

---

## Conference Report

---

# Economic growth depends upon investment in science, technology

by Marsha Freeman

While numerous studies have demonstrated that more than 50% of the economic growth in the United States since World War II can be attributed to investments in science and technology, there has been an accelerating decline in such investment through the Federal budget, particularly since the slowdown in the post-1960s Apollo space program, carried out under the guise of "saving money," which supposedly will "help" the economy.

Developing nations, and those of the former Soviet Union, are faced with the choice of following Great Britain, the United States, and a western Europe increasingly under the domination of the Maastricht Treaty, down the path of economic destruction, by capitulating to demands made upon them by the International Monetary Fund (IMF), or, following the historically successful program of investments in education, infrastructure, and industry driven by scientific advancement.

A symposium sponsored by the U.S. National Academy of Sciences on May 7, titled "National Science and Technology Strategies in a Global Context," provided a stark contrast between these two pathways into the next century.

### **China: the greatest developing nation**

At the symposium, Prof. Chen Zhang-Liang, Academic Vice President of Beijing University, and a member of the Academy of Science and of the People's Congress, described the challenges facing China, and the policy China is following to meet them. Referencing the Western books, editorials, and diatribes that have recently been warning that China's economic growth will eat the nations of the world out of house and home, Prof. Chen Zhang-Liang reported that "for the past 5-10 years we have been investing in science and technology for agriculture, and reforming state companies."

"In China," he said, "we have 23% of the world's population and 7% of the cultivable land. The challenge is that in 2025 we will have 1.5 billion people, with rapidly decreasing farmland, and severe water problems. China should be self-sufficient in food, and modernize technology." Prof. Chen Zhang-Liang, who is also the director of the National Laboratory of Protein Engineering and Plant Genetic Engineering

at Beijing University, said that "biotechnology is especially required," to meet this challenge.

Also, he said, biotechnology is required for the development of new medicines. "We have the largest number of cases of hepatitis B, with 10% of the population being carriers, and 10% [of those] developing the disease; and other diseases are increasing. Tons of drugs are needed," to improve the health of the people of China, he said.

Meeting these challenges is complicated by the fact that "state-owned enterprises have out-of-date technology. The challenges of the market economy are that there are large numbers of workers, shortage of investment, inefficient management, low income, and competition with multi-national companies investing in China." To overcome these challenges, he said, "we decided that we need high technology."

The Chinese government agency which, like the U.S. National Science Foundation, funds basic research in China, Prof. Chen Zhang-Liang explained, "is growing geometrically." Priorities for funding are biotechnology for agriculture and pharmaceuticals, space and aviation, laser technology, automation, information technology and computers, new materials, new energy technologies, and ocean technologies.

Using a model that has been highly successful at American universities, such as MIT, the Chinese are promoting the establishment of high-technology companies by professors in the universities. For the past 10 years, Chen Zhang-Liang reported, they have been working on setting up special high-tech zones in Beijing, Shanghai, and the Pudon Jiangsu industrial park. They have set up the Legend computer company, which is listed on the Hongkong stock market and competes with foreign imports. At Beijing University, they have established 18 high-tech companies, so far. The companies are owned by the university, and now give back to the university proceeds from their business which amount to one-third of the university's budget.

For China's continued growth, there are many challenges. "The provinces have different levels of development, there is a low level of general education, there is bureaucracy, there is an imperfect legal system for protection of intellectual property rights, there is insufficient financial support, and no

venture capital to promote high-tech development,” Chen Zhang-Liang said.

“We lost 15 years through the Cultural Revolution, a generation of scientists,” Chen Zhang-Liang stated. But by the late 1970s, there was a recovery in the number of scientists and engineers, and “we sent students to the U.S. and Japan, and now there is a new generation.” There are now 170,000 Chinese students in the United States, he said, who “would have a very big impact if they came back to China.”

There will be an increasing number who will probably consider doing just that, as China orders its priorities to move into the 21st century.

### **The nuclear future of South Korea**

Dr. KunMo Chung, ambassador-at-large of the Atomic Energy Commission of Korea, presented a dramatic picture of how South Korea has improved its economic growth, and what it is planning for the future. He reported that 35 years ago, the average per-capita income in South Korea was \$80 per year. In 1995, it was more than \$10,000. “It was industry and R&D that created that growth,” he said.

In the field of semiconductors, Korea now ranks third in the world. “Ten years ago, we decided to invest, and people laughed. ‘How can you catch up with the U.S. and compete with Japan?’ they asked. The Ministry of Science and Technology put large sums of money into the project,” he said. The results are well known.

“We know that science and technology are key for further development in the Republic of Korea. Our only tool is science and technology. It’s my passionate commitment. We have few natural resources, and good human resources. This provides the motive power of our development,” Chung said.

Nowhere has this policy been more the case than in Korea’s work in nuclear fission technology. In the early 1980s, Chung decided that Korea should not just buy nuclear power plants, but should develop its own Standard Korea Nuclear Plant. “We started with the Combustion Engineering design and made changes. In 1983, people laughed when I proposed it, and my predecessors [at the Atomic Energy Commission] criticized me,” Chung reported. “It was a 12-year program, and now we are discussing exporting it to China and building it in North Korea, and we are designing plants. You have more distinguished [nuclear] engineers in the U.S., but they’re tired. We have young engineers.”

Responding to the criticism that Korea is easily able to replicate technological advances made elsewhere and turn them into booming new industries, but does not do the basic research, Chung replied that the Korean Institute for Advanced Study opened last year. “We had a workshop with American scientists here [recently] for designing a superconducting [fusion] tokamak, steady state machine, to run 1,000 seconds. Practical people criticized [our] putting money into fusion. Fusion is complex, multi-disciplined R&D. Maybe we will have fusion 40 years from now, but we are an optimistic

culture in Korea. We shouldn’t count our pennies in [such] a project.”

Dr. Chung reported that there was a special law recently enacted that mandates that 5% of the national budget will be invested in science and technology beginning five years from now. As another point of comparison with the so-called advanced countries, he said, “The majority of Korean CEOs are scientists and engineers, not accountants and economists.”

### **Poland in the grip of the IMF**

A striking contrast to the optimistic picture presented by the scientists from Asia came from Eva Gajewska-Blaisdell, president of Blaisdell and Co. She is a U.S. citizen who returned to her native Poland in 1991 to try to help bring American business there. She began her presentation by reporting that the week before the symposium, Poland celebrated the 100th anniversary of the last Nobel Prize in science awarded to a Pole. “We have gotten other Nobel prizes in poetry, and our President [of Poland, i.e., Lech Walesa] got the Peace Prize, but not in science. To have a national research project, you have to have a nation,” she said.

“For 120 years, Poles didn’t have a country,” she explained. Under Russian dominance, the countries of eastern Europe were divided by specialization and told what their focus would be. As a result, “Poland lost the ability to do aeronautical and other research. What was funded in Poland was research in chemistry. Now, with political freedom, we are fighting for a position in science and technology.”

Gajewska-Blaisdell described the poor state of science and technology infrastructure, left over from the communist period. “I am on a personal crusade to influence the Polish government and get U.S. companies to collaborate, especially in computers,” she said. In addition, “Poland needs a national industrial policy.”

She reported that under the Soviet system, “research used to be in large corporations, and they are fighting for their lives. There are more than 200 research units through the State Committee for Scientific Research. An outside study was done to assess our situation, and it said that eight were promising and the others have to improve or be terminated. Thirty percent of the scientists in the institutes have been sent to do other tasks. What is spent on science is 2 billion Polish zloty, or about \$700 million. Some of the institutes rent their beautiful space to try to survive.”

In the 1970s, many scientists left and came to the United States, she said. Even so, Poland is still number 17 in terms of number of scientific papers published, which is higher than any other former eastern European country. Poland, she said, is a gateway between western Europe and the former Soviet Union, and should develop sophisticated highway systems.

That there is tremendous potential for the flowering of science once again in Poland, there is no doubt. There are elections in September and she hopes it will “bring politicians in with ethics and vision.”