INCREASING EVIDENCE FOR AN ARBOREAL ORIGIN OF DINOSAUR-AVIAN FLIGHT, AND FOR LOSSES OF FLIGHT IN POST-ÜRVOGEL DINOSAURS

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The hypothesis that birds descended from climbing predatory dinosaurs predicts that the theropods closest to *Archaeopteryx* should have been well adapted for grasping branches rather than specialized for running. The most ürvogel-like dinosaurs were *Sinornithosaurus* and *Microraptor*. Both had numerous arboreal adaptations, the foot of *Microraptor* was better proportioned for grasping branches than that of *Archaeopteryx*. Adult *Microraptor* were smaller than adult *Archaeopteryx*, disproving claims that no dinosaur was small enough to be an arboreal glider. The fossil record is beginning to favor a predominantly arboreal over a cursorial origin for avian flight.

The hypotheses that the most bird-like dinosaurs were secondarily flightless, and closer to modern birds than the ürvogel, predict that the former should have reduced bird-like and flight related characters as they evolved in the Cretaceous. The waisted teeth, distally elongated toes and abbreviated tail of the basal sickle claws *Sinornithosaurus* and/or *Microraptor* were more bird-like than those of more derived dromaeosaurs. The short tail of *Microraptor* was also a flight character lost in later sickle claws. Basal *Beipiaosaurus* was more bird-like than more derived therizinosaurs in the carpals and other respects. With short arms bearing symmetrical feathers, large sternal plates, ossified sternal ribs and uncinates, and a very short tail, *Caudipteryx* had the characteristics predicted in a dino-bird that descended from fliers more advanced than *Archaeopteryx*, and entirely lacked the attributes expected in a protoflier. The Cretaceous may have seen a radiation of neoflightless, post-ürvogeldinosaurs.