

continue to fund research in universities and institutes through competitive grants, but it would control the funding of the 100 or so "research schools" responsible for a large part of postgraduate training in Dutch universities. NWO will also get some extra funding, reaching \$58 million annually by 2000, to build up 10 of these schools into centers of excellence.

NWO's president Reinder van Duinen argues that Ritzen's plan would contribute far too little to competitive funding. Moreover, he says, with only 12% of the research budget, NWO would be in a weak position to influence the direction of Dutch science. "In relation to the direct funding of research at the universities, which is not based on a selection process, this figure is far too low. It is much lower than the corresponding figures in neighboring countries," he says. "If there is no direct increase in NWO's budget, NWO could end up in a difficult position, that of simply being an advisory body. We are not keen on this," says van Duinen.

And he is even more concerned about the proposal to split off NWO and KNAW institutes into a new organization. He argues that the close connection between scientists and funding administrators is the "success formula of Dutch physics research." Ger van Middelkoop, director of FOM's National Institute for Nuclear and High-Energy Physics (NIKHEF), argues that it is not clear how the new organization would work better than the current one. "FOM is functioning very well and we have no reason to believe we made big mistakes."

According to Daan Frenkel of the FOM Institute of Atomic and Molecular Physics, "We always work with a system of external referees, referees from other countries, for all projects that are funded by FOM." Frank van Eyckeren, director of the Association of Dutch Universities, agrees that moving NWO and KNAW institutes from their present homes may cause damaging disruption in some centers, which are strongly integrated with the research departments of universities. "It is too big a step for certain institutes, such as the FOM institutes," he says.

NWO, KNAW, and the universities are hoping to come up jointly with a compromise through discussions with Ritzen. On the agenda will be the possibility of an organization to run the research institutes that would be controlled jointly by KNAW and NWO. Parliament will begin debating Ritzen's proposals next month, says KNAW director Chris Moen, "and we will wait and see what the politicians think of all this."

—Alexander Hellemans

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INTERNATIONAL COLLABORATION

Both Sides Point Finger In Tiff Over China Dig

Last August, Spencer Lucas, a paleontologist at the New Mexico Museum of Natural History, and a team of Western scientists arrived in a remote region of northwestern China for a long-planned field expedition. Their goal: to explore one of the best nonmarine sites in the world for studying the Permian-Triassic boundary (PTB), a time of mass extinctions some 250 million years ago. But Lucas and his colleagues—two other Americans, one Hungarian, and two Chinese scientists—never got to complete their work. After demanding immediate payment to cover unforeseen expenses, their Chinese hosts informed the team that no samples could leave China. Following a tense exchange, the trip was cut short and Lucas and his colleagues returned home empty-handed. "We were snookered pretty good," says Lucas.

Chinese officials say the entire incident is a misunderstanding among scientists and that it should have no bearing on future collaborations. But they also feel wronged. "What Prof. Spencer Lucas is spreading is far from the truth and full of personal prejudice," Zhao Xun, vice president of the Chinese Academy of Geological Sciences (CAGS), told *Science*. But whether the events were a calculated attempt to manipulate foreigners or a series of innocent blunders by both parties, several non-Chinese scientists and research administrators say what happened illustrates the seamy side of research partnerships with China. Lucas and his colleagues are even asking international geology organizations to withdraw support for some activities in China. The U.S. embassy in Beijing is also taking notice: "We have had many reports of scientists being charged exorbitant fees for work already agreed upon," says Marco Dicapua, science and technology counselor at the embassy. He says that stamping out such practices and providing better working conditions for U.S. scientists have become a "priority."

When the field trip was being planned, there was not even a hint that it would end on such a sour note. In 1995, the National Geographic Society awarded a \$16,500 grant to paleomagnetist Roberto Molina-Garza of the University of New Mexico for work on the Guodikeng Formation near Jimusar in the autonomous region of Xinjiang. Cheng

Zheng-wu of the Institute of Geology, Beijing, was a co-investigator, along with Lucas and Heinz Kozur of the Hungarian Geological Survey. The proposal calls the site "the most complete section of the Permian-Triassic boundary on Earth ... a boundary characterized by terminal extinctions and profound environmental changes." The idea was to learn enough about the region to decide whether to propose that the International Union of Geological Sciences



Mountain or molehill? A dispute terminated fieldwork on the Guodikeng formation in northwest China.

(IUGS) designate it as a model site, open to any qualified researcher who wanted to learn more about this important geological period.

The Western scientists arrived in Urumqi, capital of Xinjiang, on 23 August. According to Lucas and paleomagnetist John Geissman of the University of New Mexico, another member of the team, Cheng immediately told them that inflation and additional days in the field had nearly doubled the price of the expedition. Using their credit cards, the Western scientists quickly raised \$2900 in cash. "We had no choice," says Geissman. "The alternative was to pack up and go home." But that wasn't the final demand for more money. Five days later, Cheng requested an additional \$400 for unexpected field expenses.

That request was part of a rapid deterioration in relations between the western scientists and their Chinese hosts. On 29 August, paleontologist Li Yongan of the Xinjiang Bureau of Geology arrived and claimed half of one group of samples. In addition, according to Lucas and Geissman, he announced that he would analyze them in China unless he received a round-trip plane ticket to the United States. Then Cheng lowered the boom: He informed his collaborators that

none of the samples could leave China until a new contract was signed between the relevant U.S. and Chinese institutions. "He was on the [National Geographic Society] grant," protests Lucas, "and he had told us several times that we could take the samples home. But he said the grant was only a personal agreement between us and him, not a research contract."

At that point, Lucas says he even began to fear for his safety. "We had \$10,000 in drilling equipment in a remote area within a closed region of China," he recalls. "We wondered if we might suddenly disappear." After Lucas contacted U.S. embassy officials, Cheng announced the fieldwork was being terminated early. Further talks in Beijing failed to resolve the issue, and on 10 September the team flew home.

Chinese officials and researchers paint a very different picture of the events. "The failure of the field investigation ... was the result of Dr. Lucas's lack of understanding of China's principles and policies governing international cooperation," says CAGS vice president Zhao. Cheng offers a similar description in a report on the incident he wrote for CAGS, which runs Cheng's institute. Explaining why his collaborators were not allowed to take specimens out of China, Cheng wrote: "The two sides must first sign a cooperative research agreement which has been approved by the appropriate Chinese authorities so that a cooperative research program can be established between the two sides. This is the only legal way that the specimens can leave China." Such an agreement, the U.S. scientists learned later, could involve a continuing relationship with Cheng and Li at a cost of up to half a million dollars.

Back in New Mexico, Lucas is still angry about what happened. "I paid to bring Cheng to the United States in 1993," says Lucas, who has made several successful trips to China since 1980. "I have a Chinese graduate student, and I've collaborated with Chinese scientists in the past. This is the first time anything like this had ever happened to me." He pauses, then adds, "I'm done with China. I'm pulling up my stakes. It's too risky."

Indeed, Lucas and his colleagues are so upset that they have proposed to colleagues that the IUGS, the discipline's governing body, withhold its approval for any geological activity in Xinjiang. They also want a moratorium on consideration of the Jimusar site and a half dozen other locations in China that IUGS is reviewing as model sites until the Chinese government can promise that all qualified scientists will be granted free and open access to such areas.

Their concerns have drawn some sympathy from other geologists. "Of course, there have been many positive experiences [by foreign researchers in China], but this is not an

isolated case," says Jurgen Remane, a professor of paleontology at the University of Neuchatel, Switzerland, who chairs the International Commission on Stratigraphy, which reviews sites proposed as model locations. "[The Chinese] have tried to extort money from these scientists, and they need to make substantial concessions to put the matter right," he says.

At the same time, Remane believes a moratorium on reviewing candidate sites in China may be going too far. "It would be a pity to have a good site turned down for political reasons," he says, adding his panel should stick to scientific matters. That's also how the Chinese feel. "To withdraw support for the Dalongkou section and to recommend a reconsideration of all other proposed sites in China [would be] a loss to the international geological community," says Zhao. "We welcome cooperation with foreign countries on the basis of equality and mutual benefit and respect."

Several Earth scientists with extensive experience in China say that this incident points to the need for Western scientists to be wary of potential snafus when working in China. Unexpected demands can arise, they say, because of increasing economic pres-

sure on scientific institutions to become self-sufficient, a growth in local political autonomy, and language barriers. "The dollar price of doing business in China has gone up in a hurry," says paleontologist Chris Maples of the Kansas Geological Survey, who has made three trips to China since 1991. Maples also notes that the team was working in a region far from the capital where local authorities, who also belong to a minority ethnic group, are much less likely to accede to orders from Beijing.

Others note that researchers also need to be sensitive to cultural differences. "It's easy for a U.S. scientist to feel he was ripped off when he's not allowed to do what he wanted to do and he doesn't understand the reasons why," says Steve Graham, a Stanford University geologist who has worked for 15 years in the region on joint projects with a variety of Chinese geological agencies. "It's not enough to know the facts. You also need to know the context." Indeed, to Graham, the incident is a reminder that foreign researchers must do their homework before working in China. "It's caveat emptor," he says. "That's something business leaders have known for a long time, and that scientists are just beginning to learn."

—Jeffrey Mervis

CRYPTOGRAPHY

New Attacks Breach Computer Codes

"It's the Titanic Effect," says Richard Lipton, a computer scientist at Princeton University. Lately, the seas have been full of icebergs for the computer security systems that lock up messages in supposedly unreadable code. And like the "unsinkable" Titanic, the systems have taken on a lot of water. In the past year, a security consultant found a sneaky way to read "secure" public-key messages, and Lipton and a team of scientists from Bellcore showed how to unravel entire public-key encryption systems. Now, Adi Shamir, an eminent cryptographer at the Weizmann Institute in Israel, has cracked tough secret-key systems, including the Data Encryption Standard (DES) widely used in credit card verification and automated teller machines.

Underlying the spate of attacks is a new strategy for cracking security codes. Instead of dwelling in the abstract realm of pure mathematics, cryptanalysts have begun to crack codes based on observing how imperfect computers implement the systems in the real world. "It's a new paradigm," says Lipton.

"There's going to be more of this in the future." Even though many of the attacks aren't practical for the average hacker, "it's a matter of recognizing vulnerability," says Richard DeMillo, a member of the Bellcore group.

It all started last December when Paul Kocher, a computer-security consultant based in California, opened a breach in public-key cryptography, a scheme in which one party (conventionally called Bob) can send a secure message to a target (Alice), even if Bob and Alice have never met to exchange a key.

This method relies upon mathematical functions that are easy to do but very hard to undo: multiplying two numbers versus factoring the product, for example. The function acts like a mailbox; you can put a message in, but you can't take it out. The public key is like the address on the mailbox; by publishing it, a business can enable clients it has never contacted before to send it secure information. The business retains a second, private key, which opens the mailbox.

Instead of trying to steal that second key

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