PALEONTOLOGY

# Fossilized Hatchling Heats Up The Bird-Dinosaur Debate

No children allowed. That's the way the history of life has looked in the fossil record, so few and far between are the remains of any youngsters. But that lopsided view has changed for one lineage of extinct birds. In this issue of *Science*, an international team of paleontologists reports the discovery, in the Pyrenees of northern Spain, of a remarkably well-preserved nestling bird dating from about 135 million years ago. It is the earliest hatchling bird yet discovered and comes just 10 million years after *Archaeopteryx*, the first undisputed bird. And for one so young, the fossil nestling has a surprising number of lessons to teach.

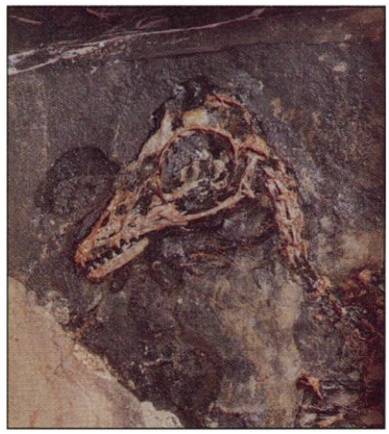
As José Sanz of the Universidad Autonoma in Madrid and his colleagues report on page 1543, the hatchling's bone structure shows that even at this early date, birds matured much as they do now. In other respects, though, the fossil is what Peter Wellnhofer, a paleontologist at the Bavarian State Collection of Paleontology in Munich, Germany, and an expert on *Archaeopteryx*, calls "a wonderful mosaic," mixing primitive and advanced features. As a result, Sanz and his colleagues argue, their finding has much to say about the evolution of modern birds—as well as the hypothesized link between birds and dinosaurs.

To some paleontologists, including the study's authors, the nestling's skull looks dinosaurian, while other features resemble those of modern birds. This provides "more evidence that birds do indeed have their origins in the small theropod [meat-eating] dinosaurs," says Lawrence Witmer of Ohio University in Athens. It's the second boost for the bird-dinosaur link in 2 weeks, closely following a *Nature* paper in which a team of Argentine scientists announced the discovery of a 90-million-year-old dinosaur that folded up its forelimbs as if they were wings.

But the bird-dinosaur connection is hotly disputed, and other scientists who believe birds evolved from earlier reptiles interpret both fossils differently. "Neither one of these fossils has anything to say about birds being related to dinosaurs," says Alan Feduccia, an ornithologist at the University of North Carolina, Chapel Hill. "And it's a misrepresentation of the evidence to say they do."

Partisans on both sides, however, acknowledge the importance of this first glimpse of an ancient baby bird. "I knew when I first saw it that it was a hatchling, just from looking at the size of its orbits and comparing the size of the skull to the rest of the body," says Sanz. He persuaded the amateur fossil hunter who unearthed the specimen nearly 8 years ago to donate it to a scientific institute in Catalonia some 6 years later. The institute then loaned it to Sanz for detailed study.

That was when Sanz made what he rates as his most "amazing" discovery: foramina, tiny holes on the surface of the bird's bones that are "almost identical to those in extant nestling birds"—and a telltale sign of bird youth. "It shows that this kind of bone was present even in an extinct lineage of birds, one that is only distantly related to modern birds," says Sanz. The nestling was up-to-date in other ways, too. Its wings, for example, are "almost as sophisticated as those of modern birds," says Luis Chiappe, a paleontologist at the American Museum of Natural History and one of the paper's authors.



AMERICAN MUSEUM OF NATURAL HISTORY

**Pretty baby.** To some paleontologists, the nestling bird's well-preserved skull looks dinosaurian; other researchers link it with much earlier reptiles.

The bird's beautifully preserved skull isn't nearly as modern, however. That supports an earlier suggestion that in bird evolution the wings led the way—just as in the evolution of humans the bipedal stance evolved before brain size changed. Indeed, says Chiappe, the skull "shows [the nestling's] dinosaurian ancestry." For example, he and Witmer note, certain bony structures found behind the eye in small theropod dinosaurs but not in modern birds are still present in the nestling, although they show signs of breaking down. "That's a key innovation in avian evolution," explains Witmer, "as it allows birds to raise their upper jaw as well as lower their mandible," enabling them to eat a wide variety of food. "And here we see the first steps toward that change."

A different mosaic of birdlike and dinosaurian features appears in the Argentine fossil. It is no bird, but rather an adult two-legged dinosaur that probably stood as tall as a man but had winglike forearms, says Fernando Novas, a paleontologist at the Argentine Museum of Natural Sciences in Buenos Aires and an author of the *Nature* paper. The dinosaur, which Novas and his colleague named *Unenlagia comahuensis* (half-bird from northwest Patagonia), "folded its arms close to its body" in a very birdlike manner, yet could have stretched them out as if taking flight—although it probably extended its arms for balance instead. That arm and shoulder anatomy, plus the dinosaur's very birdlike pelvic girdle, suggest the kind of changes that dinosaurs would have undergone during their transition to birds, Novas says.

Both "missing-link" claims are coming under heavy fire. Linking the fossils to the origin of birds is "a complete non sequitur," fumes Walter Bock, an ornithologist at Columbia University. "It just shows the fixation of these dinosaur paleontologists."

Feduccia argues, for example, that the nestling's skull, far from being dinosaurian, is more reminiscent of a primitive archosaur. Primitive archosaurs are the ancient reptilian group, more than 250 million years old, that predated both birds and dinosaurs and, he argues, gave rise to both groups via independent lines of descent. "Many of the features the authors claim indicate a dinosaur ancestry are actually characteristic of the basal archosaurs," says Feduccia.

Bock, Feduccia, and others are equally dismissive of Novas's claim that the Argentine fossil shows anything about how birds evolved. Chronologically, the fossil is simply too recent to be relevant, they say, because even if the bird-dinosaur link is real, birds would have diverged tens of millions of years earlier. "That dinosaur is 90 million years old!" exclaims Feduccia. "Birds have been around for at least 60 million years when this guy appears."

Novas and Witmer, however, think the 90-million-year-old dinosaur is a representative of a much older lineage that did give rise to birds, probably 170 million years ago in the Middle Jurassic. "Phylogenetically, birds are dinosaurs, just as humans are mammals, and *Unenlagia* is further proof that birds descended from theropod dinosaurs," says Novas.

Perhaps. Other scientists would like to see the hard evidence before they agree, and will simply wait until those earliest birds from the Middle Jurassic are found.

**–Virginia Morell**