

# China on the Move in Science: Feudal but not Futile

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China has exerted a powerful pull on adventurous Americans for well over a century. First there were the Yankee traders and merchants. Then came the missionaries, the teachers. Now and again, we even sent in the Marines.

The Revolution ruptured those varied relationships for more than 20 years, but the interest in China seems to have come back to full flower since



Fine hand polishing of a multifaceted scanner used in thermal imaging systems done on a treadle wheel at the North China Optical Factory, Beijing.

resumption of full diplomatic relations with China in January 1979.

But none of this really explains why our scientists are trooping off to China in ever-increasing numbers to visit universities and institutes, to meet, to lecture. China may rank as a world power on the basis of sheer bulk and numbers but hardly in terms of scientific achievement. So what is the attraction? Simple curiosity is certainly one factor.

"When you don't know, you go," was the succinct explanation offered by Arthur H. Guenther, chief scientist at the Air Force Weapons Laboratory at Kirtland Air Force Base in New Mexico.

Dr. Guenther was among a group of about 65 Americans who attended a split-level international laser conference in Shanghai and Beijing (Peking) in May.

He set off for China with mixed feelings of "apprehension and anticipation," he said.

"Both of these feelings originated in ignorance," he said. "I didn't know what to expect from this society, a Communist society. And yet I felt this need for discovery. I wanted to find out what China is all about."

The feeling of apprehension disappeared quickly after he arrived in Shanghai on May 5 for the opening phase of the conference.

"The Chinese are a most courteous people, most pleasant," said Guenther.

"They really went out of their way to make us feel at home."

About two thirds of the American delegation was made up of natural scientists. The others were physicians, most of them specialists in medical applications of lasers.

Charles Wang of the University of California, San Diego coordinated American participation in the conference. Others in the delegation included scientists from West Germany, France, Austria, Italy, Switzerland, and Japan as well as 100 or more Chinese. Wang Da-Heng, president of the Chinese Optical Society, was chairperson of the conference.

The opening week of the conference in Shanghai was primarily concerned with laser fusion. The closing week in Beijing focused on applications of lasers to semiconductors and fiber optics. Between those sessions, the visitors had a week to see other cities and to tour universities, technological institutes, and laboratories.

"The Chinese are really still coming out of the Cultural Revolution," said Guenther. "Part of what they are trying to do is to relearn how to manage science and how to do basic research."

During the 10 years of the Cultural Revolution that began in the mid-60's, higher education was crippled, and basic research virtually came to a halt. Scientists and academic leaders, no matter how prominent, no matter how

distinguished, had to take their turn at menial labor.

"One obvious result of the revolution is a dearth of Ph.D.'s in the 25-to-40 year-old age bracket," said Guenther. Chinese scientists are older, and most of them were trained abroad, he said.

"Some of the better universities are starting up Ph.D. programs in the laser field," said Guenther. "And they are sending students to other countries for study. They are really trying to get their act together."

There are other vestiges of the revolution as well.

"There are universities there that are producing 1,000 transistors a month. This is a carryover from the cultural revolution, too. Universities aren't just universities. They are factories. They are institutes. The Chinese are very proud of those things."

"The Chinese emphasis on laser science is readily apparent to the visitor," Guenther said. He estimated that there are as many as 10,000 Chinese working in laser-related activities.

"The effort is broad, but not very deep," he said. "They do not have high-speed instrumentation. They do not have Polaroid film. All these things make it difficult to work on the cutting edge of experimental technology.

"But when you don't have all these things, it does force you to be clever.



The importance that the Chinese attach to scientific interchanges is indicated by the appearance of Vice Premier Deng Xiaoping at a reception in the Great Hall of the People, Beijing. Arthur Guenther is at right.

The Chinese have become very innovative, for example, in developing ways to make measurements that we don't use here because we have instruments, such as high-speed oscilloscopes and detectors, to do the job."

The fact that labor is inexpensive in China also has some beneficial results, Guenther said.

"Some of my colleagues were very impressed with the size and quality of the crystals grown in China," he noted. "I suspect that the exceptional quality is a result of the constant

personal attention that goes on in the development and growth of these materials as opposed to relying on automated systems to do these things for you."

Guenther had the opportunity to spend time at a number of academic facilities in China. In Shanghai, he visited Fudan University, the Shanghai Institute of Optics and Fine Mechanics, and the Institute of Laser Technology.

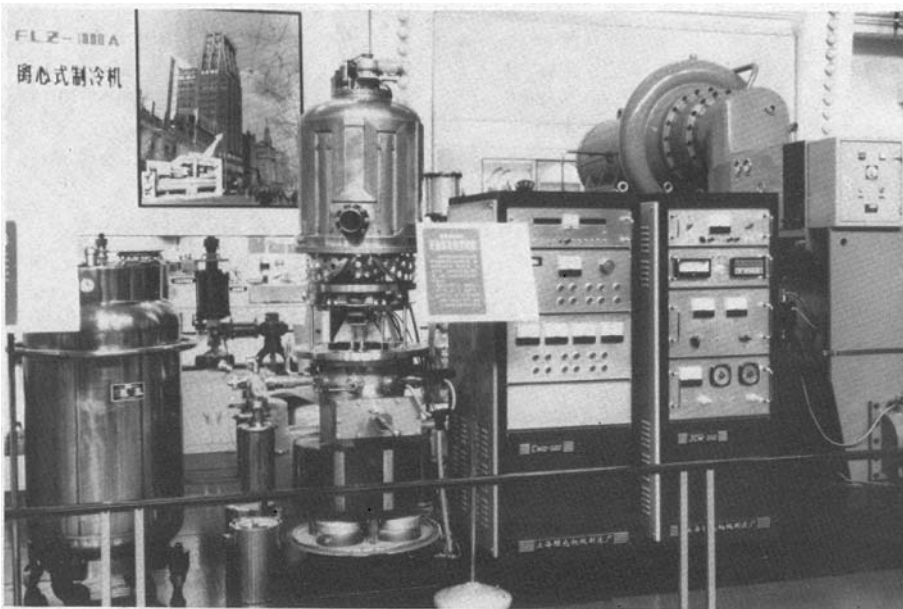
During the week-long break between conference sessions, Guenther traveled to Xian hoping to visit the academic institutions there. That didn't work out, so Guenther visited Xian's famed third century tombs instead. But he also had the chance to meet scientists from the Institute of Optics and Precisions Mechanics.

In Beijing, the following week, the delegation was planted in the midst of the Chinese capital's academia.

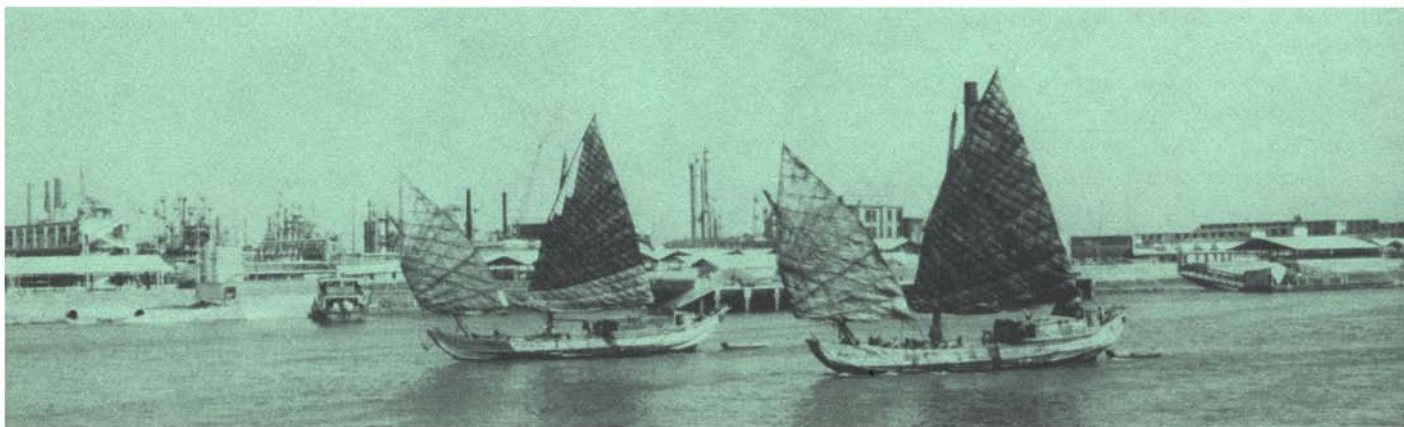
"We stayed at the Friendship Hotel, which I found a bit ironic," said Guenther. "This is a very large facility that was built for Soviet use. It is surrounded by these technological institutes. I have to say that the Russians built themselves a pretty ornate place."

The surrounding facilities Guenther visited included the institutes of electronics, of mechanics, and of atomic energy.

One impression Guenther carried away is that the Chinese academic and



Among the highlights observed by the American delegation was the latest in optical thin-film coating apparatus.



Sampans on the Wangpu River in Shanghai. China is indeed a country of contrasts.

research facilities are, in a sense, feudal domains.

"In my own field, for example, I noticed that every facility has its own optical shop, its own coating shop," he said. "There is all this duplication but there is no place that specializes in thin-film coating. There is no specialization in the hard technological areas. Everybody wants to protect his own turf. Nobody is willing to share."

These drawbacks were not apparent on the medical side, however, Guenther said.

"Our medical contingent, to a man, felt that the Chinese, in technique, were as far advanced as the United States in medical applications of lasers and other aspects of medicine."

As far as traditional methods are concerned, one American physician witnessed a Cesarean operation performed under acupuncture and came away amazed at the technique, said Guenther.

"From the start of the operation, the baby was out in 5 minutes and the operation was over in 13 minutes," Guenther was told. "The woman was awake and alert at all times; the baby was born awake and alert."

Guenther added that the physician told him: "My God, if my wife ever has to have a Cesarean, I'd like these doctors to do it."

In Guenther's opinion, there are three reasons why the Chinese are so advanced in medicine. One is the sheer numbers of people in the country.

"I was told by one American surgeon of a particular operation his hospital may perform 35 times in 2

years," said Guenther. "In Shanghai, a hospital does 500 of those operations every year. They (Chinese physicians) get a lot of chances to practice. Practice may not be a good word, but it is applied to the medical profession."

"A second reason for Chinese progress in medicine," said Guenther, is that "they have tremendous freedom to experiment in medicine without running into some government regulation."

A third significant difference, Guenther added, is that a Chinese physician may lose a patient, but "there isn't going to be a malpractice suit. That's nonexistent in China."

Guenther is quick to add that he is not saying that these differences are an unqualified plus for China.

"In this country," he said, "we pay a price for the sake of the individual. The individual here is all important. In China, regard for the individual is less evident. We demand accountability. This is not the case in China."

This different attitude toward the individual carries over into other areas of Chinese society as well, said Guenther.

"I didn't see a lot of attention paid to safety in laboratories and factories," he said. "Their factories pollute both the air and the water. I drove along the river in Shanghai and my face actually tingled, I assume because of the acid in the air from all those plants."

But Guenther didn't come away from China with negative feelings about the country or its people.

"Everybody is working. It is one of

those places where you can actually see something happening on a daily basis. Progress being made. Things being built."

Scientific exchanges with China probably benefit the Chinese more in terms of hard information, but Guenther believes that the United States profits, too.

"We may be sowing seeds for the future," he said. "Sometime down the line, there may be some return for these seeds of goodwill."

Guenther, 49, has been with the Air Force Weapons Laboratory for 23 years. He entered the service after earning his Ph.D. in optics under David Rank at Penn State, was assigned to the Kirtland Laboratory, and stayed on after his discharge "to help build it up a little."

Long active in the Optical Society, Guenther completed a term on the board of directors in December and is now chairperson of the Society's Committee on Fellows and Honorary Members.

In a personal sense, Guenther believed that he profited from his visit to China.

"I like to interact with scientists, to look at how other people do things," he said.

Apart from that general sense of satisfaction, Guenther also believes that he learned something.

"I heard a paper I really got excited about," he explained. "Now the fact is, that paper was given by an American. But if I hadn't gone to China, I never would have heard it."