

curio markets worldwide. Today, says IVPP's Zhou Zhonghe, "all the best specimens of eggs with embryos are now outside China."

The immense value of specimens to farmers eager to escape the grinding poverty of rural China almost ensures that the looting will continue, however. Local governments are hard-pressed to protect the widely scattered sites, and police and officials can be bribed. Even the threat of a death sentence, so far levied only against those who have plundered cultural relics, isn't enough to deter the illegal trade.

This presents scientists with hard choices. Although it is illegal to buy specimens with government money, Ji says that the Geological Museum has used a system of indirect payments. "We ask the farmers to do-

nate fossils to the museum," he explains. "Then, the museum gives them awards." The first specimen of *Sinosauropteryx*, for example, netted the donor \$750 in 1996.

Director Zhu Min admits that IVPP reluctantly employs the same tactic, but only as a last resort. Staying above the fray, he notes, means that "scientifically valuable specimens will not be in the hands of genuine researchers." At the same time, IVPP's Chang says that specimens bought from farmers "have lost much scientific information, such as the layer, location, and the association with other fossils." Looters rarely save fossil fragments, which may be valuable to scientists but not to collectors. Indeed, attempts to cement unrelated bits and pieces together are so common that a recent

monograph on *Confuciusornis* included a section on how to spot doctored specimens.

Some localities have gotten serious about protection, with Yunnan officials posting full-time guards at some of the most prominent Chengjiang sites. In 1997, the secretary-general of the local Communist party personally supervised filling the quarry with boulders to protect it during the off-season. And in Guizhou Province, the local government has paid for highway patrols.

But added security doesn't eliminate the problem. "It means peasants now dig less. But they haven't stopped," says IVPP's Li Jinling, flipping through photographs of plundered outcrops. "I feel very sad for Chinese science."

—DENNIS NORMILE

With reporting by Erik Stokstad and Xiong Lei.

PALEONTOLOGY IN CHINA

PARTNERS

Fruitful Collaborations Follow a Two-Way Street

Chinese scientists now hold many of the cards as foreigners seek access to a buried pot of fossilized gold

NANJING—Twenty years ago, Jin Yugan was one of a handful of Chinese paleontologists allowed to collaborate with Western scientists. It wasn't easy. A senior stratigrapher at the Nanjing Institute of Geology and Paleontology (NIGP), Jin spent up to 6 months before each trip meeting such bureaucratic requirements as advance approval for every piece of correspondence. But the hard work was worth it, Jin says, because Chinese scientists were desperate for outside information, help with publishing papers in English, and the acclaim that flowed from such collaborations.

Today, communication is a lot easier, and it's the rest of the world that is beating a path to Jin's door. Jin has even cut back on his overseas travel to spend more time analyzing his data on the Late Permian mass extinction, which is eagerly awaited by collaborators. The boost in government support also has given Jin and others "more opportunities and greater choice in finding collaboration partners," adds Yang Qun, deputy director of NIGP.

The new arrangement is a far cry from the 1920s and '30s, when foreign teams trooped around the country and then shipped home the best specimens. The war and the creation of the People's Republic ended that type of one-way interaction, and it wasn't until 4 decades later, after China began turning westward, that the next major influx of foreign scientists occurred. A series of expeditions called the Sino-Canadian Dinosaur Project began in 1986 and helped to open the door. Fueled by

\$100,000 in annual funding from the Canadian Ex Terra Foundation, scientists excavated more than 60 tons of fossils and identified many new species. "I felt sure that we could work with the Canadians on an equal footing," says Chang Mee-Mann, then the director of the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP) in Beijing. IVPP's Doug Zhiming and Zhao Xijin co-launched the expeditions with Philip Currie of the Royal Tyrrell Museum of Paleontology in Drumheller and Dale Russell, then of the Museum of Nature in Ottawa.

As China's scientific infrastructure expands, however, the preferred mode of interaction is smaller teams built upon mutual interests. "Personal connections in China mean everything," says Chris Beard of the Carnegie Museum of Natural History in Pittsburgh. Large or small, foreign collaborations must work through a Chinese host to win approval for their scientific activities. The increased wealth of their Chinese counterparts is another, welcome change. "On a trip a couple of months ago, once we paid our airfare, they paid for every-

thing else," says Will Downs of Northern Arizona University in Flagstaff, who is working with IVPP on early mammals.

The demand from the West is so great that there is a shortage of top Chinese paleontologists available to work with. Researchers at the IVPP "are just completely overbooked, all of them," says Downs. But not all Chinese scientists are equipped to enter into collaborations. "First you have to know what you're doing," says IVPP's Xu Xing, who studies feathered dinosaurs. "We don't just want to have our name out [in the newspapers]."

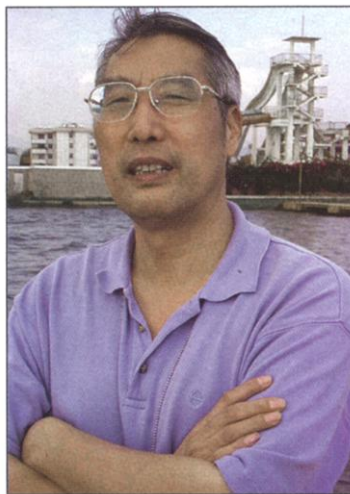
Sun Weiguo, who studies early multicellular animals at NIGP, notes that some Chinese scientists seek fame merely on the basis of their access to key fossils. "If the majority of work is done by foreign scientists," adds Xu, "that's not good for Chinese science." Similarly, Chinese scientists complain about Westerners who give lip service to scientific collaborations to obtain access to the samples.

True collaborations avoid those problems, says Doug Erwin of the Smithsonian Institution in Washington, D.C., who has worked with Jin. "If you collaborate as equals, then you can have a wonderful

time." And there's no excuse not to do it properly, adds David Dilcher of the University of Florida, Gainesville. "The door is open wide for good, constructive, collaborative research," he says.

—XIONG LEI

With reporting by Li Hui, Dennis Normile, and Erik Stokstad.



Traveling man. NIGP's Jin Yugan has more offers from foreign collaborators than he can handle.