

# Pterosaurs

If things had worked out differently, you might see a tiny pterodactyl on your windowsill instead of a modern bird.

That's because pterosaurs evolved more than 80 million years before the earliest birds, with many of the same characteristics.

Pterosaurs had hollow bones, some with an even more sophisticated structure than birds; it's one of the things that allowed them to grow to such immense size: the largest pterosaur was bigger than an F-16 fighter jet, with a wingspan of 33 ft.

These gigantic beasts were able to launch themselves because they were quadrupeds, which allowed them to run to get airborne.

Pterosaurs may also have been warm-blooded like birds, as suggested by pelts of hair-like bristles found in the fossil record.

They appear to have had similar social structures to birds: they reared young in nests, and some species appear to have traveled in flocks.

Many pterosaurs sported eye-catching crests like today's birds. Theirs were made of bones and skin, but are thought to have served the same purpose of attracting mates.

Sharp-toothed predators, peg-toothed clam crackers, filter feeders living on lakes, pelican-like ocean fishers. Insectivores the size of today's cardinal. Swoopers, stalkers, and scavengers.

They did it all, they did it well, and they did it first!

Why did more than 200 species of pterosaurs perish when the Chicxulub asteroid struck, allowing birds to take their place? It's a mystery that scientists are still working to solve.



More commonly known as the “beak-snouted pterosaur” or “devil-tailed pterosaur,” this *Rhamphorhynchus muensteri* with its 2-m-wide wingspan was one of more than 30 species of long-tailed pterosaurs aloft during the Jurassic Period.

Credit: Mike Beaugard, Nunavut, Canada (devil-tailed pterosaur) (CC BY 2.0 [<https://creativecommons.org/licenses/by/2.0>]), via Wikimedia Commons



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# Background: Pterosaurs

**Synopsis:** Pterosaurs, reptilian cousins of dinosaurs, were the first vertebrates to fly under their own power—actively generating lift by flapping their wings. They lived for more than 160 million years; for the first 80 million years of that period, they were the sole vertebrates in the skies. What became of pterosaurs, and why don't we know more about them?

- Pterosaurs were specialized reptiles from a branch of the reptile family tree separate from that of the dinosaurs. They lived alongside dinosaurs for more than 160 million years.
  - They first appeared in the fossil record about 228 million years ago, in the Late Triassic Period. They continued to soar through Mesozoic skies, finally perishing with the dinosaurs 66 million years ago.
  - Pterosaurs became the largest flying animals of all time; the largest pterosaurs weighed in at over 500 lbs (227 kg) and had wingspans of up to 33 ft (10 m).
  - The ancestors of modern birds, the avian dinosaurs, evolved characteristics that eventually enabled them to join pterosaurs in the sky about 80 million years later—in the Late Jurassic Period, 150 million years ago.
- Cosimo Collini described the first pterosaur specimen in 1784.
  - Collini believed it was a seagoing creature that used its long appendages like paddles.
  - In 1801, Georges Cuvier was the first to propose that the animals could fly; in 1809, he gave them the name *Ptero-dactyle*, or “winged-finger.” He was one of the first people to suggest that reptiles dominated Earth before mammals.
  - Paleontologists now refer to the group as *pterosaurs*, or “winged reptiles.”
- Fossils of pterosaurs are rare because their bones were hollow; special circumstances of burial were required to prevent them from being crushed.
  - Pterosaur bones were made of laminated criss-crossing layers that resisted bending and breaking, similar to plywood.
    - Their bones had walls just fractions of an inch thick, with struts that crossed the hollow cores to prevent buckling. These special characteristics allowed them to grow larger and larger without adding too much weight.
  - Today, thousands of specimens represent more than 200 pterosaur species (compared to more than 1,000 dinosaur species).
    - New pterosaur species are still being discovered, although juvenile forms with different maturity levels have sometimes been mistaken for different species.
  - Luckily, some pterosaur fossil beds are so exceptional that delicate bones, wings, beaks, claws, skin, and even pelts have been preserved.
- Pterosaurs filled every imaginable aerial environmental niche—just like birds of today.
  - With such a long evolutionary period, pterosaurs had great variability in their sizes and shapes, teeth and beaks, necks and skulls, wing shapes, leg lengths, and foot sizes.
  - Pterosaurs ranged from small insectivores to sharp-toothed predators, from filter feeders living on lakes to peg-toothed clam crackers along coastlines, from pelican-like toothless ocean fishers to carnivorous terrestrial stalkers and scavengers.



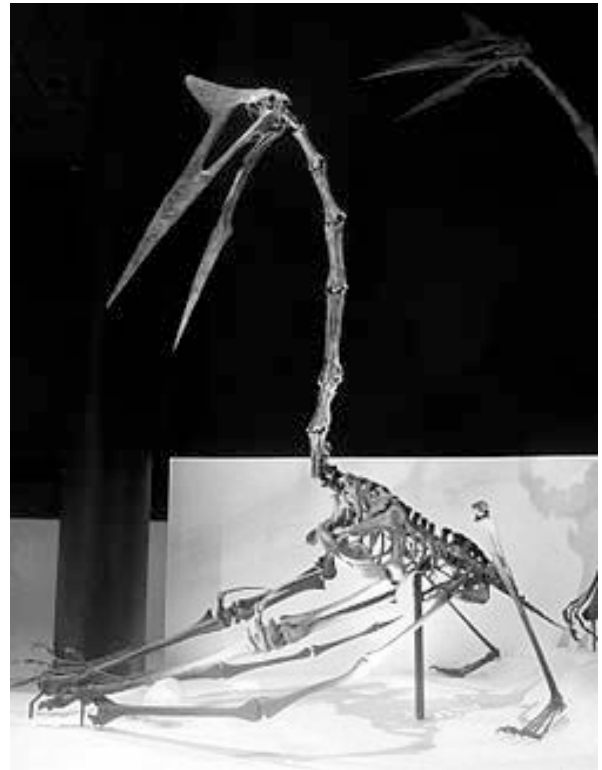
Fossil trackways show that pterosaurs were quadrupeds.

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## References: Pterosaurs

# Background: Pterosaurs

- Some pterosaurs had “pelts” of hair-like bristles on their heads and bodies, suggesting they were warm-blooded.
- Many adult pterosaurs had amazing crests on their heads that were bony, or membranes stretched between bones, or fleshy bulges.
  - These wild headdresses were likely not used as rudders or for heat regulation, as once hypothesized; they were probably used to recognize individuals of the same species and to attract mates.
  - Pterosaurs were social animals; some of them appear to have lived (and died) in large flocks.
  - Several fossil eggs with thin leathery shells have been found with baby pterosaurs at different developmental stages preserved inside.
- Scientists puzzled for many years over how these gigantic beasts launched themselves and stayed aloft. Avian dinosaurs and modern birds are bipedal (two-legged), but pterosaurs were quadrupeds (four-legged), which biomechanical studies show was key to their ability to get airborne.
  - Their wingspans ranged from the 10 inches (24 cm) of a cardinal to the over-33 ft (10 m) of an F-16 jet plane.
  - Although some old movies depicted pterosaurs picking up humans with grasping hawk-like talons, their feet were actually flat, with all their webbed toes pointing in the same direction.
  - When on the ground, they stood erect, with their bodies aligned above their feet and with their feet entirely on the ground.
  - The fourth digit on each hand was a ridiculously long finger that folded up backward when they were standing and supported the wing during flight.
  - Their large wings had membranes made of skin, muscle, and other connecting tissues that stretched from the long fourth digit to somewhere near the ankles.
    - Smaller membranes running from the wrist to the shoulder served as part of the leading edge of the wing during flight. Some species had additional membranes between their legs.
    - This assortment of tissues in their wing membranes enabled pterosaurs to change the camber, or curvature, of their wings, greatly enhancing lift.
  - To get into the air, pterosaurs used their folded forelimbs like pole vaulters to launch themselves into the sky. The tremendous power of their wings quickly lifted them into flight.
- Just like that of the non-avian dinosaurs, the entire line of pterosaurs was snuffed out 66 million years ago when the Chicxulub impact occurred. Why didn't any of these species survive and evolve along with birds? Researchers are still looking into this question.



Restored *Quetzalcoatlus northropi* skeleton in quadrupedal stance, Houston Museum of Natural Science.

Credit: Yinan Chen ([www.goodfreephotos.com](http://www.goodfreephotos.com) [gallery image]; public domain), via Wikimedia Commons

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