CHINA

Government Gives Green Light to Four New Facilities

The Chinese government has approved funding for four big-science projects that are intended to boost China's capabilities and international standing in fields ranging from astronomy to materials science. The list consists of a 4-meter-wide field telescope for sky surveys at an observatory northeast of Beijing, a new synchrotron x-ray source on the outskirts of Shanghai, the upgrading of an existing synchrotron in Hefei, and a national seismographic network to monitor crustal movements at major faults.

The projects received a high-level endorsement this fall from the Leading Group of Science and Technology—a new committee chaired by Premier Li Peng that includes the top echelon of government scientific organizations. The committee agreed to spend $55 million as part of a government promise to triple by 2000 the percentage of the nation's gross domestic product devoted to science and technology—now just 0.5%—and increase spending on basic research. The new projects are also an attempt to attract international collaborators with world-class research facilities. In addition, the projects shore up the status of the Chinese Academy of Sciences (CAS), which has otherwise seen a reduction in government subsidies but whose scientists will carry out most of the work.

The most innovative of the new ventures is the Large Area, Multi-Object Fiber Spectroscopic Telescope (LAMOST). With its large 5-degree field of view, 4-meter mirror, and 4000 fiber-optic cables carrying light to detectors—an order of magnitude more than current telescopes—LAMOST will be the world's most powerful instrument for collecting spectra from huge numbers of galaxies and other objects. Only by analyzing an object's spectrum can astronomers determine its distance and add depth to sky maps. LAMOST is expected to collect spectra for 10 million objects over 3 years. "Modern astronomy works on large amounts of data from galaxies, and LAMOST takes this fundamental requirement by the throat," says Alec Boksenberg, professor of astronomy at Cambridge University and former director of the U.K. Royal Observatories. "I think it's a really exciting project."

LAMOST will build on the work of a $40-million telescope nearing completion in New Mexico that is dedicated to the Sloan Digital Sky Survey (SDSS). The U.S. telescope will actually carry out two surveys, says Johns Hopkins astronomer Alex Szalay, chair of SDSS's scientific advisory council: One will collect light from some 200 million objects, and the second will carry out more detailed spectroscopy on one million of the brightest objects. "But LAMOST is a major next step forward" in technology, he notes.

The telescope, to be built over 7 years at an estimated cost of $16 million, will reside on a mountaintop that is already home to several instruments operated by the Beijing Astronomical Observatory. The atmospheric conditions are acceptable but less than ideal, notes one of the designers, astronomer Chu Yaoquan of the University of Science and Technology of China in Hefei, who adds that the advantages of using an existing site proved decisive. "The government doesn't want to have it too far away from Beijing," he says. "Besides, the cost of a new site out west would make the project too expensive." The telescope also owes its modest price to a design that keeps all the major components fixed in place, except for a second large mirror 40 meters from the aperture.

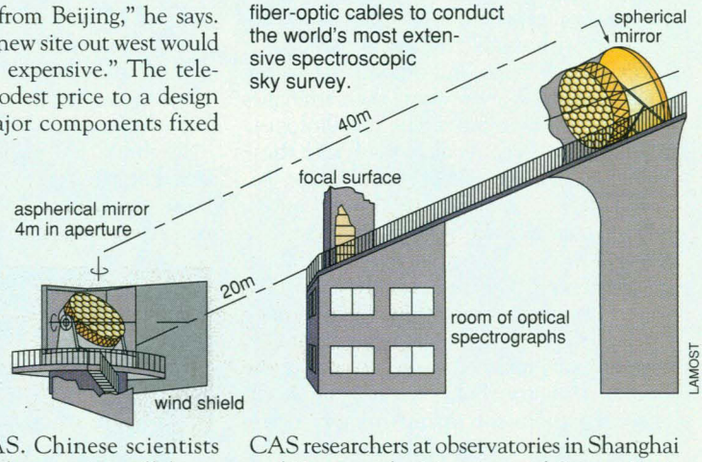
Storing and disseminating the huge amounts of data from LAMOST will be a "serious problem," admits Zu Qinxin, deputy director for basic research at CAS. Chinese scientists hope to solve it through extensive collaboration with foreign scientists. And while the government is prepared to finance the entire project, Zu adds, "we won't pass up opportunities for international support."

The two synchrotron projects are based on the assumption that there will be a growing demand from academic and industrial scientists to use the x-rays generated by these powerful machines, which open windows in fields ranging from advanced materials to virology. The Hefei facility, which dates from the 1980s, is being upgraded with the installation of several superconducting magnets and up to eight additional beam lines. It is a second-generation facility, less powerful than U.S. and European facilities.

The Shanghai instrument, however, will pose stronger competition for the West. At 2 to 2.5 GeV, it will have enough energy to generate short-wavelength, penetrating, hard x-rays. "The potential users said that they are mostly interested in hard x-rays," says Lee Tung, an accelerator physicist at Argonne National Laboratory's Advanced Photon Source, who was in Shanghai recently as a member of an international panel reviewing the project. "A higher energy would be nice," he says, "but the cost of the project is fixed."

The synchrotron is a joint project between CAS and municipal officials who believe their city should have a state-of-the-art research facility. Civic pride comes at a price, however: a 50/50 split in the estimated $100 million cost of the machine. The central government is making a down payment of $10 million for continued design work leading to the start of construction.

Details of the fourth project, which will be managed jointly by CAS and the State Seismological Bureau (SSB), remain sketchy. The idea is to augment the bureau's existing network, which collects vast amounts of data on anomalous events that might prove useful in predicting major earthquakes (*Science*, 13 September, p. 1484). The new effort will link up CAS researchers at observatories in Shanghai and Yunnan, the Mapping and Survey Institute at Wuhan, and the Satellite Ground Station at Changchun with SSB facilities. It will supplement ongoing seismological observations with information from the satellite-based Global Positioning System and very long baseline radio arrays on the crustal movements that can lead to earthquakes. The new network will also keep tabs on other geological disasters such as landslides and ground sinks.



The most. LAMOST has 4000 fiber-optic cables to conduct the world's most extensive spectroscopic sky survey.

These four projects are expected to be the first of several big-science facilities to be approved during the current 5-year plan, which runs through 2000. Other candidates include a long-pulse, magnetic fusion facility to be built in Hefei, a heavy-ion accelerator in Zhengzhou, and an oceanographic survey research vessel. Taken together, these projects will bring China one step closer to joining the big leagues of international science.

–Jeffrey Mervis

With additional reporting by free-lance writers Xiong Lei and Li Xiguang in Beijing