

RESUME OF THE DISCUSSIONS
"THE THIRD U.S.-JAPAN SCIENCE POLICY SEMINAR"

Charles T. OWENS*¹ and Nagahide ONOZAWA*²

Session I: Production of Scientific Knowledge

Comments in this session centered around the various organizational techniques and incentives used in the production of scientific knowledge, with special emphasis on the relation between work at universities and in industry.

Dr. Bartocha opened the presentations with a paper on the topic "Setting Priorities for Basic Research", and commented on the 1985 draft budget of the U.S. Federal government, especially that of NSF.

Mr. Ueki's talk prompted a discussion of industry contribution to university research support. It was pointed out that about one-half of Japanese industry contributions go for research, and the other half for various other educational activities. There is a tax benefit for donations up to 2.5% of the capitalization of the company. Companies who wish to limit the field of research or specify the subject matter pay for contract research by the university. Cost of the work is paid into the Treasury by the company and the university is reimbursed by the Ministry of Education, Science and Culture (Monbusho).

Dr. Robbins' paper on incentives to faculty for targeted research stimulated a discussion on who should be involved in such programs. Dr. Robbins indicated that best results are obtained by a mix of "big name" faculty with more junior researchers. The big names bring along their graduate students and others to the projects, and industry also likes to have big names involved. However, management of a program dependent entirely upon big name researchers would be too difficult because of strong personalities involved. It was observed that the program described by Dr. Robbins was an indictment of university administration and demonstrated the refractory nature of the university. It was suggested that facilities and manpower allocations could be directed to work which might have industrial applications, and the faculty researchers would follow. Dr. Robbins pointed out that this was being done on a limited basis at the Colorado School of Mines.

After **Dr. Samejima's** presentation, he was asked why more industries are publishing research results. The answer was that the industry is promoting

*1 Head, NSF Tokyo Office.

*2 Head, Research Cooperation Division, JSPS.

publication. The discovery that basic research could promote the industry has led to increasing publication. In addition, companies need to show their technical competence to their potential customers. A questioner pointed out that today's problems in fermentation could benefit from both chemical engineers and agricultural engineers, and wondered whether these two disciplines worked well together? The necessity of using people from many disciplines to solve today's problems is recognized, and chemical engineers are increasingly aware of the necessity to have biological skills in their field. The majority, however, still do not have those skills, though change is in progress. This led into a discussion of Japanese efforts to encourage creativity in research. It was pointed out that there is some effort now to tolerate "mavericks" or special people, though consensus and cooperation are still valued. There are some government efforts to establish new organizational arrangements conducive to creative research. Foreign scientists are sometimes used in Japanese laboratories as "provocateurs". Basically, however, Japan would like to have it both ways; creativity without disturbing the old patterns.

After Mr. Hardy's presentation, he was asked whether the NSF made contracts or cooperative agreements with universities. The reply was that they were very rare, because they are not flexible enough for the university's needs. In contrast to NSF awards, it was pointed out, Japanese awards did not include salary support. The requirement that many U.S. university department heads face is that they are given less than 100% of the salary requirements of their departments, and professors must get more money through grants in order to get through the salary year.

Session II: Communication of Scientific Knowledge

Professor Inose's presentation elicited a comment that International English should be used in meetings and other communications, both by Japanese and non-Japanese. Use of a standardized and limited English vocabulary would help Japanese to understand better and to be better understood. Another comment focussed on efforts to control the transfer of technology, and the effect which such efforts may have on S&T communication. Transfer of Technology is a complicated question which is being struggled with by many entities, including the National Academy of Science's Corson Panel. Political and economic factors will have an impact on policies toward technology transfer. It will be the task of the scientist to show that the free flow of information will benefit all, and that vigor will be increased by concentrating on development of new techniques rather than controlling the old.

Dr. Ailes' presentation prompted several questions. One questioner wanted to know whether her study led her to any conclusions about how to improve university/industry cooperation. Dr. Ailes suggested that interdisciplinary programs in universities could help mobility between the university and industry. A discussion of the role of small business in mobility of scientists and engineers concluded that while Dr. Ailes found nothing in her data which would highlight

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any such effect, the office of Technology Assessment concluded that interdisciplinary companies would do better in the long run. The existence of many small R&D firms increases mobility by offering many options for employment and the necessity to change when a company fails to grow or to remain viable. Another participant observed that immigration policy helped to determine the nature of U.S. science. Students from foreign countries constitute a great proportion of, especially, engineering graduate students. Another participant observed that a high level of foreign scientists and engineers can be both a problem and an opportunity. A forthcoming NAE study will put some light on this question. In the beginning, Japan sent scientists to the U.S. for training. Nowadays some Japanese companies bring foreign scientists to work in Japan, and some are establishing research institutes in the United States. Another commenter said that the conventional wisdom holds that mobility in Japan is low because of the "lifetime employment" system. There are, however, many joint and cooperative moves in "scheduled mobility" to other institutes, companies, etc. and return. Another comment on mobility in Japan was that while the mobility of individuals is low, the mobility of companies from industry to industry and field to field is very great. Another speaker felt that while mobility can be important, too much mobility can adversely affect continuity in technological development.

Dr. Okamura's presentation on Japanese survey teams elicited the observation by one participant – a Japanese – that Americans endured twenty years of Japanese visiting survey teams. The new efforts by U.S. technical visitors to Japan need to be endured by the Japanese. Another participant said that it was important to give the reasons for visits when requesting appointments for survey teams. The economic and commercial competition in which Japan and the U.S. are engaged can have an effect on technical visits.

Dr. Coleman's presentation of "Programs in Applied Japanese Studies", was the final item of the morning session. The chairman asked that discussion be postponed to the afternoon.

Session III: Application of Scientific Knowledge

Dr. Ganz's presentation prompted a discussion of whether or not the university could set up structures to create a more problem-rich environment. It was pointed out that university scientists normally choose from problems in their disciplines. Dr. Ganz said that "great" scientists sometimes consider both the technological and scientific aspects of their work, and that technological discoveries with great impact often have a large scientific component. There are also "natural" systems for setting up scientific and technological discovery. The questioner remained convinced that there are some ways to try to bring about the crossover between science and technology by setting up special organizational or management structures to improve upon chance. Dr. Ganz agreed that management strategies can be important, but serendipity is important, whatever management strategies

may be set up.

Following **Dr. Uenohara's** presentation on "Increased Reliance of Modern Industrial Technology on Scientific Outcomes" and **Dr. Westwood's** presentation on "Putting Science to Work in Multi-Industry Cooperation", **Dr. Yoshikawa** answered a request for a clarification on his presentation. He said he wanted to stress that the fluid flow of knowledge among different sectors (university/industry) starts with a dream and then moves to experimentation and eventual industrial application.

Dr. Lambright's presentation touched off a discussion of several issues related to earthquake prediction and the application of scientific knowledge. One participant said that after the Akita earthquake there was a notice posted at the University of Tokyo which chastised the scientists because they did not predict the quake yet got paid by television to explain how the quake came about. Another participant noted that both countries opted for prediction over design of earthquake – proof, damage – limiting structures. The constituency for prediction was organized while that of design was not. A third participant said that a tsunami warning had been issued at the time of the Akita quake, but people did not pay attention. Most who died in Akita died in the tidal wave. The reaction of the public is key to the success of the utilization of S&T knowledge. Another comment was made to the effect that researchers often exaggerate the potential application of their research in order to get more money from mission oriented government agencies or other organizations.

Session IV: Barriers to the Transformation of Scientific Knowledge

Dr. Gellman's characterization of the industry/academic cooperation in Japan as "very close" prompted one participant to question the characterization. Based on his travels in Japan the questioner felt that things were in fact not too close between academics and industry. Another participant agreed, pointing out that student disturbances in the 1960's provided a great disincentive for professors to collaborate with industry. National university professors are government employees, and may work with corporations only with very heavy restrictions.

After the presentations on barriers by **Dr. Kodama** and **Dr. Shimo**, a question was raised on how Japanese professors maintain a non-biased position on societal questions with a high science and technology component. What are the rewards for participation in advisory committees and other such groups? Another participant answered, saying that what the professors get is very little, except a certain amount of prestige. There is a small fee for attendance and a little technical information which might be of assistance in the professor's research. On Social questions, it should be pointed out, Japanese professors take positions which are better characterized as "neutral" rather than "unbiased."

Dr. Schlie's presentation brought a question about the assumptions which went into the Department of Commerce predictions being based only on large jetliners. What about the market for aircraft of other sizes? **Dr. Schlie** answered

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that those aircraft were in a category where U.S. manufacturers just gave up the market, based on unanticipated demand, Brazilian readiness to produce them and some U.S. regulations.