PALEONTOLOGY

Fossil Opens Window On Early Animal History

A fossil site in southern China that has held paleontologists captivated for a decade keeps relinquishing new treasures. Only 4 weeks ago, a Chinese-British team reported the oldest known vertebrates at the site, two fishlike creatures that lived 530 million years ago (*Science*, 5 November, p. 1064). Now, a rival team presents hundreds of astonishingly well-preserved fossils from the same site, which may represent some of the earliest chordates—a broad group that comprises not only vertebrates but also more primitive invertebrates such as sea squirts and lancelets.

The researchers, led by Junyuan Chen from the Nanjing Institute of Paleontology and Geology, think this animal, too, may have been an early vertebrate—it has a relatively large brain and perhaps eyes—but there's still some doubt, because they didn't find anything resembling a skull. Either way, however, the new fossils give researchers another eagerly awaited peek at the animals that set the stage for the evolution of the backbone, an important transition in the animal body plan. And other researchers add that the sheer quality of the specimens, reported in this week's issue of *Nature*, may eclipse last month's findings. "I think this is going to be an icon that we'll see in the textbooks for many years," says zoologist Nicholas Holland of the University of California, San Diego. "They're almost like a photograph of the anatomy of the animals," adds paleontologist Philippe Janvier of the Muséum National d'Histoire Naturelle in Paris.

Animal icon. *Haikouella*'s preserved internal organs and bulging back offer a rare glimpse of a primitive animal.

CREDITS: (LEFT TO RIGHT) NANJING INSTITUTE OF PALEONTOLOGY AND GEOLOGY; ITER

Both discoveries were made at a site called Chengjiang near the city of Kunming, where 530-million-year-old fine-grained rocks have preserved even soft animal tissue in exquisite detail. After finding a few intriguing specimens in April, Chen's group stepped up excavations. "We knew we had found something very important," says Chen, "and we started working really hard." A month later, the group had collected and described 305 specimens, 30 of them complete, of what they have christened *Haikouella lanceolata,* after the nearby town of Haikou.

Thanks to the stunning preservation, the researchers could not only discern a heart and a circulatory system in these 3-centimeter fossils, but also some of the hallmarks of chordates, such as a nerve cord and a notochord, a rod of stiff tissue that provides support along the back of the body and is present today in most embryonic vertebrates and adult chordates. *Haikouella* also has a puffed-up back that seems to contain segmented muscles—another key chordate feature. What's more, the animal seems to have a relatively large brain, and what appear to be two eyes, suggesting that it may be a very early member of the vertebrates—which would put it somewhere on the first steps of the long road to humans. *Haikouella* also clearly resembles a specimen Chen and colleagues found 4 years ago at the same site, called *Yunnanozoon lividum*, which also seemed to have a notochord and a nerve cord. Chen considered *Yunnanozoon* to be an ancient chordate, too, and says that the much better preserved *Haikouella* now confirms this.

But others contested *Yunnanozoon*'s right to a place within the chordates and seem likely to be skeptical about *Haikouella*, too. "I think they're trying to force too much advanced morphology into the animal," says paleontologist Simon Conway Morris of Cambridge University in the United Kingdom, a coauthor of the early vertebrate paper published last month. For one, Conway Morris isn't convinced that the bulging back does indeed contain chordatelike muscles. In his view, *Haikouella* may be even further down the evolutionary tree than *Yunnanozoon*—a progenitor to chordates and to other invertebrates such as the echinoderms, which include starfish and sea urchins. If so, the species might have been a kind of living fossil in its own time, offering a glimpse into an earlier phase of animal evolution about which even less is known. "In a paradoxical way it could be more interesting than [Chen's team] indicated," Conway Morris says.

But Chen and other researchers reject that idea. "There's no question that these things are chordates," says Holland. Janvier agrees. "This puts an end to the discussion about *Yunnanozoon*," he says. Everyone agrees, however, that more fossils from the Chengjiang site will likely be the key to the definitive history of the chordates. "It's quite astonishing how many new things we find there," says Conway Morris. "It's inevitable that there's going to be a whole lot of surprises." –MARTIN ENSERINK

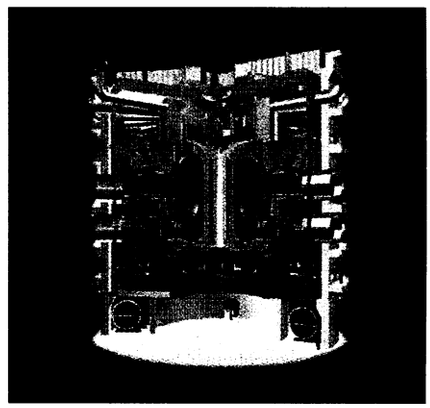
NUCLEAR FUSION

Europe, Japan Finalizing Reduced ITER Design

MUNICH, GERMANY—European and Japanese fusion researchers have drawn up what they hope will be a winning design for a scaled-down version of the International Thermonuclear Experimental Reactor (ITER). Last week ITER scientists described key elements of the smaller and cheaper design at a seminar here for policy-makers, industrialists, and journalists. Details will be revealed next month, in time to influence political decisions to be made starting next summer in Europe and Japan, the two major ITER partners. "We have been preparing for a long time and we are ready," ITER director Robert Aymar told the meeting attendees.

ITER began in 1986 as a joint project of Europe, Japan, the United States, and the Soviet Union. But its future was thrown into doubt in July 1998 when concerns about the $6.8 billion price tag led the partners to extend the design phase to July 2001 and to investigate smaller, cheaper alternatives. The United States later withdrew its support, and Russia's economy precludes it from providing more than intellectual and political support.

Despite those setbacks, a special working group was set up to look for cheaper ways of achieving a "next step" toward a prototype fusion reactor. It considered a series of smaller, cheaper experiments rather than one large one before coming down in favor of a single machine, similar to the original ITER, but with reduced technical objectives. Teams in Garching, Germany, and Nara, Japan, are now putting the finishing touches on the



Reactor redux. The old ITER design will shrink by up to 25% in new plans.