Paleontology

'Feathered' dinosaur makes debut

In late 1996, Chinese paleontologists reported the discovery of dinosaur fossils covered with featherlike fibers—a bombshell that potentially clinched the relationship between birds and dinosaurs. Since that first sketchy announcement, details of the find have remained scarce and the "feathered" dinosaur has kept a lower profile than reclusive author J.D. Salinger.

Now, Chinese researchers have published their long-awaited report on the small, carnivorous dinosaur, named *Sinosauropteryx*. In the Jan. 8 NATURE, they describe two specimens, about the size of large chickens, that provide unusual evidence of the dinosaurs' soft tissue—internal organs, skin, and other body parts that usually do not fossilize.

Both *Sinosauropteryx* specimens are surrounded by apparently hollow fibers up to 40 millimeters long, report Pei-ji Chen of the Nanjing Institute of Geology and Paleontology and his colleagues. The filaments resemble extremely simple feathers, called plumules, found on some modern birds. The fibers could represent protofeathers that helped trap body heat or served as a colorful display for attracting mates, suggest the scientists.

One specimen has two oval shapes inside its abdomen—the first clear case of eggs found inside a dinosaur, they report. This discovery suggests that dinosaurs laid eggs in pairs, a pattern closer to that of modern reptiles than birds.

The *Sinosauropteryx* specimens "are, without a doubt, the best-preserved dinosaur remains yet found," says paleobiologist David M. Unwin of the University of Bristol in England. Unfortunately, the evidence at this point cannot establish whether the fibers surrounding these specimens are related to feathers, he says. To resolve the question, scientists should examine the fossilized soft tissue of birds, mammals, and other dinosaurs from the same site in northeastern China, he says.

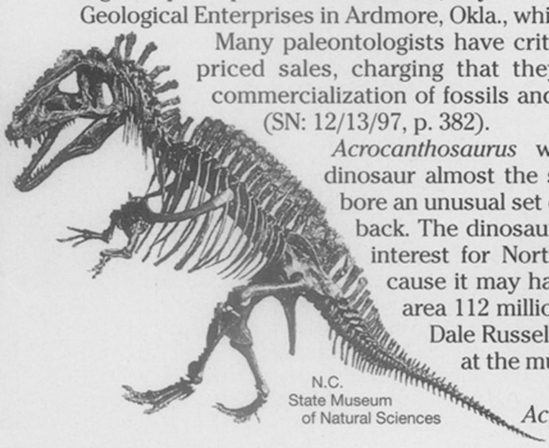
Chen and his colleagues briefly mention another carnivorous dinosaur, *Protoarchaeopteryx*, which was found next to true feathers (SN: 8/23/97, p. 120), although some researchers dismiss this association as coincidence. Perhaps even more important, Chinese scientists have quietly discussed yet another species of dinosaur that apparently bears incontrovertible evidence of actual feathers along its body. Paleontologists expect to report details of this find soon. *—R.M.*

Another dinosaur sells for millions

The North Carolina State Museum of Natural Sciences in Raleigh lost out last year during the $8.4-million auction of a *Tyrannosaurus rex* specimen, but last month the institution acquired an even rarer dinosaur, *Acrocanthosaurus*. Private benefactors associated with the museum bought the Oklahoma fossil for $3 million, an amount believed to be the second highest price paid for a dinosaur, says A. Allen Graffham of Geological Enterprises in Ardmore, Okla., which sold the fossil.

Many paleontologists have criticized such high-priced sales, charging that they encourage the commercialization of fossils and inhibit research (SN: 12/13/97, p. 382).

Acrocanthosaurus was a predatory dinosaur almost the size of *T. rex* and bore an unusual set of spines along its back. The dinosaur holds particular interest for North Carolinians because it may have inhabited that area 112 million years ago, says Dale Russell, a paleontologist at the museum. *—R.M.*



N.C. State Museum of Natural Sciences

Acrocanthosaurus

Physics

Liquid Bose-Einstein condensate found

A new analysis of data obtained 8 years ago confirms a decades-old suspicion that a measurable fraction of the atoms in liquid helium fall into the peculiar quantum state known as a Bose-Einstein condensate.

Such a condensate forms when elementary particles and atoms occupy the same quantum state. Several teams of researchers have shown recently that low-density gases can form Bose-Einstein condensates (SN: 5/25/96, p. 327; 7/15/95, p. 36).

Scientists discovered in 1938 that liquid helium-4, which has two protons and two neutrons, becomes a superfluid when cooled sufficiently—flowing without any resistance or viscosity. They immediately suspected that some proportion of the atoms might form a Bose-Einstein condensate, but direct evidence has been hard to find.

In a 1990 experiment, Adrian F.G. Wyatt of the University of Exeter in England and his colleagues sent phonons—packets of vibrational energy analogous to photons of light—in specific directions through a pool of liquid helium-4.

The new analysis of that study shows that all of the helium atoms knocked out of the liquid by the phonons came from the same quantum state. Wyatt reports his results in the Jan. 1 NATURE.

"It's clear and unambiguous that there's a [Bose-Einstein] condensate there," says physicist Allan Griffin of the University of Toronto, "but you can't tell from the data the actual fraction of helium atoms that are in that state." Upcoming experiments by Wyatt may answer that question, Griffin adds. *—S.P.*

Whither heapeth the dancing sands?

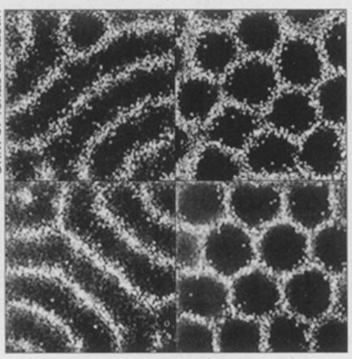
Granular materials on vibrating surfaces sometimes congregate into stable patterns (SN: 8/31/96, p. 135). Although these intricate patterns—including hexagons, squares, stripes, and circular heaps—are stationary, the individual particles that constitute them are constantly moving.

Applying the basic laws of mechanics to collisions between two particles can be difficult enough. Trying to keep track of thousands of grains of sand or salt as they bounce off each other presents a computational nightmare.

Harry L. Swinney, Chris Bizon, and their colleagues at the Center for Nonlinear Dynamics at the University of Texas at Austin have now developed a way to predict the collective behavior of these bouncing grains. They describe their computer simulation in the Jan. 5 PHYSICAL REVIEW LETTERS.

The researchers modeled the motion of particles inside a rigid box being shaken up and down at different frequencies. Rather than attempt to track the movement of particles during short time steps of fixed length, the team used the known positions and velocities of the individual grains to calculate when the next collision would occur, then marched their simulation forward one collision at a time.

This program—the first to analyze patterns in granular materials moving in three dimensions, Swinney says—led to a technique simple enough to be run on a desktop computer. The researchers verified their model with experiments using up to 60,000 small lead or bronze spheres. *—S.P.*



Univ. of Texas at Austin

These images compare patterns resulting from computer-simulated vibrations of granular materials (top) with those from experiments using small lead spheres (bottom).