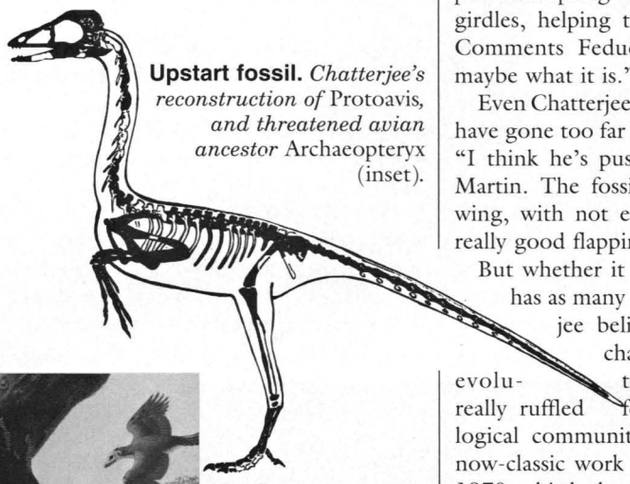
Early Bird Threatens *Archaeopteryx*'s Perch

Is it a bird? If it is, a hotly debated fossil from Texas may alter avian evolutionary history

London—WHEN SANKAR CHATTERJEE, a paleontologist working at Texas Tech University, split open a piece of rock in a quarry in west Texas back in 1983, he thought he had exposed "just some baby dinosaur fossils," and he put the specimen into storage. But now, after a long second look, he is convinced that he has discovered a fossil bird that predates the famous *Archaeopteryx lithographica*—considered the oldest known bird since its discovery in 1863—by 75 million years and pushes the evolutionary origins of the birds back to the late Triassic era, 225 million years ago. On top of that, Chatterjee confidently asserts, his fossil will "settle once and for all" 100-year-old-questions about the origin of flight.



Upstart fossil. *Chatterjee's reconstruction of* Protoavis, *and threatened avian ancestor* Archaeopteryx (inset).

Rudolf Freund/The Carnegie Museum of Natural History

Not so, say other paleontologists, who question both Chatterjee's reconstruction of the fossil and his interpretation of it—and are frustrated by the years they have waited to get a full look at the basis for claims Chatterjee has made at meetings over the past 3 years. They'll finally get that chance this week, in the latest issue of the *Philosophical Transactions of the Royal Society*, a prestigious British journal. But publication of his paper is not likely to quell the formidable army of doubters.

"It is fair to say that many workers are not altogether happy about his findings," is the polite English reaction from Angela Milner, head of fossil vertebrates at the Natural History Museum. Others are more blunt. "Calling this the original bird is irresponsible," says Alan Feduccia of the University of North Carolina. A world authority on *Archaeopteryx*, he has seen illustrations of Chatterjee's fossil and compares the reconstruction of its fragments to "reading tea leaves in the bottom of a dark cup."

But others have followed the Chatterjee saga and have come to support him. "There's going to be a lot of people with *Archaeopteryx* eggs on their face," predicts Larry Martin of the Museum of Natural History at the University of Kansas. He has seen the evidence and thinks that even if the creature is a dinosaur, "it is more bird-like than any known dinosaur."

The fossils sparking the controversy consist of two specimens of what Chatterjee calls *Protoavis texensis* ("first bird from Texas"). He estimates that the creature would have been "about the size of a pheasant, counting its long, bony tail." Much of its anatomy—including its toothy jaws—resembles a small, meat-eating dinosaur (theropod). But Chatterjee claims the skull, forelimbs, shoulder, and hip girdles are clearly bird-like. His reconstruction also shows a flexible neck, large brain, binocular vision, and, crucially, portals running from the rear of the skull to the eye socket—a feature seen in modern birds but not dinosaurs.

Chatterjee thinks that the discovery of all these features in a creature 75 million years older than *Archaeopteryx* means that famous fossil has to be relegated to a side branch of bird evolution. *Archaeopteryx*, far from being an ancestor of all birds, must have been a "living fossil," he argues.

Even bolder—and, to his doubters, more infuriating—is Chatterjee's claim that the fossil will change ideas on the origin of flight. The classical view is that flight evolved from the "trees down." *Archaeopteryx*, many experts believe, could use its claw-equipped wings to climb trees and then glide off into the air. Others argue that early birds like *Archaeopteryx* learned to fly from the "ground up." A rapidly running bird could use its outstretched wings as airfoils, launching itself into a brief glide—behavior from which true flapping flight could evolve.

Chatterjee thinks true flapping flight was already established in *Protoavis*. The key evidence he cites is a well-developed wishbone—a bone that in modern birds acts as a powerful spring between the two shoulder girdles, helping to power each wingbeat. Comments Feduccia: "A 'wish' bone is maybe what it is."

Even Chatterjee's supporters think he may have gone too far in his claims about flight. "I think he's pushing his evidence," says Martin. The fossil has "a relatively short wing, with not enough airfoil to make a really good flapping flyer."

But whether it flew or not, if *Protoavis* has as many avian features as Chatterjee believes, the fossil will still change the shape of the avian evolutionary tree—and that has really ruffled feathers in the paleontological community. Since John Ostrom's now-classic work at Yale University in the 1970s, birds have been regarded as the nearest thing to living dinosaurs. Ostrom had shown that *Archaeopteryx*'s closest relatives were the meat-eating dinosaurs. But if Chatterjee's fossil really is a bird, then birds actually predated the dinosaurs to which they are usually compared.

Asked about this, Chatterjee says: "We don't have any theropods before this bird. Maybe there is a dinosaur which gives rise to both birds and dinosaurs, but we don't have any examples so far."

That sort of speculation makes paleontologists especially unhappy. Such claims, says Joel Cracraft of the University of Illinois, would leave birds "somehow related to the primeval ooze of reptile-dom." Cracraft also points out that they ignore cladistic evidence—based on a quantitative comparison of large numbers of features—that firmly links *Archaeopteryx* to advanced theropods.

Can all those links simply be thrown away and replaced by an uncertain ancestor 75 million years older than *Archaeopteryx*? "For such a dramatic explanation you really would need substantial evidence, and it's really not there," says Feduccia. "All you can say about *Protoavis* is that it's a small Triassic reptile of unknown affinity."

Other palaeontologists, like Cracraft, say they want to take a long look at the monograph now on the way from London to see if their doubts about *Protoavis* can be shaken. Even then it won't be the end of the tale—Chatterjee is writing a longer and even more controversial monograph on *Protoavis* and the origin of flight. ■ ALUN ANDERSON