China yields a flock of downy dinosaurs

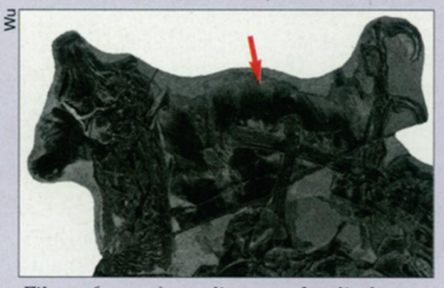
The *Velociraptors* of *Jurassic Park* had a menacing edge to their scaly hides, but Steven Spielberg should have adopted a softer look for his villains. A new fossil discovery in China suggests that *Velociraptor* and many other types of predatory theropod dinosaurs had coats of downlike fibers.

"This is further support for the idea that birds gradually evolved from theropod dinosaurs," says Xiao-Chun Wu of the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) in Beijing and the University of Calgary in Alberta.

In the Sept. 16 NATURE, Wu and his colleagues describe the newfound dinosaur, which they named *Sinornithosaurus millenii*. The 124-million-year-old fossil comes from the Yixian rock formation near Sihetun in northeast China, a site fast becoming one of the richest paleontological treasure troves in history.

In 1996, Chinese researchers captured worldwide attention when they unveiled a dinosaur called *Sinosauropteryx* that showed evidence of fibers adorning its body (SN: 10/26/96, p. 260). Last year, two new dinosaur species turned up at the locality, each of which wore a cloak of birdlike feathers (SN: 6/27/98, p. 404). The parade of fossils continued in the May 27 NATURE, when Xing Xu of the IVPP and his colleagues described *Beipiaosaurus*, another theropod with a fibrous coat.

With its downlike body covering, the newest fossil resembles *Beipiaosaurus* and *Sinosauropteryx*. It belongs, however, to a different family of dinosaurs called dromaeosaurids, which also include *Velociraptor*. "*Jurassic Park* made the dromaeosaurids very famous. Despite that, the anatomical features have been very poorly known," says Wu.



Wu

Fibers (arrow) on dinosaur forelimb may be the evolutionary precursor of feathers.

Dromaeosaurids have a special significance because most paleontologists pick this family as the dinosaur group closest to birds. According to the prevailing theory, birds split off from the dromaeosaurid line sometime in the Jurassic period, more than 150 million years ago.

As one of the earliest and most complete dromaeosaurids, *Sinornithosaurus* helps fill in critical information, says Wu. In particular, the animal had a shoulder socket pointing outward from the body, which would have allowed its arms to move in much the same way as a bird's wings do.

Taken together with the other four recent dinosaur discoveries, the new fossil suggests that fibrous coatings and even true feathers may have covered many different families of dinosaurs, at least at some point in their life cycles, says Lawrence M. Witmer of Ohio University in Athens. These fragile features could only survive, however, when exceptional circumstances preserved them, as happened at the Chinese site.

A small clutch of paleontologists disputes the bird-dinosaur link, arguing that birds arose instead from more primitive reptiles. One of the naysayers, Larry D. Martin of the University of Kansas in Lawrence, contends that the fibers found on the Chinese dinosaurs are the remains of collagen from under the skin, rather than some sort of external coating. He predicts that Chinese excavators will eventually find such fibers on fossils of lizards or perhaps fish, groups that clearly did not have a downy exterior. —*R. Monastersky*

Taking the pop out of cell-like balloons

When balloons suddenly burst at a child's party, tears may flow. However, when microscopic, balloon-like vesicles spilled open recently in a French laboratory, they took their time deflating, bringing smiles to the researchers' faces.

In a flow vital to life, nutrients, intercellular signals, and many other substances travel through pores in cell membranes. To study the physics of cross-membrane transport (SN: 12/21&28/96, p. 389) and to explore ways to ferry drugs or DNA into target cells, scientists make vesicles of artificial membranes enclosing droplets of liquid.

A hole induced in a vesicle wall allows molecules to flow through the breach, as they do through a cell-membrane pore. As fluid exits the vesicle, this sac deflates, the surface tension of its membrane subsides, and the hole closes up again.

In watery solutions used routinely in vesicle experiments, fluids gush out much like air racing from a balloon. Consequently, pores stop growing before they are large enough to be seen with an optical microscope, says Olivier Sandre of the Curie Institute in Paris. The holes also close up too quickly for experimenters to observe stages of their disappearance.

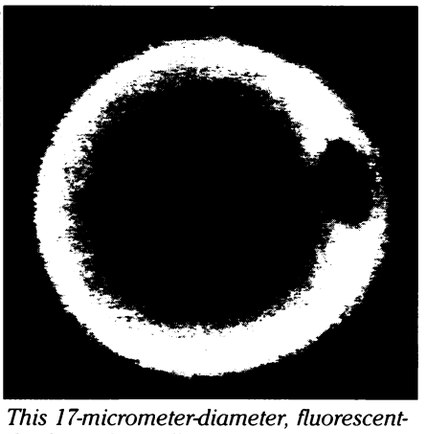
Now, however, such windows can stay open wider and longer.

Sandre, Françoise Brochard-Wyart, also of the Curie Institute, and Laurent Moreaux of the École Supérieure de Physique et de Chimie Industrielles in Paris have discovered a slow-motion switch for pore shrinkage. By adding glycerin, a clear, syrupy alcohol safe for living cells, they increase the viscosity of the fluid containing the vesicles.

"The more viscous the solution, the larger the pore and also the slower the closure," Sandre says. Because increased viscosity causes gradual fluid release, pores can enlarge to as many as 10 micrometers in diameter—sizable enough for viewing with optical microscopes.

The researchers tinged vesicles with a fluorescent dye to make pores visible. Holes appeared when they illuminated the dyed sacs with intense light. They could also open pores by making the artificial membranes glom onto a sticky surface, which stretches them. Over the tens of seconds it took vesicles to tear and then spill their contents, the experimenters saw pore after pore open and close.

The technique may help researchers slow other membrane transformations, such as the fusion of cell walls and organelles, the naturally occurring vesicles within cells, comments physicist Philip A. Pincus of the University of California, Santa Barbara.



Sandre et al./PNAS

This 17-micrometer-diameter, fluorescent-dyed vesicle swells in response to intense light. Surface tension triggers the opening of a pore (ellipse on right). In a 2:1 glycerin-water solution, the pore lingers for more than 4 seconds.

The French team reports its findings in the Sept. 14 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. In an accompanying commentary, Pincus hails the glycerin addition as a "clever trick" and "exciting advance" toward better pictures of dynamic cell-membrane behavior. Observations of the much smaller pores in real cells, however, may require X-ray microscopes, he notes. —*P. Weiss*