

# Feathers + wings = bird

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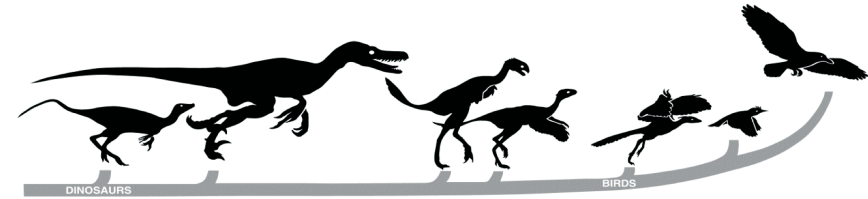


Paleontology was forever changed with the 1996 unveiling of the small Chinese Cretaceous dinosaur *Sinosauropteryx*, sporting a mane of thick filaments along its back. With only a small black and white photo, the *New York Times* proclaimed that the structures were some sort of proto-feathers and somehow supported the theory that birds were dinosaur derivatives. The discovery was the apparent culmination of a paleontological revolution that started in the late 1960s when Yale's John Ostrom discovered the birdlike dromaeosaur *Deinonychus*, reviving the hypothesis that birds evolved from dinosaurs. The hypothesis implied that flight must have originated from the ground up. The view for most of the 20th century was that birds originated from small tree-dwelling archosaurs (antecedents of dinosaurs) that developed flight by the more logical route taken by all other airborne vertebrates — parachuting and gliding, from the trees down.

The next shock came just two years later when the editor of *Nature* triumphantly announced 'the debate is over.' The cover story featured two putative dinosaurs, *Protarchaeopteryx* and *Caudipteryx*, with true avian pennaceous flight feathers on the wing. These discoveries codified birds as living dinosaurs, and established this mantra as the keystone discovery of modern paleontology. Yet, these discoveries were not properly vetted and lacked normal scientific stringency. The field abandoned the normal scientific falsification approach in favour of simply working to confirm what was already thought to be known. Quickly a consensus was achieved, and all disbelievers of the orthodoxy were banished.

Before long, fantastical proposals — ranging from diverse hot-blooded dinosaurs sporting proto-feathers, to dinosaurs with bird wings for insect traps — began to emerge. Junk science prevailed, propelling the fanatical creationists to dub the phenomenon the 'Disneyfication of dinosaurs.' To many of us who have long endured the often rancorous debate, however, this scheme is far afield from the reality of avian evolution, a topsy-turvy phylogeny that has no reality in fact. Just what is in error in the newly devised scheme?

The figure (from Feduccia 2012, modified from a diagram adapted from *National Geographic*) shows a popular version of what has become the most accepted phylogeny of birds. It shows the progression from avian ancestor to modern birds.



From left to right is the small 'feathered dinosaur' *Sinosauropteryx*, followed by the Late Cretaceous birdlike *Velociraptor* (thought to be close to avian ancestry), followed by the two *Nature* caudipterids (*Caudipteryx*, second, with true avian wing feathers), and only then followed by the Jurassic iconic urvogel *Archaeopteryx*, an early Cretaceous bird *Eoalulavis*, and finally the modern crow. Regrettably, this avian family tree is in total error, a chaotic arrangement!

Let's reconsider the evidence. *Sinosauropteryx*, with its greatly reduced forelimbs, has nothing to do with avian ancestry and the 'proto-feathers' have been shown to be nothing more than collagen fibres supporting a lizard-like frill. The Late Cretaceous *Velociraptor* of *Jurassic Park* fame is very birdlike, and may well be among the assemblage of avian derivatives that reverted to a terrestrial existence. The caudipterids, with reduced but true avian flight feathers, are in reality secondarily flightless birds — they evolved from flying ancestors but were no longer capable of flight — with myriad birdlike features remaining; they are in a sense Mesozoic kiwis. Then there is *Archaeopteryx*, truly close to the ancestry of birds, and in many aspects a bird in the modern sense. It is followed by an opposite bird (enantiornithine) — named 'opposite' because of its reversed shoulder articulation — representing the dominant land birds of the Mesozoic; and finally the modern crow.

My view, now shared by many, is that the Chinese fossils bearing modern feathers are indeed early birds, some having acquired secondary flightlessness. This view may seem revolutionary but it hearkens back to the predominant view of the 20th century. Namely that flight originated by the intuitively and biophysically facile trees-down model, in tree-dwelling basal archosaurs, with feathers originating in the context of jumping, parachuting, and gliding. This scenario is in stark contrast to birdlike dinosaurs sprouting feathers and all their sophisticated avian flight architecture in a non-flight context, so-called exaptations. Such a topsy-turvy scheme is practically non-Darwinian. The tried and true axiom still holds: if it has feathers and avian wings, it's a bird!

## References

- Feduccia, A (2012). *Riddle of the Feathered Dragons*. New Haven: Yale University Press.  
Ackerman, J. 'Dinosaurs take wing: The Origin of Birds'. *National Geographic*, July 1998: 74–99