A Biotech Enterprise Soviet Style

The enterprise is part of a larger experiment in Soviet science under Gorbachev to spur industrial innovation in the nation

Moscow

NEXT YEAR, for the first time, Soviet biologists may be able to enjoy a convenience that American scientists have long been accustomed to. They will be able to obtain restriction enzymes, a fundamental research tool in biotechnology, within days or weeks after ordering them from a new Soviet scientific association, instead of waiting up to *a year* to obtain them from foreign suppliers.

This modest, but significant development, essential if the Soviets are to catch up with Western biotechnology, is part of a larger experiment under way in Soviet science to spur industrial innovation and invigorate the country's ailing economy.

As part of General Secretary Mikhail Gorbachev's drive for economic reform, the Soviet Academy of Sciences and the government ministries in charge of manufacturing have teamed up to form 21 different enterprises to collaborate on research and development and the manufacture of a wide variety of items, including biotechnology products for medicine and agriculture, industrial robots, industrial chemicals, personal computers, and machine tools. These enterprises, known generically by their Russian acronym as MNTKs, will do everything from research to production of products.

In recent years, Soviet authorities have established a variety of collaborative programs, including the MNTK plan, in an attempt to bridge the gap between researchers and industry. These programs have had "varying degrees of success," said Loren Graham, an expert on science in the Soviet Union and a professor at the Massachusetts Institute of Technology, in the winter 1988 edition of *Issues*.

But under the MNTK plan, unlike other programs, profit is the stimulus to improvement. In a major reform, the MNTK enterprises can keep the money made from sales to develop other products rather than funnel the profits back into the general government treasury. One of the ultimate aims of this change is to make research self-financing. Before, researchers have depended on the government for virtually all their support.

Under the MNTKs, the research institutes of the Soviet Academy for the first time control several of the enterprises. Academy institutes historically have had little experience in production, but Gorbachev considers them to be "more enlightened" about technology and management methods, said Graham.

One of the most ambitious of the MNTKs enterprises is the biotech association, according to Graham. It is a collaborative enterprise that includes about 20 Academy institutes and the ministries of Health, Microbiology, Agriculture and is headed by the Shemyakin Institute, the country's leading research facility in bioorganic chemistry.

The biotech association plans to produce not only restriction enzymes, but also a wide range of recombinant DNA products for medicine and agriculture and equipment for the laboratory and industrial production. The biotech association also hopes to set up joint ventures with foreign firms and to compete eventually in the international market. It just completed preliminary field trials of bovine growth hormone in cooperation with the Monsanto Company, for example.

A key to the success of the biotech association, says Elkan Blout, dean of academic affairs at the Harvard School of Public Health, "is whether it can pick the right products, produce them reliably—pure and on time—and at a reasonable price."

In an interview with *Science*, Academician Vadim Ivanov, who is director of both the Shemyakin Institute and the biotech association, readily acknowledges that the biotech association faces many difficulties and that Soviet biological research and industrial production are far behind Western standards in many ways. But he notes that the successful production of restriction enzymes, a relatively simple product, is an indication that the biotech association can do the job. About 100 different enzymes are now being produced, he said, and some are being exported to Japan.

Ivanov, who will be 51 next month, has a tough act to follow as the successor to Iurii Ovchinnikov, who died in February of cancer. It was Ovchinnikov, a mover and shaker in the Soviet biology community, who originally spearheaded the formation of the biotech association. Ovchinnikov's persuasive powers and political savvy also convinced Soviet authorities to build new headquarters for the Shemyakin, a remarkable complex of buildings that is modern in architecture and whose interiors are plush enough to rival top corporate headquarters in the West, a stark contrast to the shoddy construction commonly seen in Moscow. (The Soviets built the outside and the Finns and Yugoslavs finished the inside.)

But Ivanov, who had been a deputy director under Ovchinnikov and is mindful of this legacy, is showing his own resourcefulness by securing new funding for the biotech association. The program was recently promised at least 50 million rubles (about $80 million) for next year, Ivanov says. About 70% of these funds will come directly from the state budget for the first time, he says. Until now, the biotech association has been funded mainly by member institutes and ministries from their own budgets. "We want to be self-supporting, but it's a remote prospect right now," says Ivanov, who is fluent in English.

The money will in part go toward the development of 32 products, 24 in medicine and 8 in agriculture. These include hepatitis

Journals No Longer Censored

Access to news about Western research is improving under glasnost and Gorbachev. *Science* and *Nature* are no longer censored by the "literature review board," says Maxim Frank-Kamenetskii, a geneticist at the Academy's Institute of Molecular Genetics who recently has published articles in the Soviet Union that are highly critical of its science structure.

Researchers can now pull journal issues off a library shelf, whereas in the past, issues of *Science* and *Nature* were locked up and scientists had to obtain permission from library officials to read them, Frank-Kamenetskii said. At the Shemyakin Institute library, well-worn copies of both magazines are intact, stacked on an open shelf.

More Soviet researchers are making visits out of the country since it is now easier to obtain approval to travel abroad. Several layers of red tape have been reduced. The main constraint on travel now is lack of travel funds, Soviet scientists say. ■ **M.S.**

B vaccine, which is in clinical trial, alpha interferon and human growth hormone, which are close to clinical trial, hepatitis A vaccine, amino acids, peptides, and even diagnostics for the AIDS virus.

While many of the pharmaceuticals under development are commonly available in the West, they are in short supply (or nonexistent) in the Soviet Union. Foreign trade is extremely complicated by the fact that the ruble is not an exchangeable currency. Ivanov notes, for example, that the country needs 600 kilograms of insulin annually, but Soviet ministries can currently manufacture only 200 kilograms. The biotech association plans to supplement insulin production. "Our number one priority is to supply [products for] our own country," he said.

Ivanov describes the biotechnology association and the changes in Soviet science with excitement. "Five years ago, the situation in science was hopeless. Scientists couldn't influence much more beyond their narrow line of work," he says. "Now I'm optimistic. We need to improve our economy. That's the basic thing."

The Shemyakin and the biotechnology association are tightly linked. Researchers at the Shemyakin can divide their time between institute work and the biotechnology association. At present, one-third of the "intellectual power" at the Shemyakin is devoted to projects related to the biotechnology association, Ivanov says. The other two-thirds focus on fundamental research.

In a change that is likely to benefit both organizations, Shemyakin staff members, for the first time, can be hired, fired, or promoted based on merit. "In principle, we now have the [economic] levers to say thank you" for good work, Ivanov says. And, in July, the biotech association introduced a competitive grants system—a rarity in Soviet science.

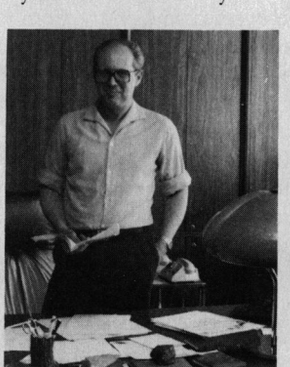
Efficiency at the institutes and in science in general may also improve because layers of bureaucracy are being trimmed away. For decades, red tape has stultified research, Soviet scientists and Western observers say.

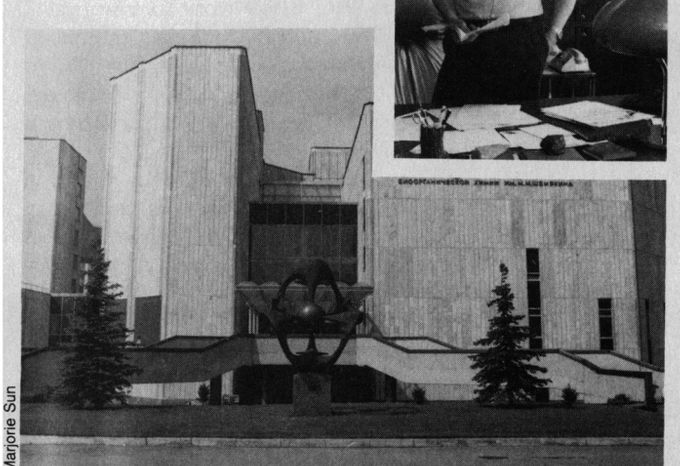
In the purchasing of lab supplies, for example, "a lot of bureaucrats were involved," which has slowed down research enormously, says Eugene Sverdlov, a top scientist at the Shemyakin and a deputy of the biotech association. Now, he says, the biotech association has created its own purchasing division meant to simplify the process.

The Academy itself has decentralized decision-making and transferred authority from sections to lower level divisions. "It's a serious change," Ivanov says.

Despite the adoption of many reforms, the biotech association faces enormous hurdles. Reducing red tape in purchasing will not compensate for the fact that laboratory supplies and machinery, from the simple to the sophisticated, are in short supply. Even the Shemyakin, which is one of the best equipped biological laboratories in the country, must cope with chronic scarcity.

Ivanov says "a major bottleneck" is the lack of centrifuges. Sverdlov points out that basic laboratory reagents are always scarce. And Soviet-made serum to grow cells "is of very bad quality," he said. Most plastic supplies, such as pipettes and test tubes, must be imported because either they are not produced domestically or are of better quality than a Soviet-made version.





Marjorie Sun

At the Shemyakin. *The country's leading research institute in bioorganic chemistry is trying to bridge the gap between research and industry. Inset: Director Vadim Ivanov.*

The availability of personal computers is limited. The Shemyakin's permanent staff of 400 must share 100 personal computers, said Ivanov. (A delivery of another 50 computers is expected later this year.)

And although Western journals are more easily available now, dissemination of information is still limited by the lack of photocopy machines and bureaucratic restrictions. The Shemyakin has only four photocopy machines. A Western observer of Soviet science remarks that at another research institute in Moscow scientists must still obtain approval to photocopy material. As a result, some researchers resort to copying DNA sequences by hand from journals.

The lack of good young scientists "is a very difficult problem," Sverdlov says. Consequently, Shemyakin in 1986 established an annual program to train 30 to 40 students mainly from Moscow State University for 2 years at the institute. The institute then can hire the best and brightest.

The biotech association itself is wrestling with institutional problems. The research institutes and the production ministries still struggle with how to decide what products to target for development.

Whether the biotech association can sell its future products at reasonable prices and still make a profit is unclear. Pricing in the Soviet Union for everything has long been determined by a special central committee and frequently does not reflect the true costs of production or market conditions. Now, under Gorbachev, the process of pricing is "in a kind of turmoil," Ivanov says.

Maxim Frank-Kamenetskii, a Soviet geneticist and critic of the country's science structure, is skeptical that the biotech association can work. "It's just a big bureaucracy," he says. There are too many basic problems in Soviet science for the association to succeed, he says. Right now "science in the Soviet Union is a corpse," he told *Science*.

But Ivanov, hopeful that perestroika will make a real difference in science and the country's economy, says, "Step by step we will improve" industrial innovation.

■ MARJORIE SUN

A Minor Identity Crisis

The Soviet biotechnology association, a partnership between scientists and industry, has already gone through a minor identity crisis, says director Vadim Ivanov.

Soviet authorities named the association Biogen when it was established 3 years ago. The choice subsequently generated confusion because the biotech company in Cambridge, Massachusetts, originally founded by Walter Gilbert and others goes by the same name. Soviet authorities are now in the process of coming up with a new name and for now are simply calling the enterprise the biotech association. "It's a big production to get the name changed," says Ivanov, with a mixture of frustration and bemusement in his voice. ■ M.S.