

Biotech Evolution Emerging in Korea

By Alvin Toffler

Korea's new cyber-infrastructure can help Korean firms move into the world markets and fields most likely to expand in the decades ahead.

One of the greatest opportunities for expansion lies in the field of health. Two powerful forces are converging to create explosive growth, not merely in health services that will provide new job opportunities, but in self-care, and in advanced health technologies.

As populations age, not only in Korea but also from Japan and China to Europe and the United States, demands for health care will escalate.

Innovative health services will be required. Many of these can be facilitated or actually delivered by the cyber-infrastructure.

The market for small, smart, cheap medical technologies for use in the home will also expand. Biosensors to monitor heartbeat, blood pressure and other body functions, and to transmit them to physicians via the Internet are already appearing in the marketplace. The number and variety of these will soar, and Korean industries are well placed to design and produce them.

Even more important, however, the shift toward an older population is converging with spectacular discoveries in biology, from stem cells, and cloning, to potentials for the fusion of human nerve cells with computer chips.

Blue Gene Computer

Korea can position itself as one of the world's most important users and exporters of advanced biotechnologies for human (and animal) health, and of services related to them.

The coming full fusion of Information and Technology (IT) and biology opens new opportunities for Korea in both fields. IT acts as a primary tool in biotech research in fields like genomics and proteomics, as the rising power of computers makes possible and reduces the cost of massive computations. Thus IBM is developing an even more powerful "Blue Gene" computer that will reportedly "tackle a problem so complex that it makes simulating a nuclear explosion, or the collision of two galaxies, look like a picnic in comparison. It is intended to help biologists explore how proteins fold themselves up into their distinctive shapes."

This move is part of IBM's plan to become the biggest supplier of computer hardware and software to biologists, a market estimated to reach \$10 billion two years from now.

According to IBM vice-president Caroline Kovac, "Biology is the science that's driving high-performance computing today." Compaq Computer has created a \$100 million investment fund to acquire stakes in biotech start-ups. Sun Microsystems started an Information Advisory Council to put its designers in touch with biotech researchers and executives.

Two years ago, Hitachi Corp. of Japan formed a "Life Sciences Unit" with a product-redesign mission similar to Sun's.

At the same time, biology could well transform computers and computing.

Successful development of techniques for growing "biochips" could impact Korea's competitiveness in the semiconductor market. Beyond this, the integration of information technology, biotechnology, materials sciences, and nano-technology will spur innovation across many disciplines. Korea should participate in all these efforts.

The Korean government designated biotechnology as a key industry for the 21st century. The 14-year Biotechnology 2000 Programme began in 1993 and involves seven government ministries. Nearly half of \$900 million of biotechnology products, including vaccines and antibiotics, produced annually is exported, mostly regionally.

However, a review by the Organization for Economic Cooperation and Development (OECD) found gaps between scientific research, applications research and commercialization of technology in Korea. It also found that most Korean production technology is imported and for many of big chemicals and food processing businesses, biotechnology is only a sideline. This leaves considerable room to increase the level of research and to capture more value than the research currently underway.

Korea's goal of raising biotechnological capabilities to the level of the world's leading countries by 2007 will depend on its ability build on and move beyond successes such as fermentation technology, antibiotics, diagnostics, and Hepatitis B vaccines to such fields as "farm-ceuticals"—for example, the attempt to harvest human antibodies from genetically altered plants grown cheaply on an agricultural scale.

Over the next decade, biotech research will move from the medical lab and supercomputer to the desktop. This will open up possibilities for smaller firms and those without access to supercomputers. In the meantime, however, the need for technology and expertise will require collaboration between firms and with university research centers, and the government.

China is making a major push in genetics, cloning, and other biological fields. It staffs its leading research centers with very young graduate students finishing their masters and Ph.D. studies. It also maintains close contact with ethnic Chinese researchers in American and European laboratories. According to the Far East Economic Review this web of personal contacts facilitates "the transfer of ideas, personnel and funding. back to China."

Bio Fund Is Key To Development

Today, as venture capital funding for advanced technology shrinks in the U.S. and elsewhere as a result of stock market declines, the Korean government should quickly create, jointly with Korean private companies and universities, a "Bio-Venture Fund". The Fund should be used to make limited investments, with careful accountability, in 100 small, leading edge biotechnology start-ups in the U.S., Europe and China – with the proviso that Korean scientists and graduate students accompany the investment and participate in the work. In this way, while some small investments will be lost, others may compensate for the loss, while exposing Koreans to the most advanced knowledge in the field. It can also help Korea take the next step, which is not merely to develop biotech, but to identify, as early as possible, the key subsets or niches of the biotech industry that will yield the highest value a decade or more in the future.

The advance of the biotech industries will give rise to a wide array of support services, to which Korea might contribute. For instance, the new industry will require scientists with business skills and managers with a background in genetics.

Leading Korean universities or private firms might create a new kind of MBA—a "Master in Bio-Administration" that could produce the next generation of CEOs in this key industry of the future.

The proximity of a large Korean ethnic community in Southern California to the fast-emerging "Biotech Corridor" between Los Angeles and San Diego offers plentiful opportunities for joint efforts between U.S. and Korean research institutes and companies.

We have focused on biotechnology, not merely for its own importance to Korea's future, but as a case model of what might be done with respect to other advanced industries, too, as Korea seeks its place in tomorrow's tri-sectored world.

This is the fifth in a series of articles based on excerpts from a paper published by well-known futurist Alvin Toffler and an independent advisory group, Toffler Associates, at the request of the Korean Information Society Development Institute (KISDI) about the emergent global economy of the 21st century and Korea's place in it. –ED