I. SUMMARY

OVERVIEW

This seminar was felt to be a useful beginning to an understanding of the science policies and policy processes in both countries. Science policy was seen to be embedded in the social, cultural and economic systems of the country. Therefore, while science policy problems may be similar at the general level, they are frequently different in their expression within each country. For example, the influence of traditional social values such as stature in the community, attitudes towards modesty and leadership, and loyalty regarding working relationships, may have a very strong effect on a country's approach to specific issues.

It was clear that neither country has a single comprehensive science policy. Rather, individual policies are developed throughout the policy apparatus dealing with individual issues.

The processes of long range planning and budget development are significantly different in the two countries. In particular, the roles of the Diet and the Congress in these areas appear quite different.

Government support of university research in Japan is largely by general institutional funding to the universities while in the U.S. it is by specific project grants. The pros and cons of the general institutional support and the project grant approaches were discussed particularly with regard to the initiation of new research programs and the support of new researchers.

Cooperation among universities, industry and government was discussed, especially with regard to the impediments to joint research. The role of scientists in the national universities in Japan and their constraints imposed both by traditions and by the Japan Public Service Law were discussed. The situations in Japan and the U.S. were compared.

International cooperation in science was discussed with special emphasis on cooperation between advanced and developing countries and between advanced countries. Despite some very important successes in international science cooperation, there remain great difficulties. While advantages may arise from effective multilateral cooperation on the global scale, the chances of success seemed to favor regional or sub-regional cooperation.

Finally, the seminar discussed the sources and uses of information in the science policy process. Many useful documents were discussed and exchanged.

Papers were presented on six general topics and were followed by discussions.

The following are brief summaries of the discussions on each topic:

1. Science Policy Framework

Papers were presented by H. Averch and jointly by A. Tezuka and F. Kodama. The discussion covered the following points.

In Japan, there are two types of science policy: science policy formulated in relation to industrial policy and science policy which is independently derived. Most science policies related to industry implement administrative measures which promote R&D in the private sector, such as tax incentives and special financing from government funds. However, providing direct subsidies to industry for purposes of R&D is quite unusual in Japan. There are two closely related types of science policy which are formulated independently of industrial policy:

(1) those formulated in light of new scientific developments,

(2) those which systematically promote research in response to social needs.

The former is primarily promoted by the Ministry of Education, Science and Culture (MESC) and the Science and Technology Agency (STA), while the latter is carried out not only by MESC and STA but also by other ministries and agencies.

It can be said that overall science policy coodination simply does not exist in Japan today, because the Council for Science and Technology is primarily concerned with narrowly delineated science policies. In order to examine the problem of overall science policy coordination, it is necessary to interrelate the S&T viewpoint, the socio-economic viewpoint and a viewpoint which assesses the appropriateness of the administrative management structure.

The structure and reality of policy formulation of various ministries and agencies share the following points in common. First, since science policy formation is limited to the administrative level, there is the tendency for the matters discussed to be seen in too narrow a light and for the problem-solving to be small-scale and gradualistic. Second, since there are three common elements of constraints on policy formation (influence exerted by strong pressure group, policy directions from the Diet and the inflexibility of a bureaucratic system), science policy in

Japan seems to be articulated through the contention of these various forces or through a natural process revolving around a cooperative relationship among these forces.

Advances in science and technology are seen to lead to economic growth and other benefits to society. The rate of return on science and technology is very high, estimated to be about 30%. In spite of this high return, science and technology is seen to be inherently risky and uncertain.

Science policy is needed to provide appropriate support to basic research and to research and development in general to provide incentives for new products and services, and to meet the problems created by science and technology.

The U.S. has no central science and technology plan; but instead, a large number of federal agencies, Congressionnal committees and private sector entities have substantial roles.

Elements of science and technology policy currently of interest in the U.S. include an assured real growth for basic research, more incentives for innovation, decreased dependency for energy, new alternatives for waste disposal, and making regulations more effective.

The matter of recovery of government support where the end result is commercially profitable was briefly discussed.

2. Organization of the Research Enterprise

Papers were presented by K. Shimo and D. Wolfle. The discussion covered the following points.

There is a highly pluralistic system, in both supporters and performers of research. There is extensive, and diliberate, use of the private sector to accomplish public purposes, including R&D. Most basic research is conducted in universities and most applied research and development in industrial firms. This system ensures widespread participation in deciding what research is conducted.

Some current trends toward greater centralization of decisions concerning research were discussed. There is a current effort in the U.S. to enlist universities in programs to increase productivity and encourage innovation. Relations between government and universities in the U.S. are increasingly strained, and there is a need to improve these relationships.

Data on the level of research and development support in Japan were discussed, showing that government expenditures for S&T as a fraction of the government budget is relatively constant, perhaps slowly declining. Expenditures for R&D were shown as a fraction of sales in a number of industries.

Particular emphasis was given in the discussion to mechanisms for supporting research in universities. General institutional support was compared with the specific project grant approach. The Japanese system is based largely on general institutional support while the U.S. system relies largely on specific project grants.

Industry-university-government relations were discussed. The constraints in Japan on the role that national university scientists can play in dealing with industry arise both from traditions and from the Public Service Law.

The role of private foundations in research support differs in the two countries.

3. Long Range Planning.

Papers were presented by M. K. Wilson and H. Inose. The discussion covered the following points.

For the purpose of analyzing approaches and problems in long-range planning, the characteristics of science in terms of scale, radicalness and maturity were discussed. Problems in long-range planning in terms of limitations in monetary and human resources, uncertainty in societal and scientific environment, unpreditable policy changes and difficulty in evaluation were noted. Based upon these considerations, the most effective method in long-range planning was said to be the establishment of an appropriate infrastructure upon which future scientific activities are dynamically carried out. Increase in research investment, enhancement of education and training, improvement of information availability, strengthening of government-university-industry collaboration and promotion of international exchange and cooperation were pointed out as crucial factors for such infrastructure building. Discussions were held on the definition of scientific infrastructure.

It is generally agreed that such infrastructure includes not only hardware but also software and science-oriented motivation of the public. The identification of newly emerging areas of radical sciences was also discussed.

Long-range planning at the U.S. National Science Foundation (NSF) was discussed in detail, particularly for the support of basic research. Emphasis on "bottom-up" planning was explained.

The objectives of long-range planning are to provide adequate resources to the scientific community, to identify areas of increasing and declining interest, and to determine the needs for resources in various fields.

Planning tools used at NSF were discussed. The role of the Annual Report and Five Year Outlook was mentioned. The relationship between internal NSF and external factors was discussed. The external factors included Administration and Congressional actions. Societal factors were discussed. Long-range planning enables the agency to respond to the needs of the scientific community and to promote efforts where scientific developments are needed. Long-range planning is useful not only in the final plan, but more importantly, in identifying problem areas, in avoiding capricious changes in support patterns, and in involving the scientific community in the process.

4. Allocation of Resrearch Support

Papers were presented by H. Osaki and R. Konkel. The discussion covered the following points.

A detailed discussion of the budget process in Japan was given. The relative autonomy of ministries and the key role of the Ministry of Finance were discussed. The role of Monbusho in funding research in universities was explained. Measures to ensure the best balance between respect for initiative of researchers and necessity of more organized research support were discussed. The function of the Diet in ratifying the budget and in legislating specific initiatives was discussed.

In the U.S., the formulation of the Federal budget plays a central role in the allocation of government resources to various research and development activities. The budget also serves as a means of clarifying and developing broad Federal guidelines and in establishing future directions for R&D program. No simple criteria exist for determing the relative priority of various R&D activities that might be carried out with government support. In the absence of such criteria, an elaborate process of budget formulation, review and modification has evolved in the United States with a large number of participants in the Administration and the Congress.

The possibility of multi-year planning and budgeting was discussed for both the U.S. and Japan. Any attempt to reform the budgetary system in this manner will, however, have to grapple with the fact that the current process is already highly complex and consumes large amounts of time and human resources.

5. International Cooperation.

Papers were given by S. Okamura and F. Long. The discussion covered the following points.

Past history and the present situation in Japan's international cooperation in science were described.

About a hundred years ago, Japan started her international cooperation in modern science, and initially, international cooperation was carried out for the purpose of getting advanced knowledge and technologies from abroad. Recently, however, Japan started to promote international cooperation in order to make positive contributions towards the world's science and to cooperate with developing countries. The difficulties in Japan in promoting international cooperation were discussed, as were proposals to promote international cooperation in science in the future.

Cooperation between advanced and developing countries was discussed. The importance of cooperation was generally accepted, but there was uncertainty on the best procedures. However, there were many comments on the effectiveness of bilateral cooperation. At the same time there was much interest in regional cooperative programs. An example would be U.S., Japan and Australia cooperation with ASSEAN countries.

6. Information for Science Policy

Papers were presented by W. Hahn and T. Sato. The discussion included the following points.

Technical problems on comparing science policy indicators by using data from OECD/CSTP papers were described and some features of Japanese data were clarified. The existence of different treatment of data in various research areas in different countries affects the figures on manpower and sources of funds for university research.

Information for science policy differs from substantive technical Information produced by R & D.

A very wide variety of documentation is available, having different time scales, formats, and quality. Current issues include the participation by all interested parties and communication across diciplines and cultures.

Recommendation:

The participants agreed that many important issues had been raised and discussed during the seminar but none had been examined in depth. Further exchanges of information and views on the general level would be useful but the group felt that a more detailed discussion of a specific topic would be a whothwhile next step.

Among the possible topics for detailed discussion are:

a) How does innovation arise from the scientific and technological institutions and what is the role of entrepreneurship?

b) What are the sources of science policy data, what definitions are used and what limitations exist on the accuracy, reliability and consistency of the data?

c) What factors affect cooperation among government, industry and universities; what factors affect mobility of scientists among the sectors and what degree of mobility is most useful?

d) What mechanisms should be developed to improve cooperation between advanced countries, like the U.S. and Japan, and developing countries?

e) What are the advantages and disadvantages of the various mechanisms for supporting research in universities and industry?

The participants also recommended that the discussion of such topics should be pursued by a group of experts in the respective field but having at least several participants from this initial seminar.