

The Lonely Bird

Claims of the earliest avian fossil launch a paleontologic flap

By RICHARD MONASTERSKY

Sankar Chatterjee should be a happy man. A well-known paleontologist, he owns finder's rights to the world's only known specimens of *Protoavis*—reputed to be the oldest bird ever discovered. According to Chatterjee, this discovery pushes back the origin of feathered fliers to about the same time as the appearance of the first dinosaurs—the late Triassic period, 225 million years ago.

Such a drastic step backward would overturn the way a generation of scientists has viewed avian evolution. "If it were true, it would be one of the most dramatic discoveries ever made relating to the origin of birds," comments ornithologist Alan Feduccia at the University of North Carolina at Chapel Hill.

Five years after he first found the fossils (SN: 8/16/86, p.103), Chatterjee is now launching *Protoavis*' formal scientific debut through publication of a detailed monograph issued in June in the *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON*. By the unwritten rules of paleontology, that paper opens up the game to other players; any scientist can now analyze the fossils in detail and publish his or her own interpretations of the specimens.

Therein lies the rub, for most other researchers don't see a bird when they look at *Protoavis*. And that fact must give Chatterjee pause.

In claiming *Protoavis* as the oldest bird, Chatterjee threatens to dethrone one of the most widely known animals in all of paleontology—the fossil bird *Archaeopteryx*. Bearing the name "ancient wing," *Archaeopteryx* dates to the late Jurassic period about 150 million years ago, during the middle of the dinosaur's reign on Earth.

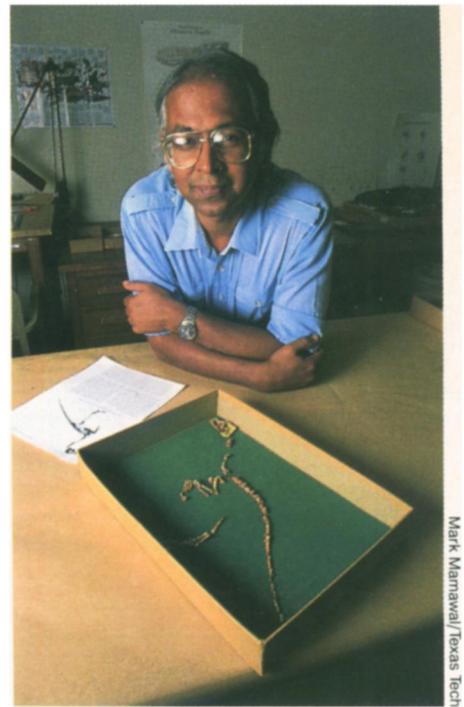
Paleontologists uncovered the first specimen of *Archaeopteryx* in 1861, just two years after Charles Darwin published *The Origin of Species*. Since then, only five other specimens of the pheasant-sized bird have turned up, all from a quarry near Solnhofen, Germany, famous for an extremely fine-grained limestone used in lithography. The character of this unique limestone is important because it has exquisitely preserved the *Archaeopteryx* remains, right down to the wing feathers—providing the proof that this animal was a bird.

Protoavis had no such luck. Chatterjee and his colleagues at Texas Tech University in Lubbock discovered the fossils of at least two individuals in West Texas mudstones, a type of rock that wouldn't preserve soft feathers. So scientists cannot tell conclusively whether *Protoavis* indeed wore the telltale cloak of birds.

Lacking such clear evidence, Chatterjee turns to other parts of the *Protoavis* fossil in making his case that the animal was a flying bird. At the crux of his argument lies the *Protoavis* skull, which has 23 features that he regards as fundamentally birdlike. In particular, the creature's skull appears to lack holes that are present on the skulls of dinosaurs and related reptiles of that period. In *Protoavis*, these holes have merged with the eye sockets, making it similar to modern birds, says Chatterjee.

The jaw of *Protoavis* holds another key place in the bird argument. Bones that attach the lower jaw to the skull permit the jaw to slide forward. What's more, a hinge between the upper jaw and the braincase allows the upper jaw to elevate, Chatterjee says. Modern birds possess both these features, but ancient reptiles had neither.

Chatterjee also reports that *Protoavis* had enormous eyes, a finely developed



A man and his fossil: Paleontologist Sankar Chatterjee displays what might be the oldest known fossil bird. In life, the adult *Protoavis* with its long tail would have been about the size of a pheasant, estimates Chatterjee.

sense of hearing and a highly specialized brain—all characteristics that extend the similarity with birds.

This first monograph describes only *Protoavis*' skull, but Chatterjee says the rest of the skeleton shows further avian elements, such as a wishbone, a shoulder modified for flying, and a keeled sternum, which serves as an attachment point for flight muscles on modern birds. While he plans to detail these features in a future monograph, Chatterjee believes the skull alone qualifies *Protoavis* as the oldest known bird.

On this issue, Chatterjee sits out on a limb, pretty much by himself.

"I didn't see anything about it that looked like a bird," comments paleontologist Jacques Gauthier of the California Academy of Sciences in San Francisco.

Gauthier, who has examined the actual *Protoavis* specimens, says most of the bones are poorly preserved, making it extremely difficult to identify many of the features important to Chatterjee's argument. "It's crushed, smooshed and in really terrible shape," he says.

While some of the bones appear birdlike, they also look dinosaurian and could represent a new type of theropod dinosaur, says Gauthier. "It's obvious that there's some interesting animal there," he adds.

Gauthier believes the *Protoavis* fossils may actually represent bones from several different kinds of animals mixed together, an opinion shared by Storrs Olson, a leading authority on fossil birds with the Smithsonian Museum of Natural History in Washington, D.C. The *Protoavis* bones were unarticulated, meaning they lay in a jumble when Chatterjee and his colleagues found them. Because the skeletal remains were not preserved in a lifelike pose, with each bone in the proper orientation, pieces from several different species could be mixed together. If so, that would undermine Chatterjee's claim for *Protoavis*, say other researchers.

Olson also questions the way Chatterjee has glued and plastered various bones together to construct *Protoavis*. "He might have made mistakes. The preparation in some cases is pretty questionable," Olson says.

Other researchers, however, take a more favorable view toward Chatterjee's claim. While they don't necessarily accept *Protoavis* as a bird, these researchers think the animal could lie very close to the origin of birds.

"There is nothing on the specimens that compels me to believe they had feathers and could fly," says paleontologist Larry D. Martin of the University of Kansas in Lawrence. However, he suggests *Protoavis* had many avian features. "The important point is you've got something that's practically a bird from the late Triassic, immensely older than *Archaeopteryx* and in fact as old as or older than any dinosaur."

Martin argues that even if *Protoavis* could not fly, it still pushes back the origin of birds to a time much earlier than *Archaeopteryx*.

Paleontologists have widely differing ideas on how such a shift would affect theories about the



Smithsonian Institution, photo 15771

The Berlin bird: This specimen of Archaeopteryx, housed in an East Berlin museum, clearly shows the outline of feathers attached to the forelimbs and tail. Although the feathers indicate Archaeopteryx was a bird and could fly, the animal had other features — teeth, clawed "hands" and a long tail — that modern birds lack.

origin of birds. To grasp the nature of the discussion, one must first realize that the fossil record does not treat birds favorably. These delicately boned creatures rarely end up immortalized in stone, leaving scientists with a poor inventory of the various birds that ever flew, swam or waddled across the Earth. This paucity of evidence provides ample room for argument about the origin of birds, and researchers have not passed up the opportunity to fight about early flight.

Many dinosaur experts see a remarkable similarity between the oldest known birds and the theropod dinosaurs, which they interpret as evidence that birds evolved directly from this group of bipedal predators. To them, birds simply represent a type of dinosaur clothed in feathers. In general, however, avian experts don't buy the bird-dinosaur link. They see fewer similarities between the two groups, arguing instead that birds evolved from a different type of reptile, perhaps more ancient than the theropod dinosaurs. If true, the ancestors of modern birds might lie closer to crocodiles than to dinosaurs on the reptile family tree.

As expected, each camp interprets the *Protoavis* claim differently.

According to Martin, who has long rejected the dinosaur-bird theory, "*Protoavis* is practically deadly to the idea that

birds evolved from dinosaurs." If *Protoavis* were indeed a bird or a close relative of one, it would push the origin of birds back into the mid- to late-Triassic, a full 75 million years earlier than scientists have previously estimated. Even by geologic standards, such a span represents a major chunk of time. "The dinosaur idea says that birds evolved late," he explains. "But *Protoavis* tells us that birds have a very, very ancient origin."

Gauthier, who sits on the opposite side of the dinosaur-bird debate, finds *Protoavis* less of a challenge. Even if Chatterjee were correct, says Gauthier, "It doesn't alter the idea that birds are theropod dinosaurs one whit." It simply shifts the chain of events earlier in time: If *Protoavis* was a bird, then theropod dinosaurs must have evolved even earlier, he says.

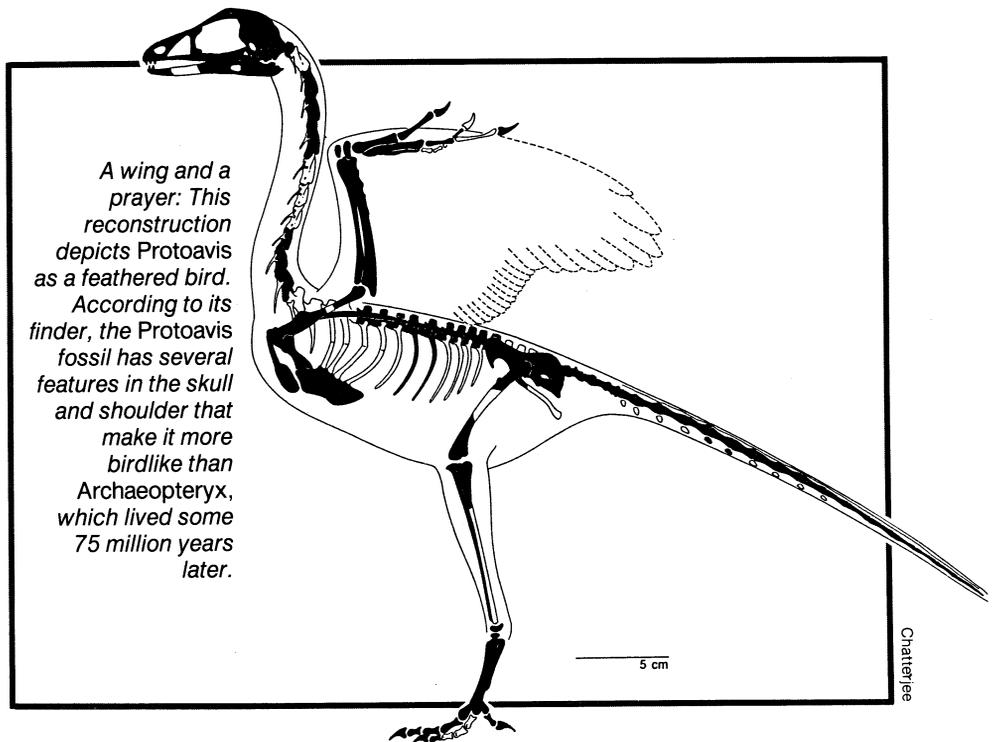
Chatterjee shares that opinion, although he says the known fossils cannot yet settle the debate.

Of course, before scientists interpret the importance of *Protoavis*, they must resolve the central question: Was it a bird or even a close relative of birds?

If it came down to a ballot, the votes would probably say nay. Many authorities in the field think it will be extremely difficult for Chatterjee to convince people unless he finds better specimens to back up his claim.

"I'm very skeptical and unimpressed," says Peter Houde, an evolutionary biologist who focuses on birds at New Mexico State University in Las Cruces.

North Carolina's Feduccia voices even stronger doubt: "You really need to have some critical evidence, and what Chatterjee has is a bunch of tea leaves in the bottom of a dark cup. It's just like reading tea leaves." □



A wing and a prayer: This reconstruction depicts Protoavis as a feathered bird. According to its finder, the Protoavis fossil has several features in the skull and shoulder that make it more birdlike than Archaeopteryx, which lived some 75 million years later.

Chatterjee