

a little under, "but the difference will not be great."

Asked about the pace of progress during the past couple of years, Fang observed "Surely no long-range program can move forward without the slightest change, and any program will have to go through necessary alterations and changes in the light of actual conditions." In a separate interview, Yong Long Kuei, director of planning for the State Scientific and Technological Commission said, "The time will come when China will make important contributions to science, but we will be able to reach the world level in only a few areas by the year 2000. Generally we are still very backward. Perhaps if we have foreign help and peace, in 50 years we will be number one in the world."



*Barges and sampans are a common form of transportation—and a place to live. [Photo by Carol Rogers, AAAS]*

China's first estimates of what it would cost to achieve the Four Modernizations came in at \$600 billion. That may well be the cost of buying the almost fully modern society contemplated in the long run, but for the short term China has scaled down her ambitions by focusing, for instance, on agriculture and light industry rather than on heavy industry. According to a recent article in the *Far Eastern Economic Review*, China is now talking about a program that might cost \$280 to 360 billion in the next 20 years.

Much of that money is going to have to come from foreign loans, often guaranteed by foreign governments. For years, China wanted nothing to do with foreign loans; but now she seems eager for them, and lenders are eager to lend, though not without some sense of the risk involved. Nevertheless, China is poor, and money is a crucial problem. Her energy posture is an example. A year ago, the Chinese were negotiating with the French for the purchase of two nuclear power plants. But China has little foreign exchange and

plenty of alternative resources, so the nuclear option was dropped. "We won't say that this effort with France is totally cancelled," said Fang, a skillful politician, "but it is not going on at the moment. We believe that nuclear power generation has bright prospects in the future, but China enjoys such an abundance of hydropower reserves, why should we spend an enormous amount of money to build nuclear power stations?"

Indeed, it seemed clear that hydropower is at the top of China's energy list. "China enjoys a natural and unique advantage in that the peak of the world, the Himalayas, are situated in our country, which give rise to an abundance of water reserves . . . . We have only made use of 1 to 2 percent of our hydropower reserves, leaving the other 98 percent untouched. And I understand that to go into hydropower generation is much less expensive, and the built-in expenses would be much less as well." Fang estimates China has the potential for generating as many as 600 million kilowatts from hydropower if she can make full use of her resources. When Vice President Walter Mondale was in Beijing at the end of August, he and Fang talked "during a working luncheon" about the United States cooperation in this sphere. Mondale, in his address to the Chinese people, said "I will be signing an agreement on development of hydroelectric energy in the People's Republic of China. U.S. government agencies are now ready to help develop China's hydroelectric power on a compensatory basis." One of the first sites for a hydroelectric plant is likely to be in the Yangtze River gorges.

China also has substantial reserves of coal which, Fang says, will provide much of the country's energy in coming years. "Last year we succeeded in producing a total of over 600 million tons of coal, leaving only a tiny gap as compared with that of the United States." China may well begin exporting coal to Japan, with whom she has done some \$3 billion worth of trade this year. Oil exportation is another possibility. Just how much oil China has is unknown. (Says Fang, "Senator Jackson gave an estimate of an annual output of 100 billion barrels of oil, but I don't know how he got this figure.") There is no doubt, however, that oil is there, in the South China Sea, the East China Sea, and on the continent. Already, China and American oil companies are engaged in joint exploration that Fang says is going "smoothly."

"In the event that you become an exporting nation, would you join OPEC?"

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## China to Build Synchrotron Near the Ming Tombs

China, anxious to enter the mainstream of modern physics, is intent on building a 50-billion-electron-volt (50 Gev) proton accelerator by 1985. Work on the design of the accelerator is under way at the Institute of High Energy Physics in Beijing. The accelerator is to be built in the hills about an hour outside of the city, near the tombs of the emperors of the Ming dynasty.

Admittedly, at 50 Gev China's accelerator will be small by world standards. The Fermi National Laboratory in Chicago and the European Nuclear Research Center in Geneva have 500-GeV machines. But it represents China's determination to become "world class" in at least some areas of science. At a time when money is desperately short, the symbolic value of this commitment of \$200 million is substantial.

Li Yi, deputy director of the institute, talked about that commitment. "If we want to make a major breakthrough in science, we have to do basic research. High energy physics, this synchrotron, is an important part of basic research. The project is a comprehensive research tool that will require technical skills and equipment in many different fields. It can greatly improve our level of achievement in science and technology, which is important to the Four Modernizations. And it can improve the training of our scientific and technical workers."

Obviously there is a lot riding on the Beijing Proton Synchrotron, which its designer, Xie Jalin, says is already affectionately called BPS by the world physics community. Xie, who graduated from Stanford in the late 1940's, says that American collaboration is essential to the success of the project. Indeed, this collaboration, which has been proceeding steadily since normalization of diplomatic relations between the United States and China last January, is one of the first concrete expressions of a desire for scientific exchange. Thus far, says Xie, who visited the United States last fall, "we have contacted physicists at Stanford, Fermi, Brookhaven, Argonne, and the Lawrence Berkeley labs. We feel our ties are strong and

are expecting some American scientists to come here to work soon."

In high energy physics as in other areas, China has had to modify somewhat her earlier goals. Originally, 1982 rather than 1985 was the target for completion of the BPS. But there is still a very real sense that things are moving, and the prospect of building a 200-GeV synchrotron next is already being quietly discussed.

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## China Adopts New Law for Environmental Protection

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"To protect the country's environment and natural resources and to prevent pollution and other public damage," China passed a major environmental protection act on 13 September. The law, which is extraordinarily broad in scope, defines environment to include "atmosphere, water, land, mines, forest, prairies, wild animals, wild plants, aquatic animals, historic scenic spots, sightseeing points, mineral springs, rest areas, nature areas, people's living areas, and so on."

The law is idealistic and probably unrealistic but signifies nonetheless that the environmental movement has, in its way, come to the People's Republic, and none too soon. China already has substantial pollution and, as she mobilizes for industrialization, will undoubtedly see more. Air pollution in this coal-burning country is particularly obvious. One Sunday, the golden rooftops of the palaces of the Forbidden City were splendidly visible from my room in the Peking Hotel. By Monday morning when the city was back at work, the Forbidden City had vanished completely in a haze of gray-brown smoke. The industrial city of Zhang-zhou, with some 350 plants, is like the way we know or imagine the coal towns of Pennsylvania to have been in the 1930's.

According to physicians and epidemiologists, the toll that pollution is taking on health is showing up in an increased incidence of heart disease, respiratory illness, and cancer, though a strict cause and effect relationship cannot be proved. Professor Wu Yingkai, director of Fu Wai Hospital in Beijing, says the "worst part of the pollution problem is that it was aggra-

vated so by the Gang of Four. I remember," says Wu, "that when Premier Zhou [En-lai] was alive he took pollution very seriously and would personally go to a plant he saw belching smoke and make them clean up. We were making some progress, but the Gang of Four said it cost too much and actually made people remove filters from the smokestacks."

The new law includes provisions for tax incentives for those who follow environmentally sound practices and penalties for those who don't.

But the cost of an environmentally protected society is likely to remain out of China's reach, and political leaders remain committed to industrialization as the country's primary need. Asked specifically if the environmental consequences of industrialization would force China to slow down, Vice Premier Fang Yi replied "No," though he acknowledged that "we have not totally solved this problem and are not doing a good job in its proper solution."

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## China's New Birth Policy: One Baby Is Enough

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At the "July 1st People's Commune" in the suburbs of Shanghai, Xi Gundie, mother of one girl and one boy born 4 years apart, is head of the women's committee and one of the commune leaders. Xi Gundie makes sure the people of the July 1st Commune (named for the birth of the founding of the Communist party) know about birth control. "Chairman Hua has called on us to reduce the rate of population growth, and we must follow the correct line," she says with obvious conviction, adding that "99.23 percent of the couples use contraceptives of one sort or another." And well they'd better.

So great is China's present determination to curb population that the government is drawing up regulations that will provide rewards to those who follow the correct line and punish those who insist on too many babies. One is enough; two is the limit. In some places, the July 1st Commune included, a system of rewards and sanctions is already in force. It is expected to take effect China-wide by March 1980.

Xi Gundie's commune grows cotton, rice, wheat, and vegetables. Its 20 factories produce a range of goods from simple, sturdy furniture to light machinery. On a recent Sunday morning, a couple of dozen men were working overtime—for overtime pay—making furniture. Generally in China, Sunday is a day of rest.

At the July 1st Commune where, typically, workers and their families are divided into work brigades and production teams, each team has a birth control leader to tell people about family planning and encourage compliance with the correct line. (The commune has 5016 households of 19,004 persons, Xi says.) These are the rules. Couples should not marry until the woman is at least 23, the man 25. After the birth of their first child, they will be told by Xi Gundie and the barefoot doctors about the contraceptive choices available to them (Xi says IUD's are most popular) and counseled against having a second child for at least 3 or 4 years. As long as they heed the advice, they will be rewarded. A family with only one child will receive an extra 4 yuan a month for "nutrition" and will be allocated for private cultivation a plot the same size as is given to a family of four. Their child will be given preference for admission to kindergarten, and the usual tuition of 6 yuan will be forgiven. The only child's medical care will be free. And the parents of a one-child family will be rewarded when they retire with a larger pension.

On the other end of the population scale, a woman pregnant with a third child might be all but forced to have an abortion. Refusal could result in a pay cut of 10 percent. Couples who fail to space their two children 4 years apart might also be fined.

In China contraceptives of all kinds are readily available and free. In pharmacies in Shanghai druggists even place condoms in open boxes on the counter so the shy or unmarried can take them without having to ask.

Chairman Hua's goal is to get China's birth rate down to 1 percent by 1985. Apparently in some cities, such as Beijing and well-ordered communes like the one in Shanghai, the goal may be attainable, but no one seemed eager to predict it will work nationwide or to say that the people will placidly accept the new family planning regulations.

**Barbara J. Culliton**