

PALEONTOLOGY

China Issues Rules on Fossil Excavation

BEIJING—China has adopted new regulations on access to fossils that assign enforcement to a single administrative body. Most scientists see the new rules as a positive step toward bringing greater order to the current patchwork system, which did little to deter illegal digging and trafficking of fossils. But a few are worried that putting a single entity in charge could result in additional barriers to research.

In the past, valuable fossils were protected by China's Law on the Preservation of Cultural Relics. But the law failed to specify which organization would issue permits, guard against looters, and help customs officials crack down on smuggling. As a result, land and resources administrators often deferred to cultural heritage officials, who lacked any expertise in paleontology. Looters and smugglers took advantage of the lax enforcement, and scientists were left to work out their own arrangements with local officials.

"Now we are authorized to oversee the [regulation of] fossils, with help from experts in the field," says Jiang Jianjun, director of the Department of Geological Environment within the Ministry of Land and Resources (MLR), which issued the regulations last month. Jiang, who has a Ph.D. in paleontology, believes that the rules, 4 years in the making, will help preserve fossil sites for research.

The regulations, which go into effect 1 October, define in general terms what kinds of fossils are protected. A forthcoming list, says Jiang, will include so-called type specimens that have been named and categorized, rare vertebrates, fossils that illustrate key features of evolution, and those from large sites. Hou Hongfei, a retired paleontologist from the Chinese Academy of Geology under MLR, worries that a lengthy list could cause long delays in the approval process. Jiang admits that scientists might face additional paperwork before getting into the field, but he predicts that uniform rules will help the government enforce environmentally sound excavation practices and improve access to the sites.

However, some scientists from the Chinese Academy of Sciences (CAS) are concerned that the new rules could cause them to be treated like second-class citizens because their institutions fall under a different government entity. In the past, CAS scientists have complained that the former Ministry of Geol-

ogy and Mineral Resources, which has been merged into the MLR, has tried to prevent them from digging at certain sites. "I feel uncomfortable with the thought that [the Ministry of] Land and Resources will monopolize the inspection of fossil excavation," says Jin Yugan, a paleontologist at the Nanjing Institute of Geology and Paleontology under CAS. "For example, I have a project that is already approved by the Chinese National Science Foundation. Now I also have to ask for a permit from the MLR or local land resource authorities before I can dig fossils."

Luo Zhexi, a paleontologist at the Carnegie Museum of Natural History in Pittsburgh, Pennsylvania, who has worked extensively in China, acknowledges that the rules might force some Chinese scientists to forge new bureaucratic ties. But he does not think the regulations will pose a hindrance to foreign scientists. "I would expect a short period of confusion before everyone sorts the system out," Luo says. "But in the long term I hope the system will facilitate scientific research while protecting resources."

Most scientists in China are also optimistic. "I think this is a small step in the right direction," agrees Zhou Zhonghe, a paleontologist at the Beijing Institute of Vertebrate Paleontology and Paleoanthropology. "But many of the rules need to be more specific. Most im-



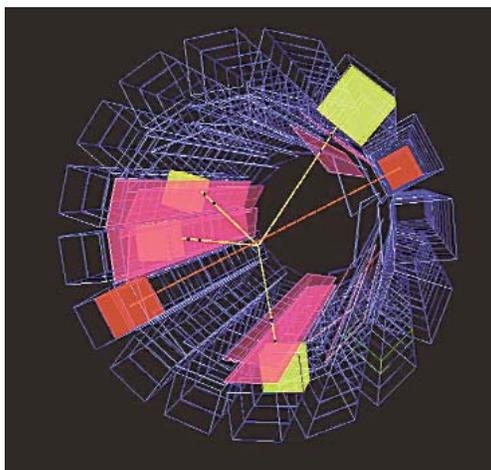
Feather in its cap. One agency will now regulate many Chinese fossils, such as these *Confuciusornis* birds.

portant, I am waiting to see concrete evidence of a firm commitment to enforcement."

Han Lin, an official at the regional administration of land and resources in Inner Mongolia, is confident that will happen. "We will hold forums and symposiums to promote the regulations and to involve people for enforcement," he says. Jiang hopes that the regulations will eventually be submitted for approval by the Standing Committee of the National People's Congress and provide the basis for a new law on fossil protection.

—DING YIMIN AND XIONG LEI

With reporting by Erik Stokstad.



End of the line. An antihydrogen atom in the ATHENA detector decays into pions (yellow) and gamma rays (red).

kelvin. Yet another trap mixes the antiprotons and antielectrons, and some of those particles combined to form antihydrogen, which, being neutral, can escape from the magnetic trap.

The researchers knew they had antihydrogen because they could see the constituent particles decay: The antiproton winds up as a handful of pions, whereas the anti-electron becomes two gamma rays that shoot off in opposite directions. The scientists detected about 130 events in which an antiproton decay was seen right next to an anti-electron decay, and from the expected rates of decay they concluded that they had produced about 50,000 cold antihydrogen atoms in all.

Gerald Gabrielse, a Harvard physicist who works on a rival experiment at CERN known as ATRAP, warns that it's easy to be fooled by subtleties of the magnetic traps. But if the result is correct, "it would be an impressive milestone," he says. "It's an initial step, though." Physicists want to use antihydrogen as a tool to see if there is any difference between matter and antimatter. If, for example, hydrogen and antihydrogen absorb different frequencies of light—that is, if their spectra differ—physicists would have to revise a basic assumption about the way matter and antimatter behave.

That will have to wait until they can trap enough of the stuff to tickle it with a laser to figure out its properties. "They're a long way from getting a spectrum," says Gabrielse. Hangst agrees: "We haven't measured any characteristics of antihydrogen." But now that the researchers can produce slow-moving antihydrogen in bulk, they hope to be able to measure its properties before too long.

And even though few scientists believe that antihydrogen will behave significantly differently from hydrogen, Gabrielse thinks it's vital to test that idea. "Just because our imagination is limited doesn't mean we shouldn't check."

—CHARLES SEIFE