

**Welcome to the American Museum of Natural History!**

In the exhibition, you will investigate the famous predator *Tyrannosaurus rex*, or *T. rex*, its evolutionary tree, and its life history.



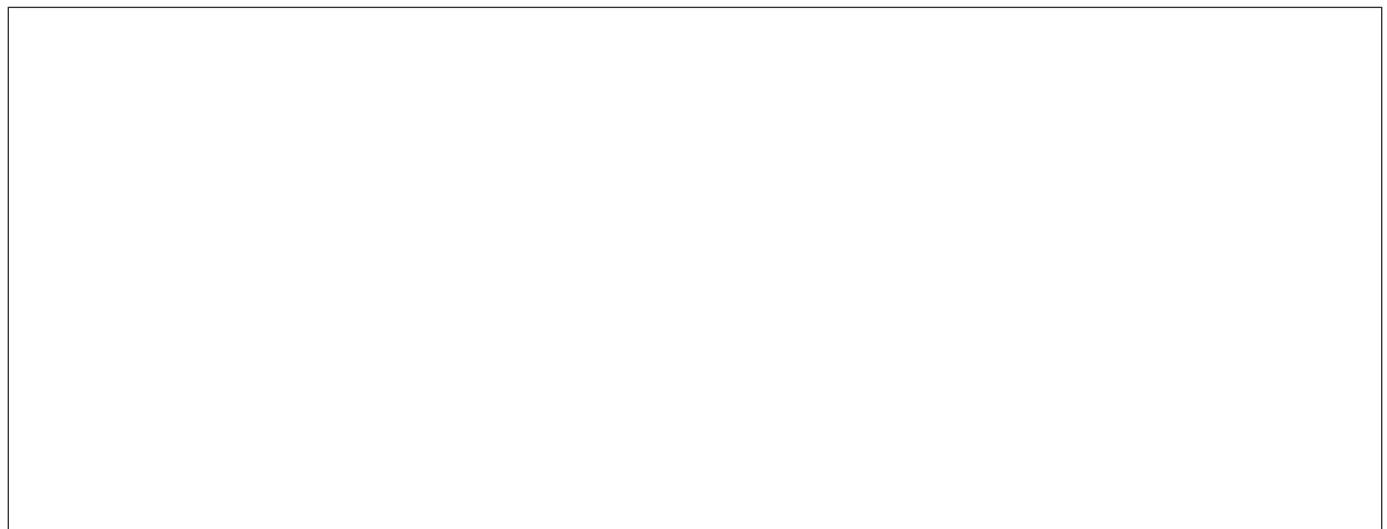
## 1. MEET THE FAMILY

Most tyrannosaurs were small and fast, unlike the gigantic *T. rex*.

**1a. Explore the “Meet the Superfamily” display.** What is a tyrannosaur?

**Answer:** Tyrannosaurs are a group of closely related dinosaurs that together form superfamily of Tyrannosauoidea. They range in size and their remains have been found around the globe.

**1b. Observe and read about the three tyrannosaur models** (*Proceratosaurus bradleyi*, *Dilong paradoxus*, *Xiongguanlong baimoensis*). Draw one of these three tyrannosaurs. Label its traits, noting how they compare to other tyrannosaurs, including *T. rex*.



**1c. Explore the “T. rex Traits” wall.**

What three traits do all tyrannosaurs share? Label them on the skull.

All tyrannosaurs share these traits. Where did these traits come from?

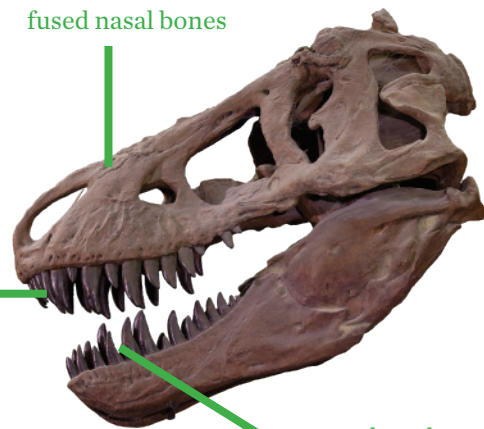
**Answer:**

They inherited them from their common ancestor.

**Answer:** fused nasal bones

front teeth are D-shaped in cross-section

serrated teeth



## 2. GETTING BIG

Every *T. rex* was once a helpless hatchling, most likely covered in fuzz like a duckling.

**2a. Observe and read about the model of the four-year-old *T. rex*.** Draw it and label the features that helped it live and survive into adulthood.

**Answers may include:**

- fast growth
- teeth are blade-like
- slim and lightweight body
- relatively light skull
- relatively long legs
- feathers covered entire body probably for warmth and camouflage

**2b. Read about *T. rex* growth and development.** How fast do scientists think *T. rex* grew? When did it reach maturity?

**Answer:** Scientists think *T. rex* grew at a maximum rate of 63.5 kilograms (140 pounds) per month. It reached maturity at 20 years of age; at that point it was 70 times as heavy as an average person.

**2c. Compare the fossil skulls and illustrations of the two-year-old *Tarbosaurus bataar* and the adult.** How is this species different at different ages?

**Answers may include:**

- Unlike the more delicate skull of the juvenile, the adult *Tarbosaurus* skull is heavy and sturdy, capable of producing a powerful bite without breaking.
- The juvenile's quick, agile body helped it hunt small animals and escape large predators; the adult's huge body is very similar to that of *T. rex*, a close relative.
- The juvenile had thin, bladelike teeth used for catching small vertebrates and insects; the adult has heavy, bone-crushing teeth and jaws, used to eat large animals.

Scientists think that juveniles and adults of predatory dinosaurs, such as *T. rex* and *Tarbosaurus*, and living reptiles, such as komodo dragons, occupied different ecological niches. What is an "ecological niche"? Why would this be advantageous to an animal?

**Answer:** Juveniles and adults occupy different ecological niches, thus avoiding competition and allowing the use of different resources.

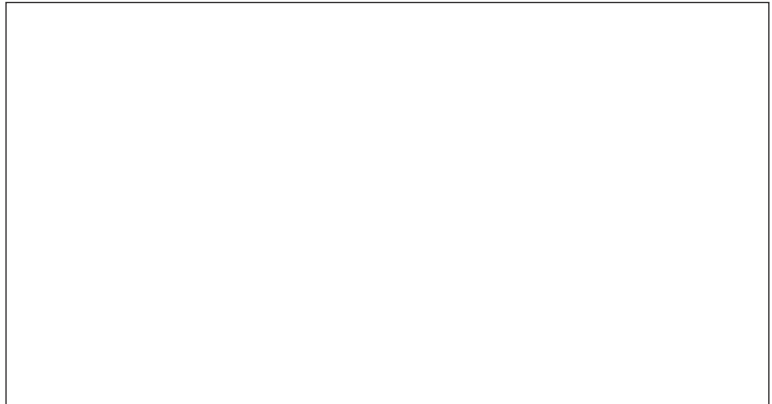
**2d. Explore the section about growth rings.** What evidence helps scientists figure out a dinosaur's age?

**Answer:** Scientists study the cross sections of fossilized dinosaur bones. Dinosaurs, like many living species, have growth rings. By counting the rings scientists can tell how fast the animal grew and how old it was when it died.

**3. GETTING BAD**

**3a. Explore fossils of teeth and jaw.**

Draw a *T. rex* tooth or part of the jaw with teeth in it. Label your drawing.



How do the teeth of *T. rex* help it kill and eat other animals?

**Answer:** *T. rex* could bite with enough force to crush bone. More than half of each tooth was embedded deep in the jaw to withstand immense pressure while biting.

How are lost teeth replaced? How is tooth replacement an advantage?

**Answer:** *T. rex* replaced its teeth in an alternating fashion, replacing each tooth once every two to three years. That meant the animals never became toothless and always had sharp new additions.

**3b. Explore the “Hidden Clues” interactive.** Fossilization usually preserves nothing but bones and teeth. But bones can contain clues about an animal’s musculature, movements, behavior, and even past injuries. Use the interactive to explore clues about how the animal lived. Pick one and answer the following:

Name of the skeletal feature: **Answers will vary.**

What does this evidence suggest? **Answers will vary.**

**3c. Explore the “Room at the Top” section.** Observe the skulls of extant mammal predators. How do scientists explain the coexistence of these top predators?

**Answer:** Top predators can avoid direct competition by hunting in different places, hunting at different times, or hunting different prey.

**3d. Explore the “Bone Crusher” section.** What evidence suggests that *T. rex* could bite through bone?

**Answers may include:**

- The *Edmontosaurus annectens* tail vertebra with an embedded *T. rex* tooth shows that this animal was attacked by a *T. rex* during its life and that *T. rex* had a powerful bite that could pierce bone.
- *T. rex* coprolite (fossilized poop) contains bone fragments that have rounded edges because they were partially digested.

#### 4. SENSITIVE SIDE

New research into this powerful hunter's senses shows that keen vision, smell, and hearing made it very hard for its prey to avoid detection.

**4a. Explore the "Big Brain" section.** Provide a specific piece of evidence that shows how a *T. rex* brain was well adapted for sensing and locating prey.

**Answers may include:** CT scans of fossilized *T. rex* skulls show that *T. rex* had a large olfactory lobe (powerful sense of smell) and large eyes (good vision).

**4b. Explore the "Touchy Feely" section.** What are the similarities between the skulls of tyrannosaurs and alligators?

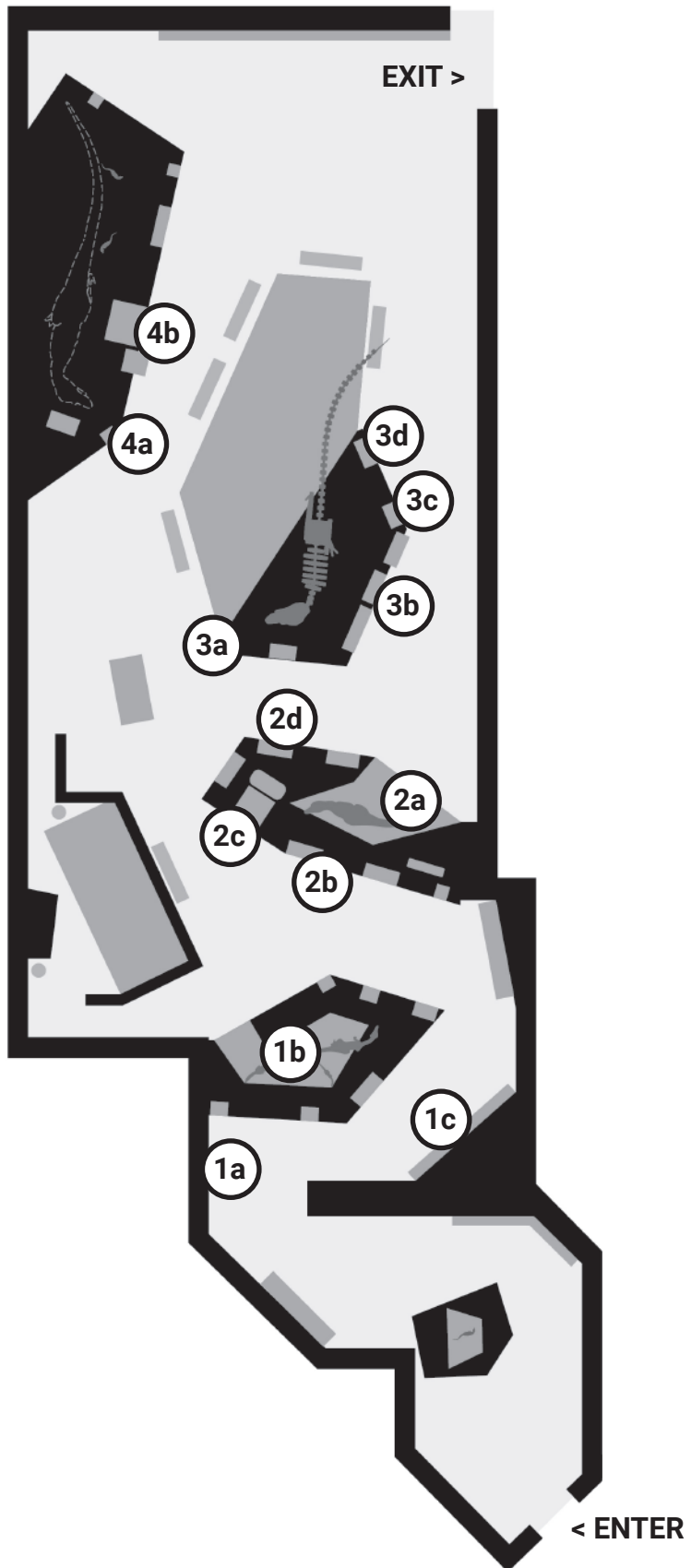
**Answer:** Tiny holes in the tyrannosaur skull are nearly identical in number and location to those in an alligator. Tyrannosaurs appear to have sense organs that are similar to the ones found in alligators.

What conclusions have scientists drawn using this evidence?

**Answer:** In alligators and crocodiles these organs make jaws so sensitive that they can gently pick up an egg or a tiny hatchling without harming it. Based on their similarity to *T. rex*, scientists comparing these fossils suggest that *T. rex* and other tyrannosaurs also had very sensitive faces.

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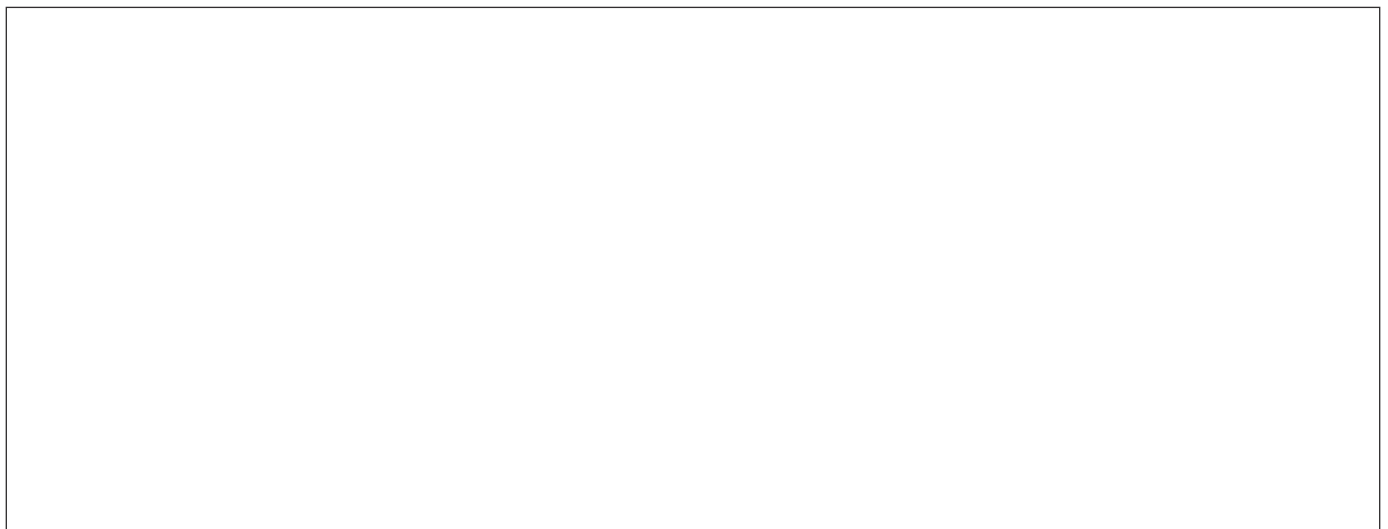
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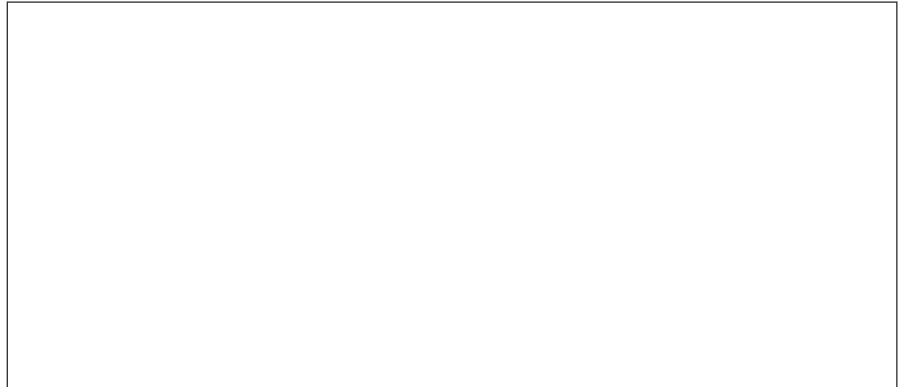
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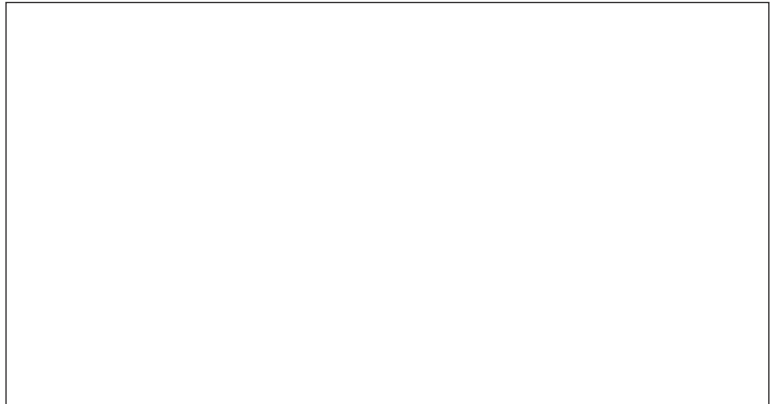
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