closely 21 areas and 13 major cities, and a raft of laws and regulations on emergency preparedness for China's 27 provinces.

Tough calls

Generating a torrent of information about high-risk areas doesn't guarantee success, however; data can also be disregarded. The program's biggest failure, Chinese officials acknowledge, was the lack of a short-term prediction for a magnitude 7.8 earthquake that struck Tangshan, 150 kilometers east of Beijing, in the predawn of 28 July 1976. Some 240,000 people in the industrial city of 1 million were killed, and the damage amounted to more than a half-billion dollars.

Indeed, some scientists worry that an overemphasis on prediction may give citizens the false impression that the government is capable of issuing real-time predictions for all earthquakes. "It is misleading and dangerous," says geophysicist Chen Yong, a member of the Chinese Academy of Sciences. "In fact, China's quake predictions still remain at the empirical stage," he says. Officials say the empirical approach is most effective when applied to quakes with foreshocks and many precursors, a small subset of all quakes. The Haicheng and Menglian quakes fit that description nicely.

Chen, who spent 15 years as the SSB's deputy director-general, is now chair of the prediction commission of the International Association of Seismology and Physics of Earth Interior. He has shifted his research from prediction to what he describes as a "more basic" study of risk assessment, but decries the low level—less than 10%—of the program's budget that goes for basic research.

Even Chinese officials say that success should not be overstated. "The three risk areas [on the current list where earthquakes have occurred this year] have been circled almost annually," says geophysicist Sun Shihong, who drafts the SSB's policies and regulations. "It is more due to chance and windfall than accuracy by scientific definition." Under a strict definition of prediction, notes geophysicist Zhang Shaoquan, "we have only been able to forecast a tiny number of quakes."

The SSB would like to improve that record. Ge Zhizhou says that Chinese earth scientists hope to "make some remarkable progress in improving the record of prediction accuracy" by the turn of the century, although he concedes that significant progress will be very difficult to achieve. Notes Sun, "We cannot expect to understand the earthquake mechanism in so short a time."

Western scientists who have recently seen some of the data amassed by the Chinese for the first time share these reservations. But they believe the information could point to some interesting lines of research. This summer, for example, a joint team of Chinese and U.S. researchers published an analysis of resistivity signals—a measure of current flow that correlates with the amount of cracks and fluid in the Earth's crust—from the Tangshan region in the 2 to 3 years preceding the 1976 quake that point to several possible precursors (*Journal of Geophysical Research*, 10 June, p. 13869). "These are interesting phenomena that suggest things we could measure," says co-author and seismologist Leonardo Seeber of Columbia University's Lamont-Doherty Earth Observatory, about a finding of lower resistivity and a descending water table in the period before the quake. "The next step is to understand the process and see if it can be generalized."

Apart from the value of the data sets, the authors see the collaboration as a step toward improved relations. "This is the first time we've been able to get our hands on the actual data," says co-author and geophysicist Chris Marone of the Massachusetts Institute of Technology. Adds Seeber, "The Chinese have proposed these results before, but the community had looked at them with skepticism."

To some Western scientists, the program also illustrates an interesting cultural difference in the way science is pursued. "The Chinese are more comfortable than Western scientists with conflicting and contradictory evidence," says Louise Comfort, a specialist in seismic policy at the University of Pittsburgh who drafted the proposal for the new U.N. program. "When they face this problem, they just broaden the scope of their inquiry and collect more data."

And collecting more data is exactly what the Chinese will continue to do. "We'll try to make accurate predictions while going on with our research, and we'll learn from both successes and failures," says Ge of the SSB. Even geophysicist Chen believes that the government's overenthusiasm for predictions is outweighed by the importance of the challenge and China's success to date. "If we had not been able to predict a certain type of quake," he says, "we would have given up the prediction effort altogether. But now we are right in the middle, and we are left with no alternative but to go ahead."

–Li Hui, with additional reporting by Jeffrey Mervis

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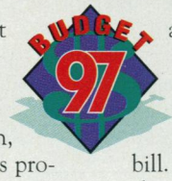
CONGRESS 1997

Senate Backs NASA Science Programs



NASA scored three victories last week when the Senate preserved a controversial life sciences program involving orbiting monkeys, rejected a move to cancel the space station, and protected a major earth sciences program. But controversies over social programs in the appropriations bill that funds NASA could make it hard for Congress and President Bill Clinton to reach agreement before the new fiscal year begins on 1 October.

Senators sparred bitterly over the Bion program, a joint U.S.–Russian effort that will place monkeys into orbit this fall and again in 1998 to study the effects of weightlessness (*Science*, 12 July, p. 175). The focus of the 3-hour debate was not whether the animals in the program are mistreated, as some animal-rights activists allege, but whether the science is valid and the money well spent.

In the end, the Senate defeated an amendment, identical to one already approved by the House, that would have halted funding for the project and transferred $16 million remaining in the $33 million program to other NASA efforts. The provision would not have stopped this fall's launch from Kazakhstan, but it would have jeopardized the 1998 mission. The House measure had caught the biomedical community off guard, but researchers waged a heavy lobbying campaign that contributed to a 54 to 42 Senate vote against the amendment.

Congressional staffers and NASA officials say they expect the Senate to prevail when the two chambers meet in conference to work out a final bill. Negotiations will also be necessary to resolve disagreements on the agency's Mission to Planet Earth program. The House wants to chop $200 million from the $1.3 billion program. The Senate approved the full amount, but voted to cut $100 million out of a larger account that includes the multisatellite research and monitoring system, the first launch of which is slated for 1998.

The fate of the once-controversial space station, however, will not be up for grabs in conference. The Senate defeated, by a vote of 60 to 37, an amendment to kill the program and then approved the same $2.1 billion already passed by the House. But House and Senate conferees are expected to allow a shift of more than $170 million in station science funding to construction to make up for severe shortfalls (*Science*, 9 August, p. 730).

These differences are minor compared to the fierce debate over other elements in the bill, notably the president's AmeriCorps service program, which the House has voted to kill. Lack of agreement on that issue could delay NASA's 1997 budget and that of the National Science Foundation.

–Andrew Lawler