WORKING IN CHINA

Geoscientists Seek Common Ground on Collaborations

NANJING—Chinese stratigraphers were elated when an international panel last August overwhelmingly endorsed a site in eastern China's Zhejiang Province as a reference point for the middle Ordovician period some 350 million to 400 million years ago. The designation represented an international seal of approval for the nation's scientific prowess and its ability to be the steward for a site that would draw researchers from around the world. By November, however, excitement about the 15-to-1 vote had turned to anger when the International Commission of Stratigraphy (which gives the final blessing to such sites) was decidedly less enthusiastic about awarding China this paleogeological plum. It approved the Huangnitang site by a vote of 11 to 5, with two abstentions. "We were shocked by such a low favor rate," admits stratigrapher Jin Yugan of the Nanjing Institute of Geology and Paleontology (NIG&P), which has worked extensively at the site.

The second vote followed a campaign by a U.S. paleontologist for a moratorium on all proposed Chinese sites until the government guarantees international access to those sites (see next page). The effort, by Spencer Lucas of the New Mexico Museum of Natural History, arose from a dispute over the ground rules for an expedition last summer to a remote site in northwestern China. That expedition focused attention on potential problems arising from joint research projects in China (*Science*, 1 November 1996, p. 715).

The increasing number of such cooperative ventures creates a pressing problem for both sides. Since 1979, for example, there has been a sevenfold increase in collaborative projects organized by the Chinese Academy of Sciences (CAS), to about 4000 in 1995, and foreign scientists make about 7000 visits there each year. Although these joint efforts take place in many fields, the country's geological richness and its strong national program make international collaborations especially popular in the geosciences. The stringent logistical requirements of many such expeditions mean that understanding the rules is essential for a successful collaboration.

The stakes are high on both sides. For the Chinese, collaborating with foreign counterparts means access to Western technology, the sharing of research costs, and global recognition of their efforts. They put a premium on such interactions: Some 10% of the 300 researchers at NIG&P, for example, hold ranking positions in 25 international scientific organizations.

History by the dozen. Chinese stratigraphers have proposed 12 sites as models for the study of important geological boundaries.

For foreign collaborators, the wealth of potentially valuable sites throughout the country, many of them thought to be unique to China, is a major attraction. Especially important in that respect is the Qinghai-Tibet Plateau in the country's wild west—the site of Lucas's botched expedition and a potentially rich source of nonmarine fossils across the 250-million-year-old Permian-Triassic boundary. "We have done extensive work in geological basic research," says Zhao Xun, deputy director of the Chinese Academy of Geological Sciences (CAGS). "That is why foreign geoscientists are interested in working with us."

But what are the ground rules for good cooperation? It's important to follow local practices and customs, obey the rules, acknowledge the professional contributions of colleagues, and pay a fair price for services provided. Even with the best of intentions, however, Zhao says that, in practice, both sides have sometimes found collaboration to be a bittersweet experience.

A matter of respect. For many Chinese scientists, the most important element is mutual respect. Academician Sheng Jinzhang of NIG&P recalls one unsettling episode in the early 1980s, when a group of Japanese stratigraphers wanted to work jointly on a stratotype section that his team had explored for many years. The Japanese scientists planned to start from scratch, he said, while he "suggested strongly that the joint research should be based on what the Chinese scientists had done, and that improvements be made where necessary." His point was clear. "In the end," he said, "they acknowledged our study of fossils, while I admired their work on sedimentary rocks."

Some Chinese researchers also complain that their overseas colleagues sometimes fail to respect their advice on China's rules for collecting samples. CAGS geophysicist Guo Jingru recalls an unhappy episode a few years

PALEONTOLOGY

Pact to open up new fossil trove. The latest example of China's importance to paleontologists around the world is the discovery of a stunning trove of dinosaur and bird fossils in northeast China. And a new international collaboration is expected to be the key to unlock its secrets.

Scientists at the National Geological Museum in Beijing and The Academy of Natural Sciences in Philadelphia are hoping to reach an agreement for long-term exploration and characterization of the site in the Yixian formation of the Liaoning Province of northeast China. The academy's Don Wolberg estimates that the effort could cost $1 million over 5 to 8 years and involve mapping and dating the site, drilling, and an analysis of its geology, flora, and fauna.

The fossil beds, covering a period some 120 million to 130 million years ago at the border of the Jurassic and Cretaceous periods, are the resting place of hundreds of early birds and dinosaurs. They include a female dinosaur called *Sinosauropteryx*, which had the carcass of a mammal in its gut and an egg in its oviduct—making it the earliest example of mammalian predation and of an internal organ from the fossil record (see photo). The rich beds also have produced two notorious fossils in the past year—the purported "feathered" dinosaur called *Sinosauropteryx prima* (*Science*, 1 November 1996, p. 720) and a candidate for the oldest modern-looking bird, called *Liaoningornis* (*Science*, 15 November 1996, p. 1083).

DAVID BUBIER/THE ACADEMY OF NATURAL SCIENCES

"It appears to represent a blank page in a chapter of Earth time not seen before," says Yale University paleontologist John Ostrom, who in March led a reconnaissance trip to the site by a group of U.S. and German paleontologists.

–Ann Gibbons

No Moratorium on Trust

Veterans of international collaborations with China say that trust is the lubricant that makes such projects run smoothly. But the pump temporarily ran dry in the feud between Chinese geoscientists and Spencer Lucas, a paleontologist at the New Mexico Museum of Natural History.

"Anybody who approves a GSSP [global stratotype section and point] is taking a big chance," says Lucas, who fought with his Chinese collaborators last summer over the rules governing a field project and ultimately left the country without any samples. "Who knows what they will do at a site once it gets approved?" But Liu Dunyi, a geochronologist with the Chinese Academy of Geological Sciences (CAGS) and a vice president of the International Union of Geological Sciences, says that Lucas turned a simple misunderstanding into an unwarranted attack on the country. "[The incident] was an isolated case that has nothing to do with China's official policy," he says. "Professor Lucas has made it an excuse to negate all international collaborations in China and mar the reputation of Chinese scientists."

Last fall, Lucas urged the global geosciences community to impose a moratorium on its process of approving Chinese sites as models for understanding Earth's history until high-ranking state authorities promise free and open access to them. Although that campaign may have affected the voting on one site (see main text), it does not appear to have had a lasting effect on the process.

Now there are signs that the breach may be closing. Last month, Lucas and his co-investigators on the ill-fated expedition invited their Chinese colleague, CAGS's Cheng Zhengwu, to sign a joint research agreement and to participate in an analysis of the samples, now being kept in Beijing, once the material is sent to the United States. "We're happy to work with them, but we can't offer them any money," says magnetopaleontologist John Geissman of the University of New Mexico. "There's nothing in the original grant for analysis." The invitation followed a recent letter to Lucas from Cheng, recounting the incident and ending with his wish "to cooperate with the U.S. side and send the samples to the USA as soon as an agreement is signed." **–Jeffrey Mervis**

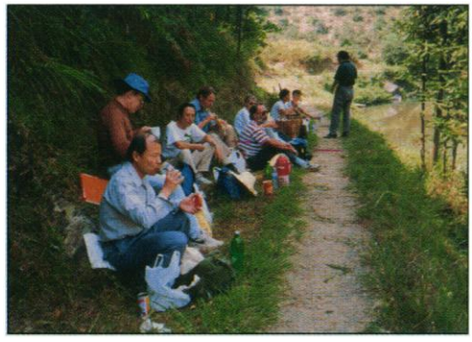
ago with some German geologists. "We were collecting data for our high-temperature and high-pressure research in Tibet when I found that my German colleagues had collected some rock samples," he says. "When I told them that rock collecting was illegal because it was not in the bilateral agreement, they refused to budge, saying that as long as it is beneficial to science, they were justified to do anything. I was really mad." Only when they realized they would have trouble getting these samples out of the country, he says, did they change their minds.

China is not alone, of course, in protecting its geological and fossil resources. Liu Jiaqi, director of the CAS's Institute of Geology, recalls that while visiting Yellowstone National Park a few years ago, he was tempted to hammer off a rock sample. "But my American host said to me: 'Do you want to go behind bars?' I understood him and dropped the idea."

And sometimes Chinese scientists can send a mixed message. Zhang Miman, of the well-known Institute for Vertebrate Paleontology and Paleoanthropology in Beijing, believes that some Chinese researchers have turned a blind eye to the collection and shipping of precious samples and specimens in return for personal gain, including round-trip tickets to a foreign country and the inclusion of their names on research papers written by the foreign parties. She emphasizes, however, that such behavior violates national sovereignty.

Money matters. Not surprisingly, money is often a source of friction. Geologist Larry Brown of Cornell University is a senior scientist on the International Deep Profiling of Tibet and Himalayas (INDEPTH) project (*Science*, 17 November 1995, p. 1144; 6 December 1996, pp. 1684–1694). He says his team had to cancel plans to film some of its work after learning about the high cost of access fees that non-Chinese participants were charged to enter Tibet. The negotiations, he says, left him with the impression that some Chinese are "more concerned with financial than scientific issues."

But CAGS geologist Xiong Jiayu, who is also head of the academy's Science and Technology Division, says many of the conditions are not set by scientists. For instance, Tibet has a local rule that forbids a single vehicle from going out to the field, he says. And housing costs are almost always higher for foreigners, he notes, because of rules that prohibit them from staying in the same, inexpensive guest houses typically used by their Chinese colleagues.



JIN YUGAN

Breaking bread. An international working group examining the Huangnitang site takes a lunch break.

Then there is the matter of setting aside what INDEPTH scientists euphemistically label a "public relations" budget. The money is used to smooth out any obstacles to progress, from a recalcitrant truck driver to an uncooperative local official. Once INDEPTH's foreign participants understood the importance of having such a budget, says Zhao Wenjin, a senior geophysicist at CAGS and co-leader of the project, they were able to carry out their work much more easily.

Veterans of joint projects say that one way to avoid mishaps in navigating the complex regulations, differing procedures, and rigid social norms in Chinese society is to put everything in writing. "Our Chinese colleagues are always faithful to the very word," says Brown. "The disagreements usually come over issues that developed during the course of the experiment."

Other tips from experienced collaborators are to select a partner carefully and be sensitive to cultural differences. Don't assume, for example, that a nod or smile means one's collaborator has understood the conversation or agreed to a particular course of action. For vertebrate paleontologist Richard Tedford, of the American Museum of Natural History in New York, there's really only one thing to remember: "Communicate, communicate, communicate," he stresses. "That's the secret."

Despite the occasional problems, China and its global partners are eager to reap the scientific advantages that flow from collaboration. In January, the International Union of Geological Sciences, in addition to ratifying the Ordovician site, took a small step toward cementing those ties by embracing a draft of guidelines compiled by geoscientists from 22 nations. The guidelines say that each visiting scientist "must respect not only the sovereignty, laws, and environment of the country in which he or she conducts research, but also the dignity and intellectual rights of its scientists." In other words, mind your manners when traveling abroad.

–Li Hui and Xiong Lei

Li Hui and Xiong Lei are reporters with China Features.