



himself as a fall guy for shortcomings of the South Korean science system. “They can’t hit government, so they hit me,” he says. “My strategy for making KAIST better was to find things that were not good and expose them. Talking about the real problem is healthy. This unhappiness is the first step.”

Some observers say that Laughlin’s tenure was doomed from the outset. “The board made a mistake when they hired him. A lot of people knew it was a mistake, but Korea has a ‘Nobel disease,’ so a lot of people thought that someone with a Nobel Prize could fix anything,” says Chung Wook Kim, a Korean-

American physicist at Johns Hopkins University in Baltimore, Maryland. Although Chung calls Laughlin “a good physicist and a friend,” he says Laughlin was “not qualified” to lead KAIST and that his “definition of reform was vague.” Yoon emphasizes that the faculty is not allergic to reform: “Korean or foreign, if someone with statesmanship and management skills is appointed as president, we will support him or her.”

Laughlin counters that his mandate was vague. “Everyone has different expectations, and ... expectations got blurred,” he says. The science ministry, meanwhile, has washed its

hands of the affair. “What happens at KAIST is an internal issue,” says a ministry official.

Laughlin plans to return to Stanford after his term ends on 14 July. His stature in South Korea may be diminished, but his bank account is not: He told *Science* that he accepted the KAIST presidency in the first place because the salary, approximately \$500,000, was “too high to refuse.” KAIST’s future is less assured. If the trustees want reform, says Chung, they should appoint someone who is familiar with South Korean culture and politics.

—D. YVETTE WOHN

D. Yvette Wohn is a reporter in Seoul.

PALEONTOLOGY

Fossil Shows an Early Fish (Almost) out of Water

A fossil discovered in the upper reaches of Canada has revealed a creature that had the jaws of a fish, a head like a crocodile, fins better engineered for standing than swimming, and a future on land. This 375-million-year-old find, reported in the 6 April issue of *Nature*, is the latest—and most telling—fossil showing how aquatic vertebrates turned into four-legged landlubbers called tetrapods.

“It’s the most significant discovery in years,” says John Maisey, a fish paleontologist at the American Museum of Natural History in New York City. “It’s got features that other fish don’t have and features that tetrapods don’t have.”

Until now, the few fossils representing missing links between aquatic and terrestrial vertebrates have tended to be mostly fishlike or tetrapodlike instead of true intermediates. In 1999, paleontologists Neil Shubin of the University of Chicago and Ted Daeschler of the Academy of Natural Sciences of Philadelphia, Pennsylvania, happened upon a description in an undergraduate geology text of a large, isolated rock formation that was the right age to contain better representatives of this key transition. Canadian geological survey data indicated that these rocks were formed in a delta that emptied into an inland sea—a good environment for land-bound piscines.

For 4 years, the pair, along with Harvard zoologist Farish Jenkins Jr. and various students, traipsed north through the Nunavut Territory to field sites hundreds of kilometers from the nearest village or an airport. But they had little to show for their efforts until the first 3 days of their last season. Then, Shubin recalls, “we hit the mother lode.” All told, the group has

excavated 10 jawbones, three skulls, and two specimens in which the head and part of the trunk are in one piece—all of them belonging to a species the group calls *Tiktaalik roseae*, Inuit for “big freshwater fish.”

Getting these treasures back to the labs intact was challenging, Shubin notes, and part of the biggest specimen had to be left behind. Daily sleet, snow, and cold weather also slowed the drying of the plaster casts needed to transport the rock. Colleagues are ecstatic that the group made such heroic efforts. “It’s remarkably complete material,” says Maisey. “We can see quite a bit of the anatomy.”

Tiktaalik is not quite midway on the path to life on land, but close. Key tetrapodlike features have all but replaced fish traits, the researchers report. For example, until *Tiktaalik* came along, the earliest transitional fish still had gill cover plates, which pumped water over the gills, and its shoulder girdle was fused to the skull. *Tiktaalik* has no gill cover plates and just a few, reduced bones to tie the shoulder girdle to the skull. (Land vertebrates don’t have any of these bones.) This fish therefore had a neck, concludes Daeschler. Also, he notes, it may have favored breathing air over underwater respiration.

Tiktaalik’s head is flat with the eyes on top and the back of the skull squared off, much like the head of the earliest tetrapods. The fish does have the typical scales, but underneath them are overlapping ribs, which Jenkins

had suggested 35 years ago would be needed to help support a body outside water.

The pectoral fins are lobelike, as expected, but their bones are like those in the arm and forearm, with hints of a wrist and hand at the very tip, says Jenkins. Novel joints observed in



Landward bound. This ancient fish is a missing link between fish and land vertebrates.

the fossil suggest that *Tiktaalik* could swing its fins out and forward, enabling it to push up and eventually lumber onto shore, says Shubin.

Why head for the shore? These misfit fish, says Maisey, “could barely crawl on land, and they could barely swim.” Still, the ability to flop out of the water likely helped them escape aquatic predators, and lifting their heads to look for land predators paved the way for descendants that abandoned their watery existence, he suggests.

The new fossil, says paleontologist Per Ahlberg of Uppsala University in Sweden, “goes a long way in filling one of the big gaps in the origin of tetrapods.”

—ELIZABETH PENNISI