CHINA

IVF Project Stirs Debate Over How to Preserve Pandas

BEIJING—The giant panda (*Ailuropoda melanoleuca*) has become a symbol of international efforts to protect endangered species. But the 10-million-plus year old "living fossil" also stands at the center of a long-running debate about the appropriate use of technology in augmenting the animal's numbers in China, home to all of the world's approximately 1000 wild pandas as well as nearly 100 living in 29 zoos and research centers.

The latest controversy involves a 5-year project to produce the world's first giant panda conceived by in vitro fertilization (IVF). Although researchers have used artificial insemination successfully for almost 2 decades, the proposal to try IVF has triggered a scientific dispute within China about the pros and cons of such technology. It also highlights a split between advocates of captive breeding techniques and those who favor greater efforts to improve conditions in the wild.

LU ZHI

Not black and white. Even if IVF succeeds, Pan Wenshi *(right)* and Lu Zhi worry that the project could hurt efforts to save pandas.

IVF proponents say that the panda population has declined to the point that new technologies must be found to ward off extinction. But opponents say that the reproductive rates of wild pandas, although low, are sufficient to preserve the species if more is done to protect their habitat. The disagreement extends into the central government, where officials from the ministry responsible for zoos and captive breeding vie for limited resources with officials from another ministry that oversees wildlife preservation and conservation.

Chinese scientists have spent years studying the panda's reproductive system, including hormones, semen quality, pregnancy, and nursing behavior. The first live panda birth resulting from artificial insemination was carried out at the Beijing Zoo in 1978, followed by the successful use of frozen, thawed semen at Chengdu Zoo. These developments opened a new chapter in artificial breeding of pandas, says senior veterinarian Zhang Anju, chair of the China Panda Breeding Technology Committee and head of the IVF project.

Zhang, a former director of the Chengdu Zoo, points out that five female pandas produced 14 litters (20 cubs) at his zoo between 1990 and 1995, of which 15 are still alive. Nationwide, 46 litters (60 cubs) have been produced, of which 42 are still alive, since the committee was formed in 1989. That's a much better record than over the previous 50 years, when 345 captive pandas produced a total of 67 litters (106 cubs), only 32 of which survived for more than a year.

Unfortunately, those gains have not significantly increased the overall number of domestic pandas, and artificial insemination remains an experimental procedure marked by mixed success. "New breakthroughs are needed for a marked increase in panda population," says Zhang. "And test-tube technology and the development of embryo transplanting have made that possible." Some 14 veterinarians, zoologists, and engineers are involved in the IVF effort, which is being carried out at the Embryo Engineering Laboratory for Giant Pandas & Other Endangered Rare Wildlife Species in Chengdu, the capital of southwestern China's Sichuan Province. The project's 5-year budget is $1.2 million, derived from a combination of state, local, and provincial governments as well as overseas donations.

Zhang's team hopes to extract ova either from the ovary of a deceased female panda or from a captive panda. Mature ova will be fertilized, and any zygote that results will be nurtured in a test tube and then kept frozen at –196°C in a liquid nitrogen bath until a suitable transplant candidate can be found. Zhang expects to refine the technique on black bears before using it on pandas, but probably not before the end of the decade.

But several Chinese panda experts have questioned the value of Zhang's project. Fertilization biologist Chen Dayuan, of the Institute of Zoology of the Chinese Academy of Sciences, says it is "neither practical nor helpful" as a way to increase the number of pandas. "A test-tube panda can create an instant sensation and demonstrate that China's biology engineering has reached a certain level," says Chen, a consultant to the Chengdu committee. "But the panda population of 1000 is too small to support such a project. Our first and foremost task is to rescue pandas from extinction."

Chen, secretary-general of the Chinese Society of Zoology, says his research has shown that the unstable success rate of artificial insemination over the past few decades is caused mainly by a reproductive endocrine disorder that leads to a failure of sperm and ovum to meet and fuse. Chen's work, which involves supplemental hormone treatment for females and enhancing the sperm viability of males, has contributed to the recent success of the Chengdu breeding program.

Even sharper criticism of the project comes from Pan Wenshi of Beijing University, who has spent 16 years observing pandas in preserves at Wolong in Sichuan and Qin Ling in Shaanxi. "Panda is by no means a test animal," says the 59-year-old zoologist. "Obtaining ova from female pandas means a surgery which is definitely uncomfortable to them, if not fatal. Other test-tube projects have shown that one successful test-tube life comes out of numerous failures. Do we have so many pandas to fail?" Adds zoologist Lu Zhi, his former student and now a colleague at Beijing University, "There is nothing wrong with the test-tube technology itself. What is wrong is the choice of panda as the candidate for the test."

Pan says that the best way to save pandas is to preserve their habitats and release the captive pandas back to the mountains. And he worries that IVF funding could drain money from that effort. "Pandas have a much higher rate of survival in their habitats than in zoos," he asserts. At Qin Ling, Pan, Lu, and their colleagues have followed about 80 pandas and recorded 11 births and only four natural deaths between 1988 and 1995. He says that even during bamboo flowering, which heralds the death of the panda's major source of food, "the pandas migrate, switch bamboo species, or simply change elevation to secure nutrients."

Zhang acknowledges the issues raised by his critics: "We are fully aware that pandas are an extraordinarily precious animal." His initial work will be aimed at solving technical problems such as in vitro culture of zygotes and learning more about the animal's reproductive cycle. Zhang says he does not know

what proportion of the captive panda population will be used for IVF tests, but his assistant, He Guangxin, director of the Chengdu Zoo, states that the team won't begin working with live pandas "until after we have perfected our skills on some less precious animals."

The IVF project has already been endorsed by a scientific review panel reporting to planning officials in Chengdu, and it is being reviewed by the State Planning Commission, which oversees all large science and technology projects. Although municipal governments provide much of the support for captive pandas—the Beijing Zoo, for example, spends $75,000 a year caring for its 15 pandas—the Ministry of Construction is responsible for captive breeding programs on a national level. Zhao Qingguo, a ministry official, says zoos remind visitors of the importance of protecting pandas and other precious animals in addition to offering a refuge for species nearing extinction and an opportunity for reseachers. "The natural reserves, which are usually inaccessible to ordinary visitors, won't produce such a striking and appealing effect," he says.

At the same time, the government plans to spend $7.2 million over 10 years to improve 13 existing panda reserves, create 14 more—mostly in Sichuan—and build 17 corridors of bamboo groves between reserves. It is part of an effort, begun in 1992, that is seeking $30 million in foreign contributions. "We hold that pandas should live in the wild rather than captivity," says Zhou Zhihua, a staff member of the Protect Giant Panda Office of the Department of Wildlife and Forest Plant Protection within the Ministry of Forestry. "Zoos should only serve as a supplement."

But Zhou admits that the international community has been less generous than Chinese officials had hoped. "Our biggest problem is funding," she says. To date, China has received a total of $2.3 million from South Korea and Japan for a 10-year loan of giant pandas to those countries. Reflecting the delicate balance between captive breeding and conservation efforts, each ministry was allotted $1.03 million, with the remainder going to the pandas' home zoos.

Given the symbolic importance of the panda, the debate in China is being followed closely by scientists and conservationists throughout the world. "Whatever they do, the whole world will be watching," says virologist Stephen O'Brien of the U.S. National Cancer Institute, who has worked with Pan and Lu and been closely involved in international conservation efforts. "That's just the way it is with pandas."

–Zhou Meiyue

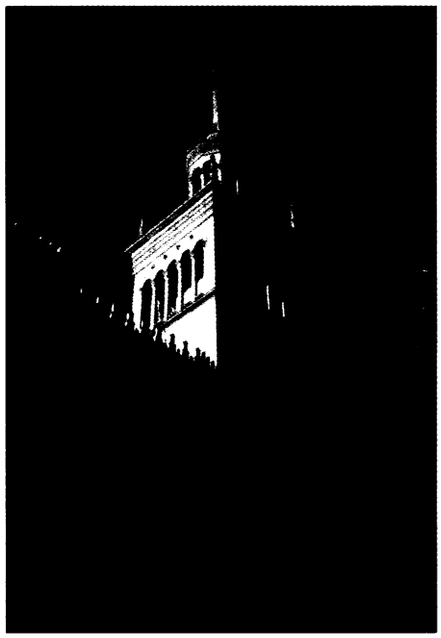
Zhou Meiyue is a reporter for China Features *in Beijing.*

AFTER THE BREAKUP

Civil War Leaves Once-Proud Georgian Science in Tatters

TBILISI—The problems confronting the scientific communities of the 15 new nations created by the breakup of the Soviet Union are depressingly familiar: an all-powerful academy, reluctant to give up control over funding; overstaffed institutes full of aging equipment; and shattered economies that can no longer afford a bloated scientific enterprise. But in the southern republic of Georgia, it is hard to imagine how any science survives at all. Shortly after declaring independence in 1991, Georgia was plunged into almost 2 years of civil war. Although the conflict is now restricted to the breakaway republic of Abkhazia in northwestern Georgia, this country of 5 million people is exhausted—its gross national product is $350 per person, on a par with Mozambique. And not surprisingly, Georgian science, which once boasted a strong math community and a productive suite of optical telescopes (see box), is in crisis.

Once nourished by bountiful Soviet coffers, many of Georgia's scientific institutes are now as lifeless as the dark traffic lights in electricity-starved Tbilisi. Yet the Georgian Academy of Sciences has resisted cutting the 10,000-person staff in its 50 institutes, despite receiving a budget last year of just $2.5 million—$250 per person to pay for everything from salary to electricity bills.



R. STONE

Glorious past. Once-thriving academy has 10,000 staff members in 50 institutes.

"There are too many scientists in Georgia," says physicist Tamar Khulordova, director of the International Science Foundation's (ISF's) Georgia office. "They are all poor, hungry, and cold." With the economic situation showing no signs of improving, the academy may have to act soon. "The time for reform has arrived," says Peter Mamradze, first deputy to Georgia's State Minister.

At stake are the few healthy research teams that have sustained themselves on Western grants, such as those from the ISF, the fund set up by U.S. financier George Soros, and the European Union's INTAS program. But many of these grants are expiring this year, leaving top scientists high and dry.

Physicist Tamaz Butkhuzi argues that without fundamental reform, science in Georgia cannot survive. Butkhuzi spent 15 years at Moscow's Lebedev Institute of Physics before coming to Tbilisi State University (TSU) in 1992 to launch a research program on semiconductors. He returned because Georgia lacked this field and because, he says, "I love my native land." Butkhuzi, however, returned in the middle of the civil war. The streets were dangerous, and workers plundered their own labs. For instance, says Butkhuzi, in 1992 a TSU employee destroyed a $20,000 transformer to pilfer $100 worth of copper wire.

Intercity travel was not only dangerous but prohibitively expensive. "We could not get gasoline to go on collecting trips," says Gia Nakhutsrishvili, director of the Institute of Botany. Tamaz Agladze, head of the Georgian Technical University's electrochemical engineering department, pressed ahead with a planned international electrochemistry conference in Tbilisi in 1991, but only 30 people came, including a few scientists from Germany and Hungary. Those who turned up experienced real wartime science. "We had discussions even as machine guns fired in the streets," says Agladze.

These days, Georgian scientists don't have to worry about bullets, but they do have to worry about money. The state pays a nominal salary, roughly $15 a month, which is between 5% and 10% of salaries in Soviet days. In Nakhutsrishvili's botany institute, he says, only the five groups with ISF grants and a handful of other scientists—about 30 of the institute's 200 staff members—are "working really hard." Libraries lack the money to subscribe to most journals.