THE LAST WORD

by Masami Tanaka

A JAPANESE VIEW OF JAPAN'S BIOTECHNOLOGY

Until recently, biotechnology in Japan was mainly a matter of fermentation—in brewing and the manufacture of pharmaceuticals and organic chemicals. However, recent strides in molecular biology and molecular immunology make us confident that the technology will play a key role in production processes in a wide range of industries, including, obviously, the chemical, agricultural, food, and pharmaceutical sectors. Biotechnology should sophisticate Japan's industrial structure and increase the already high added value of Japanese products. We expect to improve daily life by providing the population with new commodities.

Biotechnology may also make a great contribution to the "Technopolis," the new concept of regional development in Japan.

American venture capital indirectly triggered the biotechnology boom in Japan. In the success of enterprises like Genentech, Japan saw a new technology that could extend a helping hand to industry caught in the slump of an oil crisis. Industry grasped that hand gladly. According to a survey conducted by the Ministry of International Trade and Industry (MITI) in the summer of 1983, major Japanese enterprises were even then conducting biotechnology research on a very wide scale. All told, more than 150 firms were engaged in such research, and at least 10 new firms have joined their ranks in every year since 1980. Private enterprises spent about 50 billion yen ($200 million) on research in 1982, up 20 percent from the preceding year. That figure continues to rise.

Primary Characteristics of Public and Private R&D

Each nation's biotechnology has its own special features. The U.S. government spends huge sums on basic research and offers attractive tax incentives to a very active venture-capital community. European governments offer direct financial assistance under centralized development plans.

Biotechnology companies in Japan fall into two categories, depending on how much they spend on research and development. One group of companies conducts research on a limited scale, spending 100 million yen (about $400,000) or less per year. The other group—which embraces some 20 companies, central figures in fermentation, pharmaceuticals, and, to some extent, chemicals—conducts broad research with budgets of tens of billions of yen.

One notable characteristic of small-scale research is that the R&D effort is treated as a special "venture business" organized around approximately 10 researchers within what is typically a much larger enterprise. This contrasts with the American approach, in which academic researchers create companies as a spin-off of their research, supported by venture capital drawn from private-sector investors.

Japanese biotechnology remains very close to more traditional technologies, like fermentation and enzymology, in which the country has accumulated considerable know-how. Industry is integrating this inherited strength with the new techniques of genetic engineering. This gives Japanese biotechnology one of its most distinguishing features.

The Japanese economy expects private enterprises to judge the market for themselves, make management decisions at their own risk, and to offer commodities and conduct research on their own. Biotechnological research, however, takes a very long time to come to fruition, and the field presents especially large risks. If research were left completely up to the private sector, businesses might not be able or willing to do everything that's needed. So, in recent years, the government has become involved with setting policies on biotechnology and in funding the basic research which is so deeply tied to commercial developments—not only for Japan's welfare, but for the world's as well. This government involvement has become another hallmark of Japanese biotechnology

The government is thus also responsible for drawing up rules for the industrial application of this new technology—rules that both control and protect the results of research, that encourage enterprises to follow their own judgment in pursuing R&D yet ensure general safety when the results of that R&D are applied in industry. It is also the job of the government to coordinate a system for collecting, preserving, and distributing biological resources. In consultation with industry and academia, MITI is attempting to fill these roles. The R&D Project of Basic Technology for Future Industry is one good example. The ministry's support of national institutes like the Fermentation Research Institute is another.

MITI is not alone in this, of course. The Ministry of Education and the Ministry of Agriculture, Forestry, and Fishery are undertaking their own programs. In the nonprofit sector, the Bioindustry Development Center (BIDEC) of the Japanese Association of Industrial Fermentation is collecting and exchanging information on new trends in the field. BIDEC also promotes international cooperation and helps researchers travel overseas.

A New Pattern of Development

Biotechnology is already evolving along lines different from those of past technologies. In electronics, synthetic textiles, plastics, and aircraft, the United States led the way and the rest of the world followed. Biotechnology, on the other hand, has been an international undertaking almost since its inception. New research is under way simultaneously in America, Europe, and Japan, growing from the nuclei of universities and venture businesses. Since Japan has in the past tended to import technologies, it has little experience in the sort of interdisciplinary fundamental research now demanded of biotechnological pioneers. The country's residual strength in production technologies should, however, put Japan in a good position for the future.

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