The Challenge of Joint Research in Japan

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Japanese research programs conducted jointly by industry, government, and academia are often assumed to be harmonious, well-orchestrated collaborations. But this is not so: turf battles, distrust, and differing values have prevented more than limited and hesitant involvement in joint research by faculty at national universities. Projects led by academics are relatively uncommon, and for this to change, further deregulation of the national universities is necessary. It is useful to look at the evolution of university involvement in research and development and ask: Who takes the initiative, and what are the issues confronting the academic community in Japan in the 1990s?

Only since 1983 have national university faculty been openly and freely allowed to undertake joint research with private companies. In 1980, at a meeting of the Council for Science and Technology, nominally the highest organ for science and technology policy-making in Japan, the head of the Science and Technology Agency (STA), who has cabinet minister rank, proposed giving considerable STA money to university professors who are leaders of science programs. The Ministry of Education (MOE) warned the professors that if they accepted this money, they would never again get funds from the MOE.

The 1980 STA offer and the 1983 policy shift reveal aspects of a radical change in Japan's previous R&D strategy. Two factors have driven this: the increased blurring and overlapping of academic values and commercial values in both the United States and Japan and the technology "war" between Japan and the United States. Both were direct causes for the shift away from importing technologies and toward developing indigenous ones, in part by means of greater emphasis on university involvement in joint research.

Beginning in the 1970s academia and industry in the United States saw a need to change the institutional arrangements surrounding science and technology and were envisioning the transformation of abstract science into a goose laying golden eggs. In Japan we watched with interest. We also watched with concern.

Into the 1970s, as long as Japanese companies had money they could buy technology. By the late 1970s Japanese companies increasingly were displaying capabilities, particularly in electronics, that put them on the cutting edge. The resulting trade tensions between the two countries are well known. U.S. companies started demanding access to technologies developed by Japanese companies as part of the price for their own. In addition, from the early 1980s, requests for study tours of U.S. research labs began to be denied.

One event, of great symbolic importance in Japan, came in June 1982: the arrest of Japanese businessmen in the United States for stealing IBM trade secrets. Until then, hearing the worldwide praise of the quality of our industrial products, the typical Japanese citizen assumed that our technology had surpassed that of the United States. When they saw TV newscasts of handcuffed elite businessmen being taken away by FBI agents, they were forced to realize the level of their expertise was not what they had imagined.

The arrests were profoundly shocking to most Japanese. For the first time people in general began to use the phrase "Japan–U.S. technology war" and felt strongly that something ought to be done to win it. A major newspaper ran a series with that as the title. One article stressed "Victory or defeat depends on basic research" (*1*). Fearing restrictions on access to foreign technology, Japanese industry and government decided to accelerate indigenous R&D.

Thus, in the late 1970s and early 1980s, there emerged a vision of creating a "country based on science and technology." First limited to just "technology," it was soon realized in different ministries and agencies that "science" had to be added. A series of liaison conferences took place within the government, and the vision was transformed into official policy in the 1981 Science and Technology White Paper (*2*). At the heart of the problem was how best to reorganize science and technology strategically so Japan could survive and flourish in what was seen as a difficult new climate.

Three programs were set up in 1981, all advocating *san-gaku-kan* (industry-university-government) joint projects. But researchers in national universities, who by and large had the highest reputations and the best equipped labs in the early 1980s, were, as civil servants, subject to statutory limitations on their cooperation. An "allergy" toward industry was exhibited in university circles generally. This was the result of differing philosophies of knowledge and residual reaction to wartime military-industrial cooperation. The Ministry of International Trade and Industry in particular was thus suspect, and its Next Generation program garnered only peripheral involvement from universities, mainly in planning and advising.

Of the programs, only ERATO (Exploratory Research for Advanced Technology)—set up by an arm of STA—was fundamentally innovative. The inflexibility of Japanese research organizations has often been cited as the main reason Japan lacks scientific creativity and ERATO tried to engage this problem head on. (University participation in ERATO has been extensive: as of 1991 some 29 projects have been carried out, 10 of them with professors as leaders.)

Meanwhile, MOE began to wonder if its 1980 scuttling of STA's funding proposal was short-sighted. As the ministry in charge of such important resources, MOE could not simply remain aloof or continue to respond negatively to the new strategy of cooperation. This was a turf fight the Ministry could lose.

It is difficult to know just what was going on within MOE at the time of the 1980 incident, but at least two factors should be considered. First, historically, MOE has not been quick to respond to changes in the world; rather it has tended to stand somewhat aloof from political, economic, and social development. Second, although STA was set up in 1956 to centralize the national administration of science and technology, MOE retained jurisdiction over research inside universities.

In the early 1980s MOE had no comprehensive science and technology policy of its own, and the agency charged with having a national one—the STA—had no authority in dealing with universities. Clearly this was an untenable situation. So MOE's staff began in 1981 to work on guidelines under which national universities could participate in joint research projects. It took 2 years, until May 1983.

Under the 1983 guidelines, companies and universities can undertake joint projects that seek concrete results that, as proprietary research, the company can exclusively develop into products. Universities were able to allow into their labs nonacademic researchers whose status could remain unchanged as private company employees and who could be supported by company money. (It was already legal for companies to buy the educational and research capacity of a university, but historically this has had a bad image.)

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Government-led research is the most clear-cut. All the programs have clear missions, and everyone knows what role to play. But even then, things do not work that smoothly. In this category of joint research, a wide range of government administrators and policy-determining bureaucrats is involved in all projects, and their influence must always be kept in mind (3).

Industry-led and university-led joint research may at first glance appear to be two sides of the same coin. However, their cores do not coincide. Industry-led research functions from the point of view of industry's need to recruit good students as employees and to get access to original ideas before rivals do, while keeping them secret as long as possible. University-led research aims to increase the quality and quantity of research activity on campus and have it generally freely accessible.

In the early 1960s industry called for university-industry research, but this call was drowned out by the student movement that disrupted campuses in the late 1960s and early 1970s. Faculty feared if they worked with industry, radical students would destroy their labs. By the mid-1980s there were no more such threats, research costs had risen sharply, and facilities had deteriorated because of tight government budgets. In this context, a group of academics, especially those in experimental research, believed worthwhile work in universities would come to a halt without new funding sources. For the first time there had been a confluence of industry and university needs. Although their reasons differed, the aims were the same.

It is difficult to predict where Japanese universities are headed. Two things should be noted—both familiar to researchers elsewhere. One is the serious problem of the deterioration of science and engineering department facilities since the government's tight budget policy was adopted in 1982. The other is the future of the relationship between science and society.

What is to be done about the anti-industry allergy and the concern about freedom of research? In principle most university people now agree on the need for cooperation with private companies, but there is still disagreement on specifics. There are academics who believe current funding problems are not really that dire. Some simply are not interested in cooperative research. So the status quo prevails. How much—and how easily—university-linked joint research will be done remains an open question. As solutions are worked out, one hopes researchers, companies, and government policy-makers on both sides of the Pacific can benefit from comparing notes and sharing thoughts on what is a common issue.

REFERENCES AND NOTES

1. *Yomiuri Shimbun*, 9 July 1982.
2. Kagaku Gijutsu-cho (Science and Technology Agency), Ed. *Kagaku gijutsu hakusho 1981* (Science and Technology White Paper, Tokyo, 1981), p. 115. White papers are published annually by a number of government units as reports on the previous year and look-ahead policy statements. The Japan Institute of International Affairs publishes English abstracts of them, with a lag time of about a year, as *White Papers of Japan* (Tokyo).
3. There is a growing literature in English on various aspects of Japanese government-led as well as industry-industry joint research. [See, for instance, J. Levy and R. Samuels, *Institutions and Innovation: Research Collaboration in Japan* (MIT–Japan Science and Technology Program, Cambridge, MA)]. There have also been studies of Japanese firms linking with U.S. firms and research institutions [see, for example, Office of Japan Affairs, National Research Council, *U.S.–Japan Technology Linkages in Biotechnology: Challenges for the 1990s* (National Academy Press, Washington, DC, 1992)].
4. This article is extracted from a larger study. I wish to express sincere appreciation to the many people who generously supplied information, much of it normally unavailable. I would especially like to thank N. Saito, H. Suzuki, and K. Nagata of Waseda University; K. Marumo of Japan Techno-Economic Society; C. Watanabe of the New Energy and Industrial Technology Development Organization; and Y. Fujii and S. Kobayashi of Bunkyo University. I have also benefited from discussions with R. Samuels of Massachusetts Institute of Technology and H. Patrick of Columbia University.

Underfunding of Basic Science in Japan

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Japan's higher education system is made up of 98 national, 41 prefectural, and about 400 private universities. Approximately 30 of these schools are strong in scientific research as well as education, but they are suffering from lack of adequate funds for both basic research and education.

Over the past 20 years, the research activities of Japanese universities have rapidly expanded, especially in applied science. Japan competes strongly with other leading Western countries. For example, comparing the number of publications in the field of electronics and pharmaceuticals, Japan ranks second to the United States, followed by the United Kingdom and West Germany. In 1986 Japan ranked third in the number of physics papers published worldwide, exceeded only by the United States and the former Soviet Union.

One might assume that Japan's leading industrial research centers contribute the majority of published scientific works; however, this is not the case. According to publishing figures, a total of 92,363 physics papers were published in Japan between 1976 and 1986. Of these, 47% came from ten of the leading national universities including the University of Tokyo, Kyoto University, and Osaka University. Four leading private institutions, Keio, Waseda, Nihon, and Tokyo University of Science, contributed about 3%, while Hitachi, NTT, Toshiba, and other private industry contributed about 10%. The remaining 40% came mainly from national laboratories and smaller public and private universities. These statistics clearly indicate the importance of the national universities in advancing scientific research in Japan.

While research flourished in the universities during the 1970s and 1980s, the Japanese government took economic measures that began to seriously affect the established national universities.

AERA/ASAHI SHIMBUN

The eroding infrastructure of Japanese universities.

In an effort to stimulate the economy, the Japanese government sold national bonds both domestically and abroad that created funds for schools, roads, and other public works. As a result, the Ministry of Education, Science and Culture built many new national universities and laboratories

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