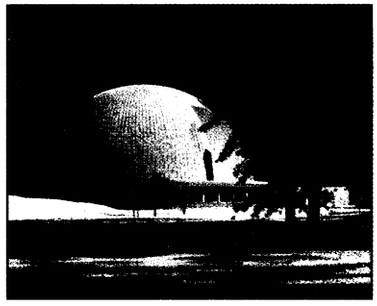
LETTERS

"The core spirit of science"



BROOKHAVEN

Responding to an editorial by Li Peng, premier of China, readers note that science "teaches people to think independently" and that "science and technology alone cannot solve China's agricultural problems." On other topics, it is pointed out that "over 1000 scientists" participate in research that uses neutron beams every year in the United States. (At right, Brookhaven National Laboratory's high-flux beam reactor.) The "present, unsustainable system" of public funding of research is criticized. And the danger model of immunity is discussed.

Neutron Research Community

The News & Comment article "U.S. neutron scientists settle for less" by Andrew Lawler (9 Aug., p. 728) provides a sobering assessment of the current status of neutron facilities in the United States and prospects for new ones. I take issue, however, with the description of the neutron research community as "small and fractious." The "fractious" aspects of our community (as Lawler amply demonstrates) are mainly within the U.S. Department of Energy and its competing national laboratories, not among neutron researchers, the large majority of whom come from universities and industries. Nor is our community "small." Well over 1000 physicists, chemists, materials scientists, and engineers participate in research in the United States every year using neutron beams, and this number has doubled in the last decade. As an example, researchers using the reactor at the National Institute of Standards and Technology, which has recently developed the only internationally competitive cold neutron research facility (CNRF) in the United States, have tripled since the opening of the CNRF in 1990. Moreover, these numbers do not reflect broad and critical U.S. needs for isotopes and irradiation facilities applied to medicine and technology, which also require modern neutron sources.

Unfortunately, our community has not benefited from development of a totally new neutron source in this country for more than 25 years, and we are continuing to fall behind our international competitors, a point clearly documented by Lawler. We must find a way to meet the increasing neutron research needs of modern U.S. science and technology. Even in the face of tight budgets, we in our field must unite to make a coherent case and set priorities for critically needed investments for a new neutron source and for upgrades to existing neutron facilities. This effort must be less concerned with the needs of any particular national laboratory than with providing the best capabilities for the nation. Failure to succeed in this mission could lead to a loss of any chance for the United States to be competitive in vital neutron measurements, nuclear medicine, and related technologies, as we move into the next century.

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Science in China

The editorial by Li Peng, premier of China (5 July, p. 13), gives a positive signal that the Chinese government finally realizes that it is time to replace the empty "ism" with science. Science is not merely a collection of utilitarian tools for planting rice, building highways, and so forth.

The core spirit of science is to seek truths through unrelenting effort and utmost honesty and to uphold truths with courage and integrity. These are vital elements for all societies, especially for today's China. Science also teaches people to think indepen-

dently, and to question and reason objectively. These two aspects are critical for preparing China to have a national common ground and for bringing a new kind of people into being, who have the vision, character, and capability to make China a good member of the global village.

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Science is needed everywhere for economic development, especially for China, because of its huge population and limited arable land. Li Peng's editorial correctly identifies agriculture as the biggest problem. However, many experts believe that science and technology alone cannot solve China's agricultural problems (*2*); there is much debate about the world's grain supply and Chinese grain needs in 2030, when China's population is projected to reach 1.6 billion (*3*).

China's agricultural problem is due mainly to the marketing system, policy, management, lack of infrastructure, and government's neglect of the farmer's interest. So far, it is not a production problem. Chinese farmers do not have ownership of the land they use. This situation results in low investment for land improvement and maintenance. Other issues—such as price control for grains, government grain procurement quotas, and grain movement restrictions—discourage farmers from producing more. At the same time, these factors encourage farmers to hold back grain stocks in their own households.

Current Chinese government policy promoting "three highs" (high yield, high quality, and high efficiency) appears to be meeting short-term immediate demand, but in the long run, excessive use of agricultural chemicals and water and an increase in the crop index are likely to result in increased pollution, erosion, waste, and deterioration of natural resources. Agricultural education, research, and extension in China are mostly separated (*1*). Agricultural education is under the Ministry of Agriculture, independent from other higher education. Infrastructure, particularly in rural areas, is lacking. Government investment in agriculture amounted to only 1.3 percent of the total state investment in 1995 (*4*). Most significant, there is a critical water shortage in China. Moving water cannot meet total demand because the annual average water supply [650 billion cubic meters (bcm)] is much below the total potential demand (*5*). Where and how to find new water resources for agriculture, industry, and human needs is an urgent issue.

We applaud the Chinese government's call to place a high priority on science, and an even higher priority on agriculture. Such a call can only be effective together with a call for policy changes.

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References

1. T. C. Tso, Ed., *Agricultural Reform and Development in China* (Ideals, Beltsville, MD, 1990), p. 405.
2. *Am. Assoc. Chinese Stud. Bull.* **23**, 429 (June 1996).
3. The 1995 state investment on fixed capital totaled 1994.5 billion yuan (1 U.S. dollar = 8.3 yuan) of which agriculture received only 26.4 billion yuan.
4. By 2030, the projected total agricultural water need is 900 bcm, of which 700 bcm would be for grain production alone.

Science requires the freedom to challenge ideas openly. If the Communist government of China wants partners, it should begin with its own intellectuals.

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