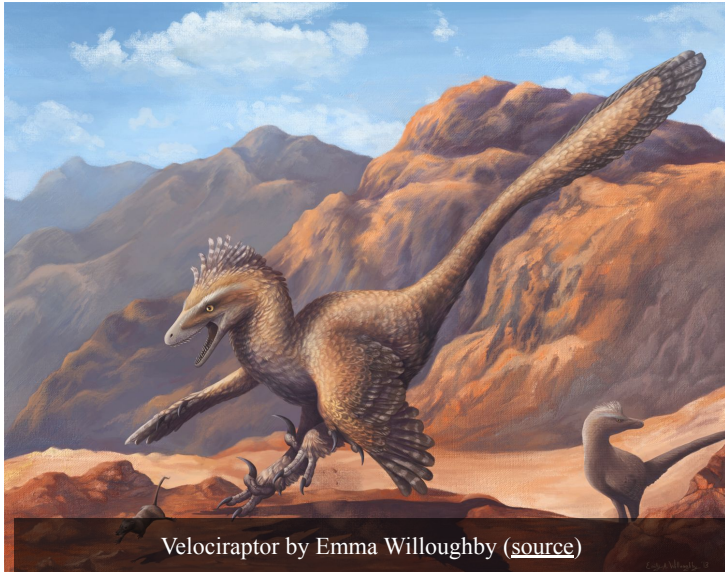


Tyrannosaurus and *Triceratops* by Vlad Konstantinov ([source](#))

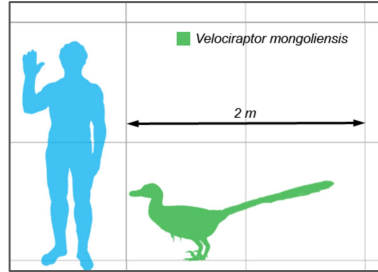
Key Taxon: *Velociraptor*

Velociraptor

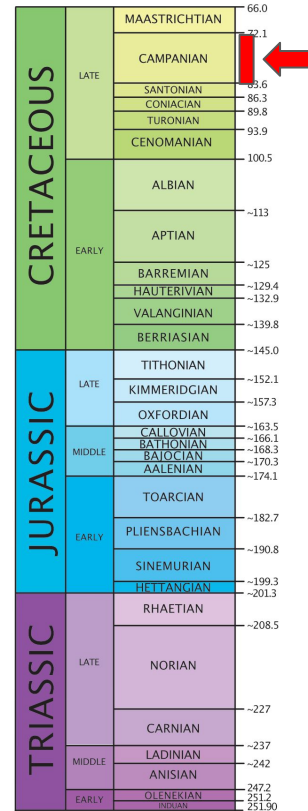
Greek: “veloci” = swift; “raptor” = thief



Velociraptor by Emma Willoughby ([source](#))



- Found in Asia
- ~ 6 ft long; ~40 lbs
-



Eoraptor versus *Velociraptor*

Morphology terms:

Anterior (head) /
posterior (tail)

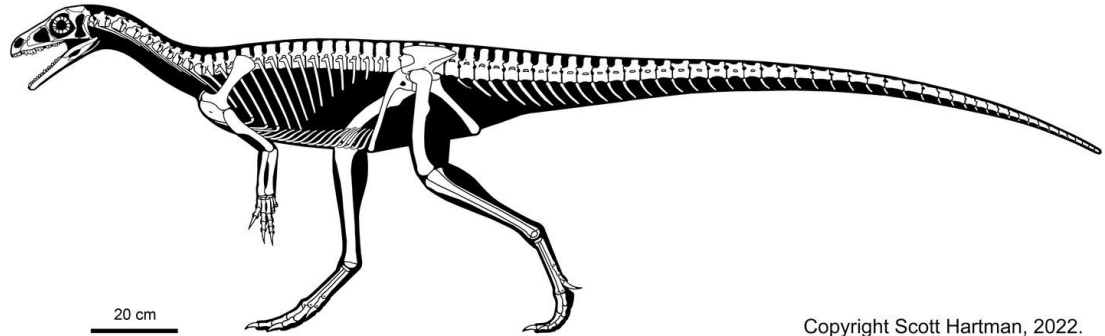
Dorsal ↑ \ Ventral ↓

Humerus : tibia ratio

Pelvis: pubis / ischium

Neural spines

Ossified tendons

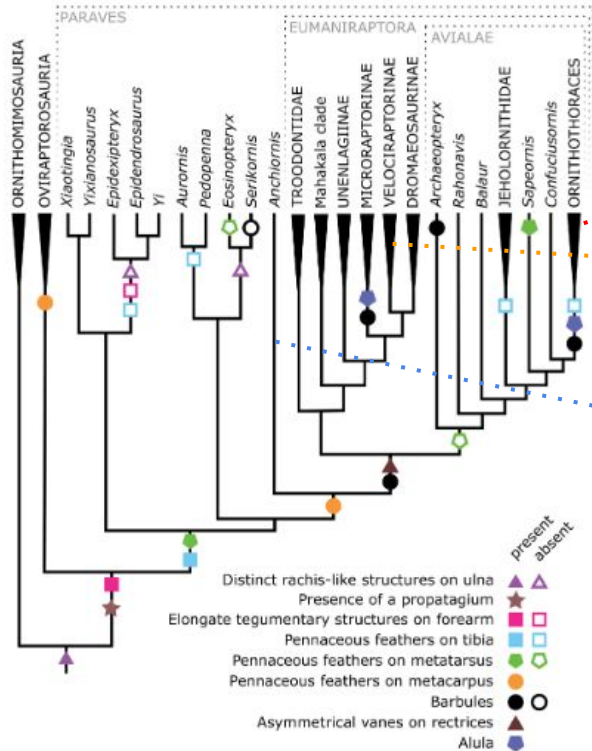


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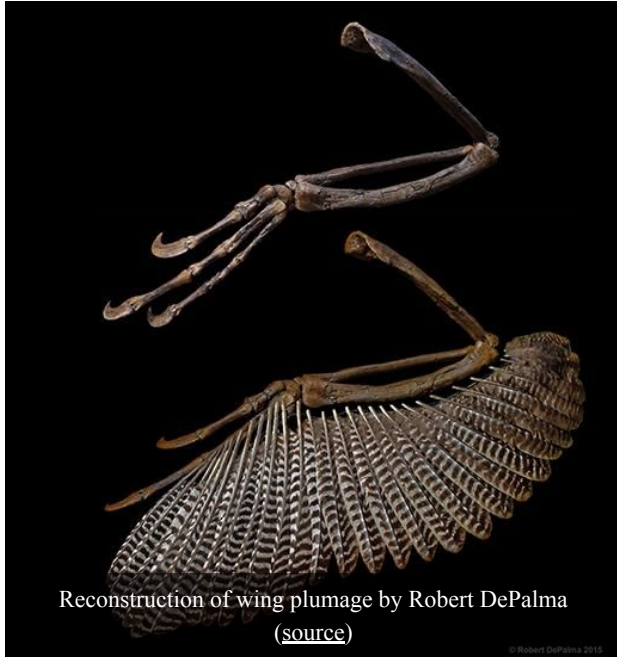
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Feathers? Phylogenetic Evidence



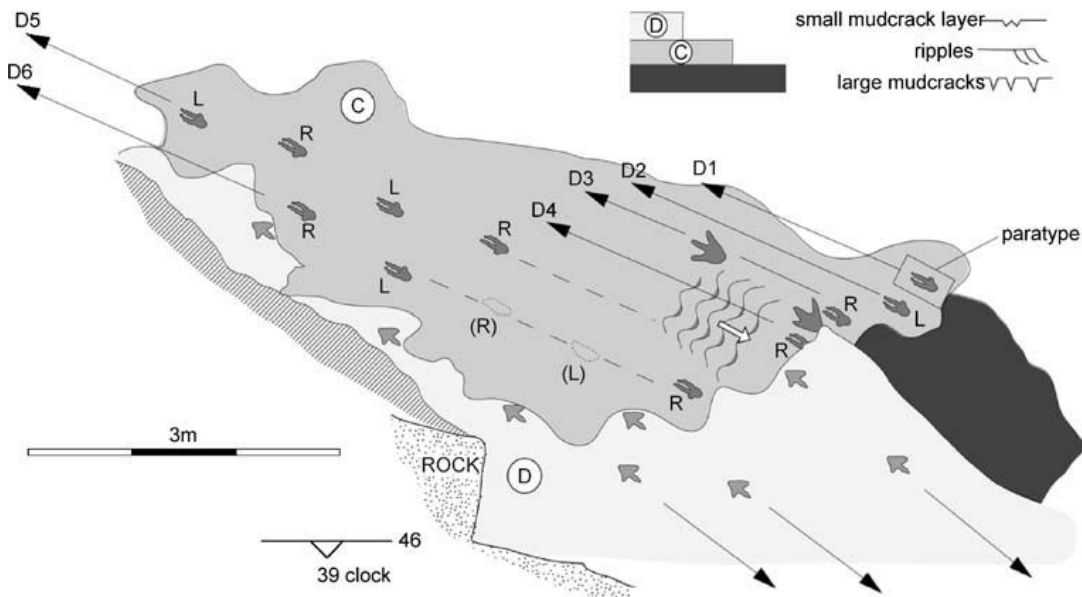
Lefèvre, Ulysse; Cau, Andrea; Cincotta, Aude; Hu, Dongyu; Chinsamy, Anusuya; Escuillié, François; Godefroit, Pascal (2017). "A new Jurassic theropod from China documents a transitional step in the macrostructure of feathers". *The Science of Nature*. **104** (9–10): 74.

Feathers? Fossil Evidence



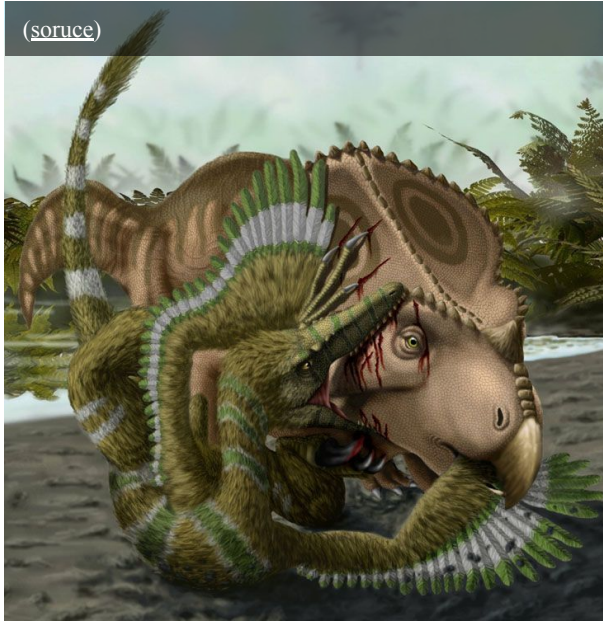
Turner, Alan H., Peter J. Makovicky, and Mark A. Norell. "Feather quill knobs in the dinosaur *Velociraptor*." *Science* 317.5845 (2007): 1721-1721.

Hunting behavior in *Velociraptor* ?



Li, Rihui; Lockley, M.G.; Makovicky, P.J.; Matsukawa, M.; Norell, M.A.; Harris, J.D.; Liu, M. (2007). "Behavioral and faunal implications of Early Cretaceous deinonychosaur trackways from China". *Die Naturwissenschaften*. **95** (3): 185–191.

Hunting behavior in *Velociraptor*



“Fighting Dinosaurs” fossil ([source](#))

Hunting behavior in *Velociraptor*



Key Taxon: *Tyrannosaurus*

Tyrannosaurus

Greek: “tyrannos” = tyrant; “saurus” = lizard

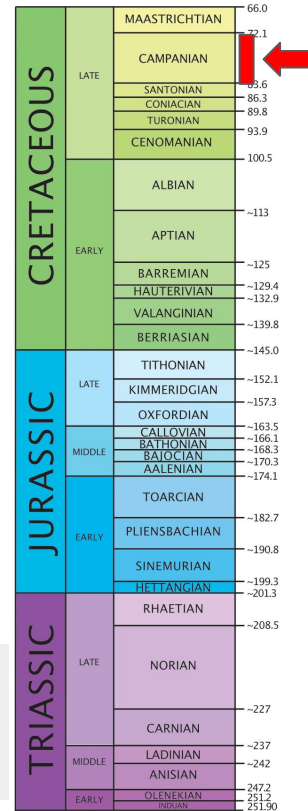


Tyrannosaurus by Mark Whitton ([source](#))

Common across N. America

~30-40 feet long

Fowler et al. (2012) How to eat a *Triceratops*: large sample of toothmarks provides new insight into the feeding behavior of *Tyrannosaurus*. *Journal of Vertebrate Paleontology* 32(5, abstracts vol): 96



Eoraptor versus *Tyrannosaurus*

Morphology terms:

Anterior (head) /
posterior (tail)

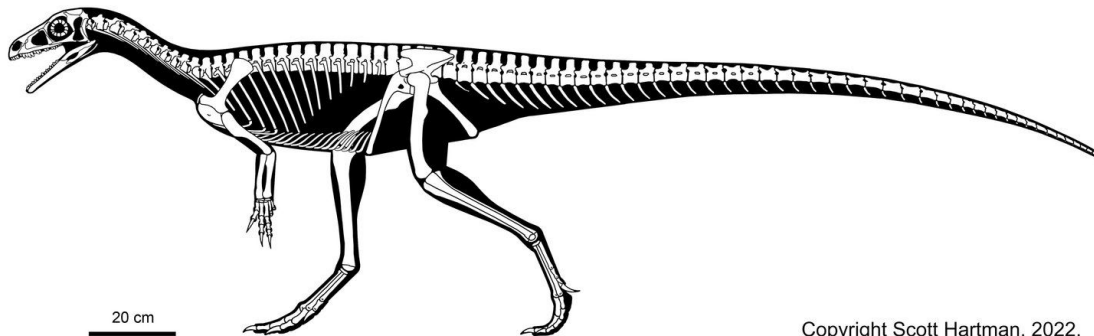
Dorsal ↑ \ Ventral ↓

Humerus : tibia ratio

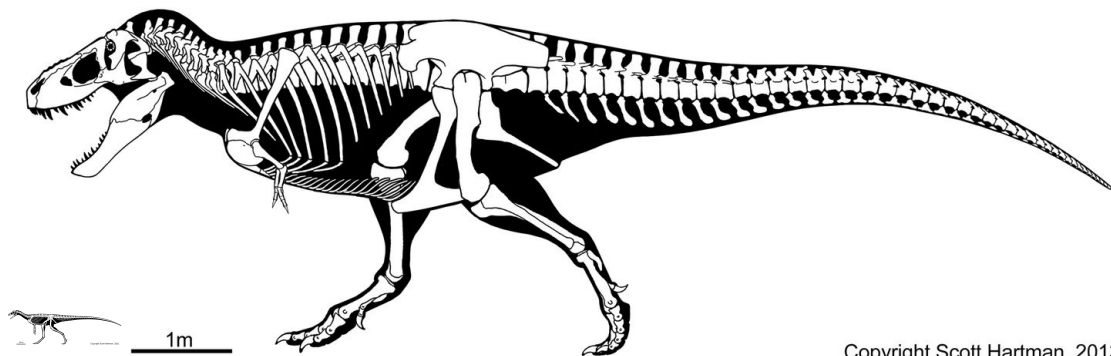
Pelvis: pubis / ischium

Neural spines

Ossified tendons



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Allosaurus vs. *Tyrannosaurus*



Allosaurus skull ([source](#))



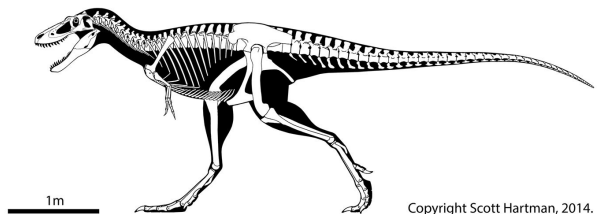
Allosaurus skull ([source](#))



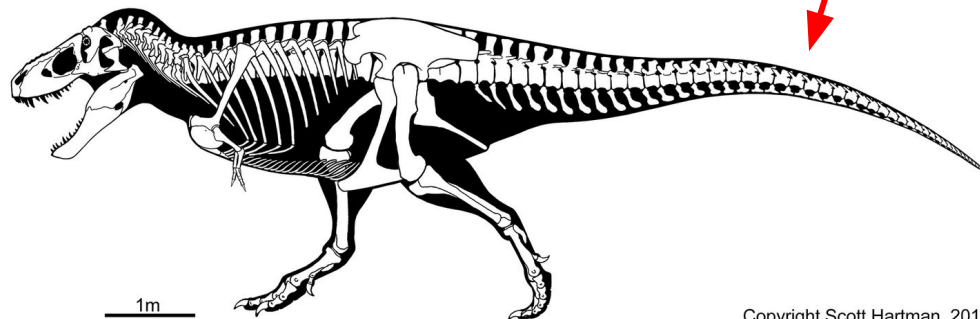
Tyrannosaurus skull ([source](#))

Tyrannosaurus skull ([source](#))

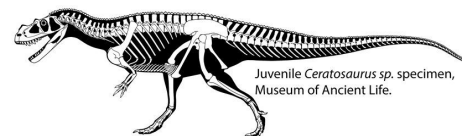
Tyrannosaurus growth vs. *Ceratosaurus*



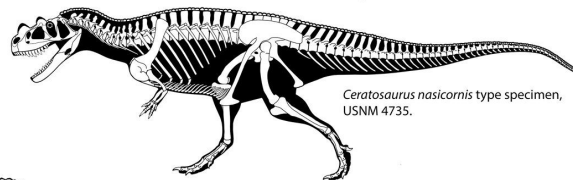
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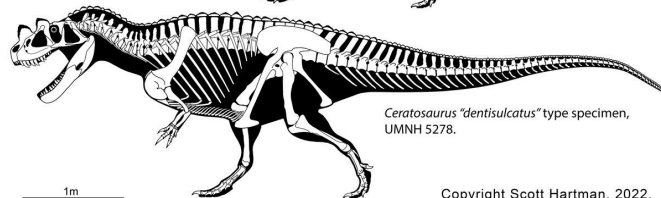
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Juvenile *Ceratosaurus* sp. specimen,
Museum of Ancient Life.



Ceratosaurus nasicornis type specimen,
USNM 4735.

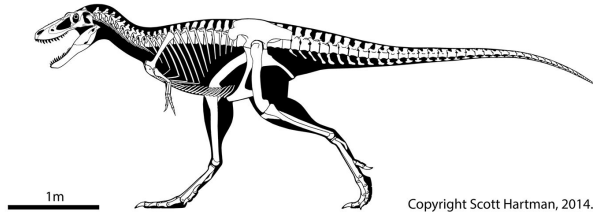


Ceratosaurus "denticulatus" type specimen,
UMNH 5278.

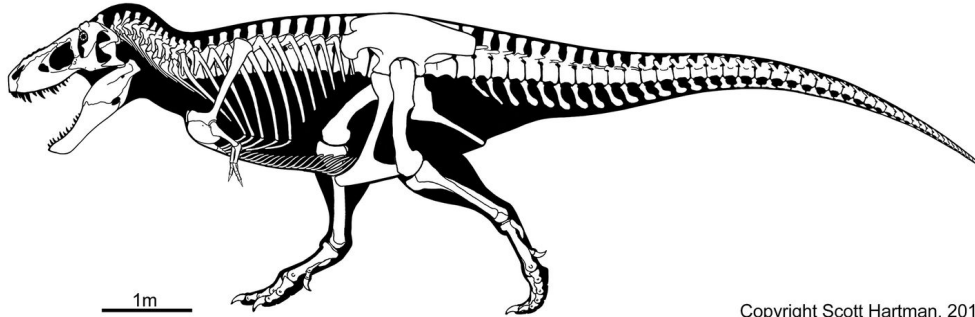
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Tyrannosaurus growth

- Delopmental niche partitioning
- Delopmental niche partitioning



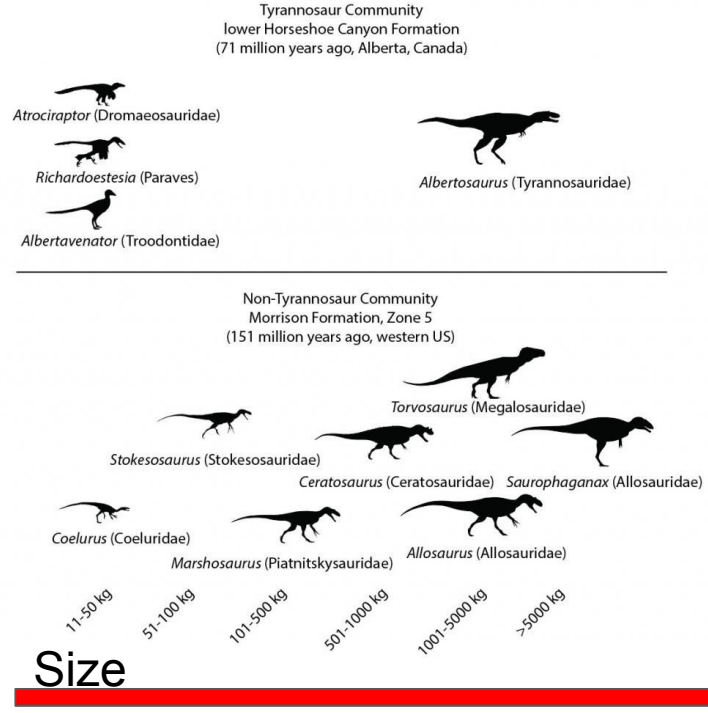
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Tyrannosaurus growth

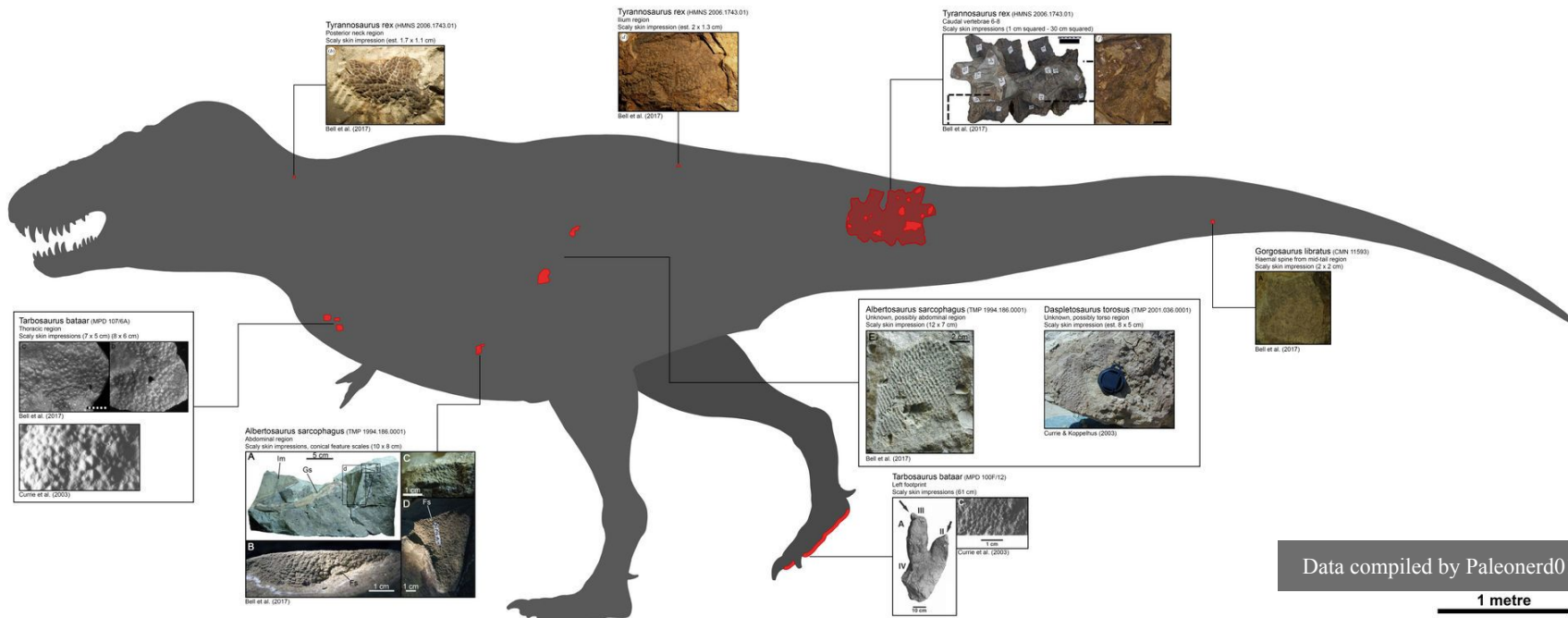
- Because of developmental niche partitioning, Tyrannosaurs were effective at outcompeting other medium to large predators
- Opposite of pattern seen in herbivores



Thomas R. Holtz. Theropod guild structure and the tyrannosaurid niche assimilation hypothesis: implications for predatory dinosaur macroecology and ontogeny in later Late Cretaceous Asiamerica. Canadian Journal of Earth Sciences, 2021

Silhouettes from PhyloPic.org. Originals by Tasman Dixon, Craig Dylke, FunkMonk, Scott Hartman, T. Michael Keesey, Matt Martyniuk, Dean Schnabel

Feathers?



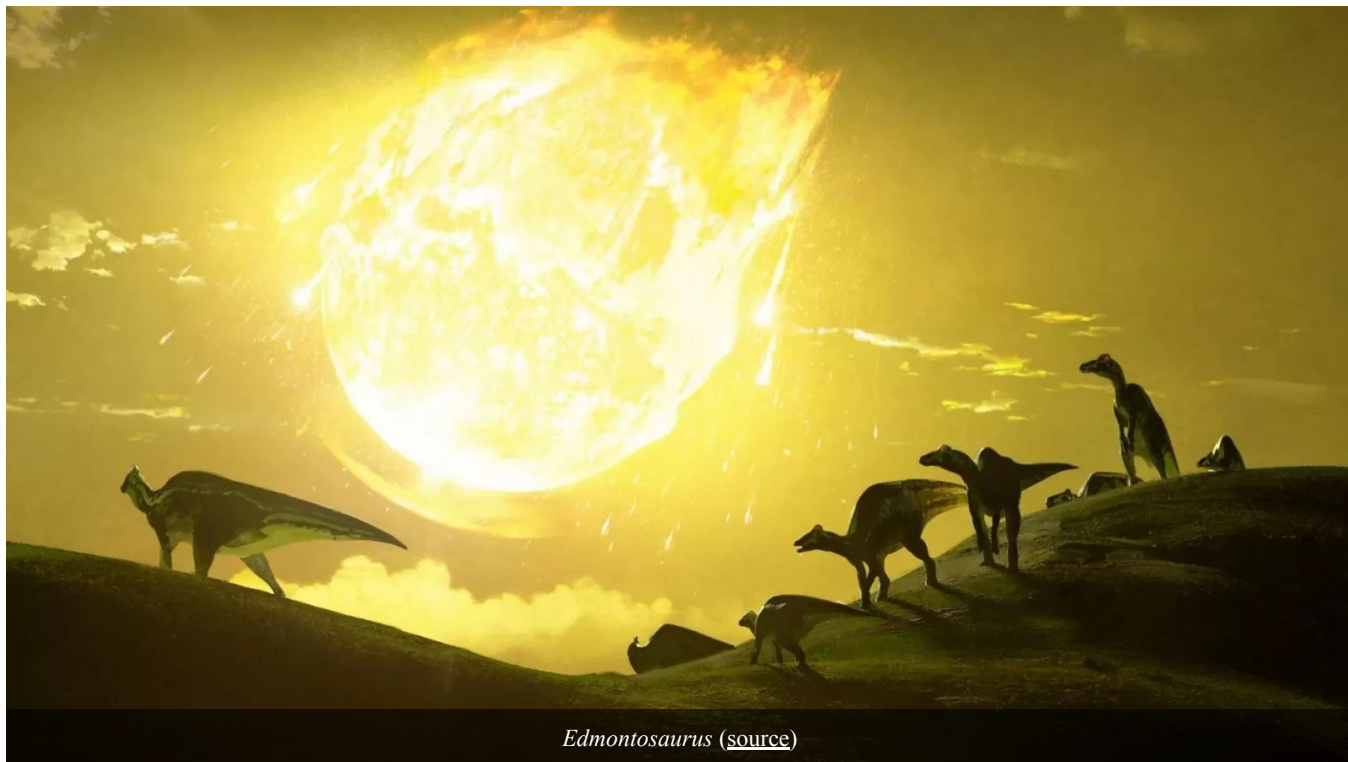
Data compiled by PaleonerD01 ([source](#))

1 metre

References

1. Bell, P., Campione, N., Persons, W., Currie, P., Larson, P., Tanke, D., Bakker, R. (2017). "Tyrannosauroid integument reveals conflicting patterns of gigantism and feather evolution." *Biology Letters*, 13(6), 20170092-.
2. Currie, P., Badamgarav, D., Koppelhus, E. (2003). "The First Late Cretaceous Footprints from the Nemegt Locality in the Gobi of Mongolia." *Ichnos*, 10(1): 1-13.
3. Currie, P. J., Koppelhus, E. B. (2015). "The Significance of the Theropod Collections of the Royal Tyrrell Museum of Palaeontology to Our Understanding of Late Cretaceous Theropod Diversity." *Canadian journal of earth sciences*, 52(8): 620-629.

Next class



Edmontosaurus ([source](#))

Tyrannosaurus hunting *Edmontosaurus*

