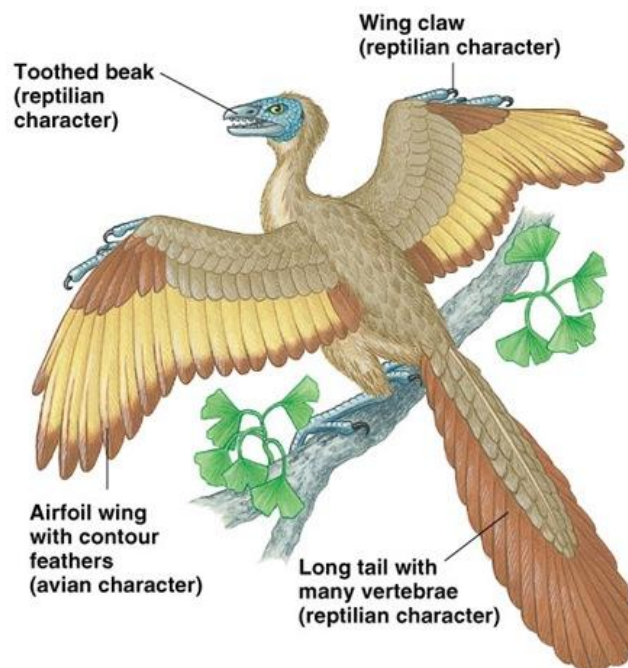


ARCHAEOPTERYX

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Archaeopteryx is a Jurassic fossil bird that shares both bird and reptile features. It is widely accepted as the earliest and most primitive known bird. Fossils show the presence of wings and feathers, as in birds, but also teeth (which modern birds do not have), claws on the wings, and a long, lizard-like tail, with tail vertebrae, such as with reptiles. The description of the first intact specimen in 1861 (two years after Charles Darwin published *The Origin of Species*), set off a firestorm of debate about evolution and the role of transitional fossils that endures to this day.

Archaeopteryx shared many anatomic characters with coelurosaurs, a group of theropods (carnivorous dinosaurs). In fact, only the identification of feathers on the first known specimens indicated that the animal was a bird. Unlike living birds, however, Archaeopteryx had well-developed teeth and a long well-developed tail similar to those of smaller dinosaurs, except that it had a row of feathers on each side. The three fingers bore claws and moved independently, unlike the fused fingers of living birds.



Archaeopteryx had well-developed wings, and the structure and arrangement of its wing feathers—similar to that of most living birds—indicate that it could fly; however, paleontologists disagree over whether Archaeopteryx engaged in powered flight (in a manner similar to modern birds) or whether it relied on gliding while in the air. A study of melanosomes (the pigmented, melanin-producing granules present in specialized skin cells called melanocytes) in the animal's feathers revealed that the feathers were black and that the arrangement of the granules within the feather's microstructure probably provided increased structural support to the wings, similar to the way it does in modern birds. Skeletal structures related to flight are incompletely developed, however, which suggests that Archaeopteryx may not have been able to sustain flight for great distances. Archaeopteryx is known to have evolved from small carnivorous dinosaurs, as it retains many features such as teeth and a long tail. It also retains a wishbone, a breastbone, hollow, thin-walled bones, air sacs in the backbones, and feathers, which are also found in the nonavian coelurosaurian relatives of birds. These structures, therefore, cannot be said to have evolved for the purpose of flight, because they were already present in dinosaurs before either birds or flight evolved.

Archaeopteryx continues to play an important part in scientific debates about the origin and evolution of flight. Some scientists see Archaeopteryx as climbing through the trees like a squirrel, following the idea that birds evolved from tree-dwelling gliders). Other scientists see Archaeopteryx as running quickly along the ground, supporting the idea that birds evolved flight by running. It was noted in the section above that the Thermopolis specimen showed the lack of a reversed toe, which is used by birds for perching, and thus supporting the idea of a terrestrial existence. So far, Archaeopteryx has perhaps produced as many questions as answers, and the latest findings on this fossil are unlikely to be the last word.