

SCIENCE

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EDITORIAL

Progress in Japanese Science

This issue of *Science* returns to a subject, Science in Japan, that we have visited before (23 October 1992 and 18 July 1986). Our News staff reports the advances that Japan has made toward its goals to strengthen basic research, to increase interaction between universities and industry, to improve the quality of its research, and to participate more extensively in international research.

Despite increased support for basic research, the basic research budget in Japan, as in the United States, is less than the basic research scientists consider desirable because of other budgetary pressures on the government. At the same time, the research budgets of companies are less than desired because of the lingering recession. In contrast, participation in the exchange of information between countries is progressing nicely, with greater contributions from Japan to international projects and more welcoming of foreign scientists to Japan. This follows in important ways the wishes of Emperor Akihito, who wrote in our previous issue of 23 October 1992 of a past history of seclusion of Japan from Western information and his desire to foster a greater spirit of openness with foreign countries. From the contributions of Japan to international high energy physics research to its role in the rice genome project, information generated in Japan is very valuable to Western scientists and, similarly, Western research is useful to Japanese science. A Policy Forum by Saburo Nagakura and Hitoshi Kikumoto discusses new policies affecting university scientists in Japan.

Scientific research in Japan and other Asian countries is becoming increasingly important to the Western world. A tradition of strong internal discipline, together with impressive resourcefulness and energy, establishes a base from which great scientific progress is to be expected. We have already seen the indications of this progress in this issue and in last year's *Science in Asia* issue (15 October 1993), which focused on the emerging scientific powers of East Asia. The day is not far off when the flow of information in both directions will increase appreciably. Fortunately, the new technology of the information highway will make that communication easier.

Japan, like the United States and other developed countries, is struggling to find the right ratio of pure and applied research. The perception of basic research as only an obligation to international society and only of peripheral benefit to the country of origin is persistent in many ministries of government, and it conflicts with the desires of scientists in basic research who seek more support. It is to the benefit of all scientists to support a comprehensive international understanding of property rights and patent harmonization. In such a system, the basic information would be available to all, but the country of origin would have an incentive to provide more funds for basic research. Research made possible by those funds would add to the global supply of information. Any breakthrough would benefit the country of origin slightly ahead of others in the world, but all would benefit from the new funds for basic research. With such an incentive, governments and scientists would be all pulling together, unlike the current hesitant partnership.

Japan, like the United States, is exploring gingerly the relationship between industry and academia. There are clearly areas of basic research, such as soil nitrogen fixation or high-temperature superconductivity, that are of interest to industry but seem too long term for direct industrial funding. There are other areas, such as modified penicillins, that are too applied for basic research qualifications. Between these extremes there are difficult questions as to who provides the money and who gets the patents. These problems are consistent throughout the world and, thus, it is intriguing that Japan, a leader in both basic and applied research, is coping with the same problems.

Science plans to keep track of and help with these developments with a network of contributing correspondents including Dennis Normile and June Kinoshita and free-lance writers in Asia, as well as occasional staff visits and, at some point, establishment of an office in Asia. The future looks not only exciting but of great benefit to the world.

Daniel E. Koshland Jr.