PALEONTOLOGY

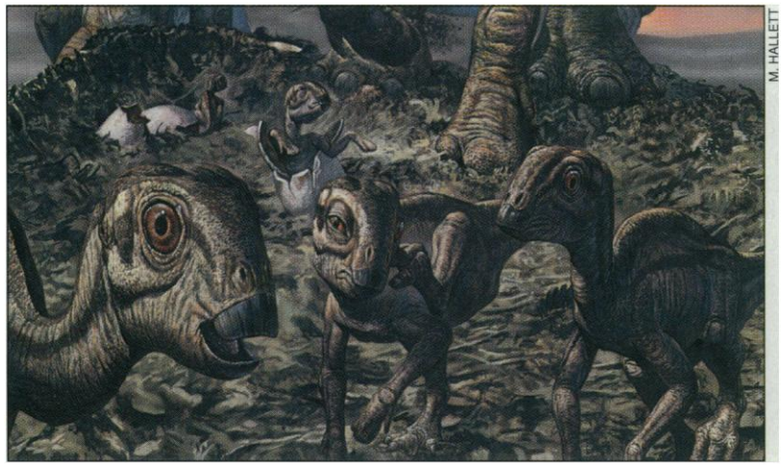
Strong Baby Limbs May Kick Image of Maternal Dinos

When Jack Horner found that baby duck billed dinosaurs seemed weak in the knees 7 years ago, he gave their parents' fearsome image a strong kick in the head. Horner, a paleontologist at Montana State University's Museum of the Rockies, argued that immature leg joints meant the hatchlings were unable to walk very well: Survival, then, depended on doting parents bringing food to their nests, like mother pelicans regurgitating food for their young. The notion of mothering dinosaurs has since taken off, replacing the view of these creatures as cold, heartless reptiles with an image of attentive, birdlike animals. But now two researchers have taken a swipe at ancient motherhood.

On page 712 of this issue, paleobiologists Nicholas R. Geist and Terry D. Jones of Oregon State University, Corvallis, present data on baby dinosaur pelves and leg joints that suggest the creatures hit the ground running—their bones look as robust as those belonging to so-called "precocial" infants such as young crocodiles and ostriches, which are highly active when they hatch. The skeletal self-sufficiency of the youngsters knocks the pins from under the attentive mother argument, the duo says. Moreover, they argue, the basic idea that glimmerings of modern bird behavior can be seen in dinosaurs—one of the lines of evidence supporting a bird-dinosaur family connection—has to be questioned, because nesting and brooding can also be seen in reptiles and other vertebrates. "Put all the evidence together—from our bone study to the brooding behavior of hundreds of species of reptiles—and there's nothing to say that dinosaurs were in any way different," says Jones.

Attacking motherhood and family ties, of course, is bound to stir up controversy. Researchers do applaud the way that Geist and Jones tested Horner's hypothesis. "It's a nice comparison and the first close look at Horner's [original] paper," says Philip J. Currie, curator of dinosaurs at the Royal Tyrrell Museum of Palaeontology in Drumheller, Alberta. And scientists such as Alan Feduccia, an evolutionary biologist at the University of North Carolina, Chapel Hill, who has long disliked the image of dinosaurs fussing in a rookery like so many overgrown pelicans, say the study is "another nail in the coffin of the bird-dinosaur connection."

But others, who see a tiny tyrannosaur in every bobbing robin, aren't persuaded. "It's just a straw man, saying that dinosaurs were precocial and that therefore birds are not a kind of dinosaur," argues Mark A. Norell, a paleontologist at the American Museum of Natural History and one of the discoverers of another dinosaur, an Oviraptor, that apparently died while brooding a nest of eggs (*Nature*, 22/28 December 1995, p. 774). He says that the connection also rests on strong anatomical relationships between dinosaurs and birds that can be traced across the eons.



M. HALLETT

Standing alone? Baby duckbilled dinosaurs, in this painting and in a new theory, have strong legs and can care for themselves after hatching without doting parents.

Horner's behavioral link actually grew from anatomy as well. He based his argument for caring parents on the skimpy cartilage at the ends of thigh bones belonging to embryonic and hatchling dinos called Maiasaurs. Until that cartilage developed, he argued, the animals' knees and hips wouldn't work very well, just as they don't in altricial (helpless) newly hatched birds.

But Geist says he had his doubts about Horner's analysis. "The amount of cartilage doesn't tell you whether a bird is precocial or altricial," because it's similar in birds of both types. So it can't reveal much about dinosaur self-sufficiency either.

Comparing pelvic bones among different species can, however. Geist and Jones were interested in the amount of pelvic ossification—how strongly the bone had been built up—at hatching time. "That's where the major muscles for walking attach," says Geist, "so if the pelvis is well-ossified, that's a good indicator that the hatchling was mobile."

In altricial birds such as finches, the pelvic bones were hardly ossified at all, but in ostriches and other ambulatory hatchlings, as well as crocodiles, the bones looked nearly as sturdy as those of adults. And they were just as ossified in five genera of embryonic dinosaurs, including *Maiasaura*, indicating the bones were well-developed even before the babies hatched. The beasts, Geist and Jones conclude, could walk at birth.

Horner concedes that he may have "overstated the case for dinosaur altriciality" based on the leg joints, but he's since come up with other evidence. Ongoing studies of Maiasaur bone growth rates suggest they grew like altricial birds and thus the babies were dependent on their parents. Further, "baby duckbilled dinosaurs weren't like little alligators with big mouths and sharp teeth to defend themselves," Horner says. Even if they were up and running around, he doubts that they were off on their own. "They would have been 'meals-on-wheels' " for all the meat-eaters in the neighborhood, he says. ("It's more likely that they could really turn those wheels," counters Geist.)

And then there's the brooding Oviraptor, which Geist thinks is not especially birdlike. "There's nothing to distinguish them from what crocodiles do," he insists, noting that crocs nest in colonies and often lie with their throats lowered over their eggs to brood them. But Norell thinks it is the very picture of a caring bird parent. "The Oviraptor wasn't just in 'close association' with the eggs, but was in an actual brooding position with its legs curled up under it as is seen in living birds," says Norell. "Now how does that make it similar to living crocodiles?" Besides, Horner adds, researchers have built a sturdy family tree connecting dinosaurs more closely to birds than to reptiles, based on anatomy. "What is a dinosaur most closely related to that sits on its eggs?" he asks. "It's certainly not a snake or a frog."

The real problem with this sort of bird-reptile debate, other paleontologists say, is that dinosaurs were neither, but something in between. "We keep trying to force dinosaurs into one of two molds that we see today," says Peter Dodson, a paleontologist at the University of Pennsylvania's School of Veterinary Medicine. "And that is just too simple."

–Virginia Morell