

Catching the tide of innovation

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The reasons for Japanese pre-eminence in many areas of technology are widely misunderstood in Western countries, who would do well to take advantage of the opportunities that Japan offers.

JAPAN already dominates several fields of technology and is preparing to conquer others. The response to this challenge by Western countries, in particular the United States, is usually to complain that Japan is taking a free ride on Western science and technology. But researchers and especially industrialists would do well to stop grumbling and start taking advantage of the many opportunities now existing to tap Japanese expertise.

Participation

Earlier this year, the Japanese Ministry of International Trade and Industry (MITI), which has done much to foster the upsurge of Japanese industry by coordinating and supporting numerous research and development consortia, announced that foreign companies were authorized to participate in its major cooperative projects. In September, MITI offered foreign companies the opportunity to play a part in three large projects in which it plans to invest several hundred million dollars over the next nine years. Yet few, if any, businesses from outside Japan are expected to take up the invitation.

Not all the opportunities offered by Japan are attractive to foreign companies. The national genetic engineering project started by MITI in 1981 was certainly successful in developing this technology in Japanese industry and universities, where the basic know-how was almost totally lacking; but it would probably have been less useful to foreign participants. Other projects, however, such as that to develop environmentally compatible manufacturing technologies, would be highly rewarding. Interdisciplinary research consortia have been created to recruit the various specialists necessary for the development of new, complex technologies, which would otherwise be difficult to accomplish. The amalgamation of diverse technologies in this way is one of the strengths of the Japanese approach, and has led to their discovery and leadership of fields such as opto-electronics and mechatronics. In addition to the national projects, many of the universities are offering to supply research findings whose commercial value is not always immediately obvious, or for whose exploitation no suitable Japanese partners can easily be found.

Any foreign company wishing to avail itself of Japanese expertise in science and technology must thoroughly understand

both the nation's research system and its people's approach to life and work. Applied, practically orientated and technical research is much more in tune with the Japanese disposition than is basic research, even though their basic research seems to be advancing. Indeed, Japanese papers are now among the most often cited in physics and biology. But the percentage of engineers graduating from institutes of higher education in Japan is five times higher than in any other country in the world, indicating the enduring Japanese partiality for the technical and the practical.

That Japan's research and development expenses are rising three times faster than those of the United States should help to dispel any lingering doubt that Japan is determined to take the lead in science and technology. But money alone is not the key to rapid advances in technology. Japan's financial commitment is backed by a unique interaction of governmental and private leadership, allowing competing firms to collaborate successfully in research projects.

Biotechnology is a particular instance. For companies that are hampered by political constraints in their home countries, Japan offers an unusually favourable environment. Unlike some European countries, it has no laws restricting the application of gene technology, although five different ministerial guidelines have been issued on the use of recombinant DNA. With the exception of the Environment Agency, all ministries concerned regard the present guidelines as adequate, because no accidents have occurred since modern industrial biotechnology was introduced to Japan ten years ago. Political opposition to biotechnology is virtually absent, as attested to by the recent unhindered establishment of many biotechnological research facilities, and of production plants for drugs manufactured with the help of genetically engineered organisms, for example Toyobo's new pilot and production plants in the Shiga Prefecture. In harmony with OECD guidelines, MITI expects organisms that are non-pathogenic in industrial processes to be treated in accordance with ministerial guidelines on good, large-scale industrial practice. But the Japanese definition of a genetically changed organism differs from those adopted in other countries, relating only to the introduction of foreign DNA, and not to chromo-

somal or cellular manipulations.

Some large foreign companies are setting up or already operating research laboratories in Japan in the hope that their new discoveries will be imbued with the Japanese flair for application. But few have so far gained unqualified acceptance as part of the research community. It is hard for job-rotating foreign nationals in key positions to acquire appreciation of the very different Japanese code of business ethics. Nevertheless, with that appreciation it is surprisingly easy to collaborate with one of the university laboratories: for example CIBA-GEIGY's newly established International Research Laboratories in Japan are engaged in several cooperative projects with universities, and not only has the transfer of technological expertise been quick and easy, but long-term collaborative enterprises are simple to begin because of the existence of special centres for cooperation at universities (for example the Centre for Development of Cooperative Research at Kobe University, or the Seiken Institute at Kyoto University).

Commitment

Foreign companies wishing to join with Japan in a national research consortium have to make a great deal of effort and a strong commitment. Any attempt to evade or curtail the all-important preparatory phase involving lengthy negotiations and many workshops is taken by the Japanese as an affront; and companies looking for quick commercial successes in return for their participation will have come to the wrong address. The research consortia are concerned with high-risk, next-generation technologies, and profits cannot be expected for at least 10 to 20 years. It is this forethought that has led to MITI initiating neuro- and optical-computing projects due to start in 1992. Western scientists often look condescendingly upon such undertakings, which sometimes even lack a clear strategy; but who else is developing parallel-computing neural networks with an investment of several million dollars, so as to be able to compete with the Japanese in 20 years' time? Ignoring Japan's opening doors may sooner or later turn out to be committing technological suicide. □

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