***A Lost-and-Found Nomad Helps Solve the Mystery of a Swimming Dinosaur***

**By**[**KENNETH CHANG**](http://topics.nytimes.com/top/reference/timestopics/people/c/kenneth_chang/index.html)**, New York Times,** SEPT. 11, 2014

The first bones came in a cardboard box. [Nizar Ibrahim](http://paulsereno.uchicago.edu/fossil_lab/staff/nizar_ibrahim/), a paleontologist, was in the Moroccan oasis town of Erfoud at the edge of the Sahara, returning from a dinosaur dig in the sands. Inside the box, brought to him by a nomad, were sediment-encrusted pieces more intriguing than anything he had found himself, including a blade-shaped bone with a reddish streak running through the cross section. He took the bones to a university in Casablanca.

That was April 2008.

The next year, he was in Italy visiting colleagues at the Milan Natural History Museum who showed him bones that seemed to be from Spinosaurus aegyptiacus, a strange-looking predatory dinosaur larger than Tyrannosaurus rex that lived in northern Africa about 95 million years ago.

He looked at the spines, part of a giant distinctive sail on the back of Spinosaurus. He saw a familiar red line — possibly a passageway for blood vessels long since decayed away — in the cross section of a bone. “My mind started racing,” he said.

Amazingly, the pieces in Milan and those he had seen a year earlier and 1,200 miles away were from the same ancient skeleton.

That was the start of an odyssey of diligence and serendipity that led to the unveiling on Thursday of a new skeleton of Spinosaurus. The largest known predatory dinosaur, growing to at least 50 feet in length, Spinosaurus is also the only dinosaur known to be a swimmer that spent a large fraction of its life in the water.

“It’s probably the most bizarre dinosaur out there,” said Dr. Ibrahim, a graduate student when he saw the first bones, and now a postdoctoral researcher at the University of Chicago.

Spinosaurus had been an intriguing mystery for decades. The original fossil of the dinosaur, discovered in Egypt a century ago and moved to a German museum, was destroyed during World War II, leaving paleontologists with little more than a few drawings to ponder.

The new partial skeleton is of a Spinosaurus not fully grown, about 36 feet long. Its forelimbs were large and strong, with scythe-like claws; its hind legs were short, with paddle-shaped feet.

In [an article](http://www.sciencemag.org/lookup/doi/10.1126/science.1258750)published online on Thursday by the journal Science, Dr. Ibrahim and an international team of colleagues describe the features that made the dinosaur well suited for swimming and feasting on giant fish that lived in the rivers there.

Conical teeth in a crocodilian snout overlapped like a snare for trapping fish, and it had nostrils halfway up the skull so it could stick its snout into the water and still breathe.

With its flat feet, Spinosaurus may have paddled like a duck. It had a long, flexible tail, which it may have used for propulsion. “It’s like a cross between an aquatic bird and a crocodile,” said Paul C. Sereno, a paleontologist at the University of Chicago who was part of the research team.

On land, Spinosaurus was ungainly. The researchers calculated that its center of mass would have been too far forward for it to have stood easily on its hind legs, like other predator dinosaurs; instead, it ambled on all four legs.

 “It does add significantly to the strangeness,” said [Matthew C. Lamanna](http://www.carnegiemnh.org/vp/lamanna.html), a paleontologist at the Carnegie Museum of Natural History in Pittsburgh, who was not involved with the research. He described the evidence for Spinosaurus’s semiaquatic existence as “quite convincing.”

[An exhibition on Spinosaurus](http://events.nationalgeographic.com/events/exhibits/2014/09/12/spinosaurus-lost-giant-cretaceous/) opens Friday at the National Geographic Museum in Washington. The National Geographic Society provided financing for the research.

The new findings may return prominence to Ernst Stromer, the German paleontologist who first described Spinosaurus aegyptiacus, meaning “Egyptian spine lizard.”

Stromer’s fossil, mounted in the Bavarian State Collection of Paleontology in Munich, included the lower jaw and parts of the spine.

In April 1944, the British Royal Air Force dropped a bomb on the museum, and Spinosaurus — and every Egyptian dinosaur fossil known at the time — burned.

After that, some isolated bones of Spinosaurus were found, but nothing as complete as Stromer’s specimen. Some evidence, like the conical teeth, suggested Spinosaurus ate fish, but perhaps it just waded into a river and caught them like a grizzly bear.

One fossil, uncovered in Morocco around 1975, had been thought to be part of the lower jaw of a crocodile, but a decade ago, Cristiano Dal Sasso of the Milan museum realized that interpretation was upside down. “There were too many bones to be the lower jaw,” he said.

It was actually from the top half of a snout of a huge adult Spinosaurus.

In 2008, an Italian geologist showed the new Spinosaurus bones to Dr. Dal Sasso, who then showed them to Dr. Ibrahim.

But the scientists were missing crucial geological information about where the bones had been excavated.

Dr. Ibrahim needed to find the nomad, so last year, he returned to the Erfoud area.hotos

A researcher helping him, Samir Zouhri, of University Hassan II Casablanca, asked how they would locate the man, whether Dr. Ibrahim had a name or an address or a phone number.

“I didn’t want to disappoint my Moroccan colleague,” Dr. Ibrahim said, “so I told him I distinctly remember that the man had a mustache.”

Dr. Zouhri did not seem impressed. “He basically thought that was not an adequate starting point for our wild-goose chase,” Dr. Ibrahim said.

The search indeed proved fruitless, and they were sitting in a cafe, about to give up, when a mustachioed man walked past.

It was the nomad who had showed Dr. Ibrahim the Spinosaurus bones five years earlier.

“I had to run, because he was walking fast,” Dr. Ibrahim said. “He recognized me, and I convinced him to take us to the site.”

The nomad, who Dr. Ibrahim said did not want public attention, remains anonymous.

A few months later, Dr. Ibrahim and other members of the research team returned, uncovering more bone fragments and confirming that the fossils Dr. Ibrahim had seen in 2008 and those in Milan were all from the same dinosaur.

The partial skeleton — about a quarter to a third of the animal, Dr. Sereno estimated — did not tell the whole story. The researchers made a three-dimensional digital model of the bones and added pieces scanned from other fossils like the Milan snout and the Stromer drawings.

The new fossil also served as a Rosetta stone. A second dinosaur fossil of Stromer’s turned out to be a Spinosaurus; some of its bones matched those from the Moroccan find.

Putting all the pieces together and making educated guesses from close relatives of Spinosaurus, the researchers came up with a complete skeleton and produced a life-size model for the National Geographic exhibition.

The dearth of swimming dinosaurs has been something of a mystery. Among other groups of animals, some species did move from land to water — for instance, the mammals that evolved into whales. Even among birds, the modern-day descendants of dinosaurs, some like penguins and ducks spend copious time in the water.

“Dinosaurs were landlubbers,” Dr. Sereno said. “Until this one.”