Fish-Eating Dinosaur Found in Africa

Prospecting in the desert of Niger, a team of paleontologists has discovered a 100-million-year-old dinosaur with a body as big as *Tyrannosaurus rex* and a snout so long and thin it would rival Pinocchio's nose after his biggest fib.

Together with similar species found on three continents, the Niger animal shows how a group of related predatory dinosaurs underwent a profound evolutionary transformation—one that sculpted the familiar dinosaur face into a snout that would appear, from above, to be as long as a baseball bat and just as narrow.

"It's a bizarre thing. It looks like a long-snouted crocodile," says paleontologist Paul C. Sereno of the University of Chicago, who led the African expedition last December. In the Nov. 13 SCIENCE, Sereno and his colleagues describe the newfound species, which they named *Suchomimus tenerensis*, meaning crocodile mimic from the Ténéré Desert. "It must have been a very effective form for catching fish," suggests Sereno.

Suchomimus belongs to a group of theropod dinosaurs called spinosaurids, first discovered by German paleontologists working in Egypt in 1912. The original specimen, named *Spinosaurus*, was destroyed during World War II, and it wasn't until 1973 that a French paleontologist unearthed jaw fragments of a similar dinosaur in Niger. Philippe Taquet of the National Museum of Natural History in Paris marveled at that dinosaur's resemblance to the gavial, a modern crocodile with a long, thin snout. He imagined such dinosaurs fishing on the shores of lakes, much like herons.

In 1983, paleontologists in southern England found the first reasonably complete spinosaurid specimen. The animal, named *Baryonyx*, had the characteristic long snout and also a giant curved claw.

The new find by Sereno and his colleagues reveals that spinosaurids had faces even more extreme than previously recognized. The snout of *Suchomimus* extends 25 percent farther than researchers had calculated for other spinosaurid specimens. The animal would have reached 11 meters in body length and had thumb claws measuring 33 centimeters long,

Sereno, M. Roberts, H. Larsson

Thumb claw of the African dinosaur.

which in life bore a horny coating that would have extended the claw another 10 cm, says Sereno.

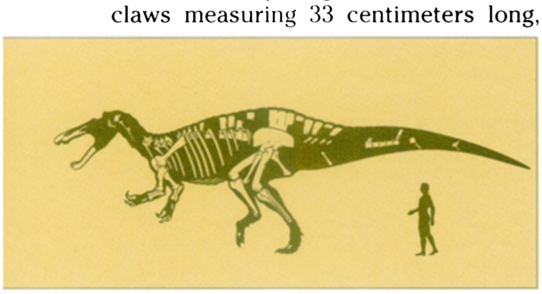
Angela Milner of the Natural History Museum in London says that some elements of *Suchomimus* are more complete than those of *Baryonyx*, which she named and studied. "This fills in some parts of the animal that we didn't have, and it gives us more [characteristics] to work out the relationships of these dinosaurs to other groups," she says.

Suchomimus had elongated spines on its back vertebrae, forming a low sail over its hips. This species is midway between *Baryonyx*, which had no such structure, and *Spinosaurus*, which had a tall sail, says Milner.

Hans-Dieter Sues of the Royal Ontario Museum in Toronto, who is analyzing fragments of a spinosaurid that was found in northeast Brazil, says the animals' snouts defy easy answers. "The whole skull has the most unusual shape for any dinosaur. It raises an interesting question of what these animals did for a living."

Partially digested fish remains rest inside the ribs of *Baryonyx*, reinforcing the theory that it consumed fish. Sues, however, doubts that the dinosaur snouts were specialized for fishing, noting that they differ in important ways from those of crocodiles. *Baryonyx*, he points out, had the bones of a herbivorous dinosaur in its gut alongside the fish remains.

—*R. Monastersky*



Sereno/SCIENCE

Reconstruction of the long-snouted Suchomimus.

Light powers molecular piston and cylinder

A device of molecular dimensions moves like a simple machine when stimulated by light, according to a new study.

J. Fraser Stoddart of the University of California, Los Angeles and his colleagues at the University of Birmingham in England and the University of Bologna in Italy have synthesized a pair of organic molecules that join together like a cylinder enclosing a piston. The researchers find that by attaching a photosensitive compound to the cylinder, a cyclophane, they can use light to make it expel the piston, a bis-naphthalene.

"If you look at the process, it leaves the impression of a linear motor," Stoddart says. He and his colleagues report their findings in the Nov. 4 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

Multicomponent molecules with this piston-and-cylinder structure are known as pseudorotaxanes. Unlike true rotaxanes, they don't have bulky caps on the ends of the piston that prevent the cylinder from sliding off (SN: 12/13/97, p. 378).

The researchers examined the response to light of the pseudorotaxane in a solution of sodium oxalate. A complex containing the metal rhenium, affixed to the cylinder, absorbs a photon of light and donates an electron to the cylinder. The electron neutralizes one of four positive charges that hold the piston in place, weakening the bond enough to encourage the piston to slide all the way out.

To keep the electron from returning to the rhenium complex immediately, before the piston has time to move, the chemists allow sodium oxalate to donate an electron to replenish the rhenium complex. Even with sodium oxalate supplying electrons, only about 30 percent of the pseudorotaxanes disassemble upon illumination.

When the researchers turn off the activating light and bubble oxygen through the solution, they restore the cylinder's positive charge, and a piston reenters.

Rotaxanes and pseudorotaxanes might one day be used in miniaturized sensors or in information-processing devices, Stoddart says, but such applications will take "lots of development." The current study is mainly "a proof of principle that this assembly of components can move with respect to each other."

Harry W. Gibson, who studies rotaxanes at the Virginia Polytechnic Institute and State University in Blacksburg, agrees that applications are still far away. Chemists often carry out basic chemical studies in a solution, he notes, but useful devices are usually in the solid state. For molecular machines, "there's still a gap to bridge between the conceptual and the practical. Clearly, this is a step in that direction."

—*C. Wu*