The Evolution of Birds and the Origin of Flight

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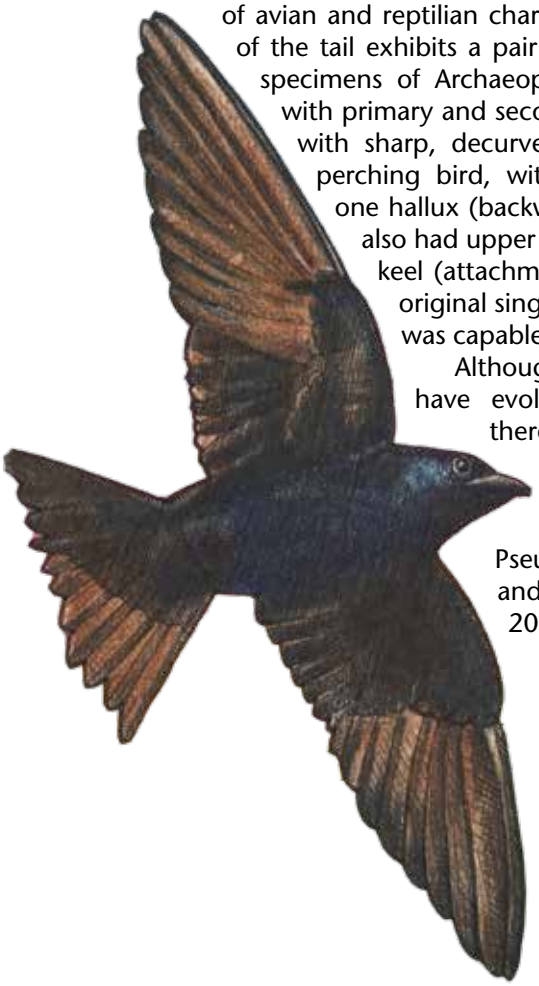
Archaeopteryx, discovered in 1860, is the oldest known bird dating back 150 million years. Scientists first found a single asymmetric secondary feather, then an entire specimen (Feduccia, 2001b). Its fossil was excavated out of Jurassic period limestone. Archaeopteryx, which has a long reptilian tail, is a "mosaic of avian and reptilian characteristics" (Feduccia 2001a). Each vertebrate of the tail exhibits a pair of tail feathers. There are only seven known specimens of Archaeopteryx. These specimens show wings with primary and secondary flight feathers; three fingers with sharp, decurved terminal claws; and feet of a perching bird, with three forward-facing toes and one hallux (backwards pointing first toe). Archaeopteryx also had upper and lower teeth and a sternum, but no keel (attachment sight for the flight muscles). The original single feather proved that Archaeopteryx was capable of powered flight (Feduccia 2001a).

Although most scientists agree that birds have evolved or descended from reptiles, there is much debate over which group of reptiles birds evolved from and during which time period they evolved. Two theories are the Pseudosuchian thecodont hypothesis and the Dinosaur Theory (Feduccia 2001a, Gill 1995).



Pseudosuchian Thecodont

The Pseudosuchian thecodont hypothesis suggests that birds evolved roughly 230 million years ago (early to mid Triassic period) from small arboreal thecodonts. Thecodonts are reptiles from the Mesozoic that have teeth in sockets and an opening on each side of the skull in front of the eye socket (Feduccia 2001a).

Dinosaur Theory

The Dinosaur Theory suggests that birds evolved about 150 million years ago from theropods, or bipedal, carnivorous dinosaurs. The two theories differ in the timing of appearance of the first birds and also the lines of descent. The group of theropods thought to have given rise to birds existed in the Cretaceous period, 80 million years after Archaeopteryx (Feduccia 2001a). The Dinosaur Theory is widely accepted by vertebrate palentologists, but ornithologists are skeptical. Flight evolving from ground-dwellers (the theropods) is nearly (albeit not completely) impossible.

Along with theories of evolution come theories for the evolution of flight. Scientists believe that feathers evolved from scales. There are several theories for the evolution of flight: Ground-Up (Cursorial) Theory, "Insect-Net" Theory, and the Trees-Down (Arboreal) Theory.

Ground up Theory

The Ground-Up Theory said that ancestors of birds ran along the ground, jumping into the air. Wings and feathers then evolved to aid them in propulsion, and flight evolved (Feduccia 2001a, Gill 1995). This theory is linked closely with the Dinosaur theory described above.

Insect Net Theory

Proponents for the "Insect-Net" Theory described Archaeopteryx as a small, terrestrial dinosaur that used its wings to catch insects (Feduccia 2001a). They hypothesized that the forelimb feathers elongated to become more efficient for catching prey. Eventually, the motion used to capture insects evolved into flapping flight (Feduccia 2001a). This is a variation of the Ground-Up Theory and is also linked to the Dinosaur Theory.

Trees Down Theory

The Trees-Down Theory is the most widely accepted theory because it does not contradict any evidence from either Archaeopteryx or any other fossil finds. This theory states that the ancestors of birds were tree-dwellers that jumped from branch to branch (Feduccia 2001a). Wings and feathers developed, allowing them to glide and fly. This concurs with the Pseudosuchian thecodont hypothesis.

Literature Cited

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