5. INTERNATIONAL COOPERATION

INTERNATIONAL COOPERATION IN SCIENCE

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1. Introduction

Japan started her international cooperation in modern science at the beginning of the Meiji Era (1868-1911). During the Edo Era Japanese Government had a strict national isolation policy (1635-1867), and any international cooperation was strictly prohibited. During that period Japan experienced stable and peaceful social life, without knowing the rapid progress in modern science and technology and its effects on the Industrial Revolution in advanced Western countries.

By the Meiji Restoration, national isolation policy was abolished and Japan tried to start scientific exchange with foreign countries. Although Japan had indigenous science and culture and highly educated people, she was much behind the advanced countries in modern science and technology. Therefore, her efforts in scientific exchange was mainly centered upon exchange with the advanced countries for purpose of catching up with them.

Many reports from the Advisory Councils of the Government point out that scientific research by nature claims internationalism. Exchange at international levle of the results of scientific research is essential for the development of scientific research, and moreover, international cooperation should be promoted not only for purpose of gaining something from other countries but also for purpose of giving something to other countries. However, as a matter of fact, it took a long time for Japan to break away from her tendency to have international cooperation simply to borrow advanced knowledges and technologies from abroad. And just recently Japan started to promote international cooperation in order to make positive contributions towards the world's science. Following this new policy, Japan has been trying to promote international scientific cooperation not only with advanced countries but also with developing countries.

The rapid progress in science and technology in recent years has made our world very small in effect. Information about the results of scientific researches have been actively exchanged through scientific papers and at various scientific meetings published or organized by academic societies. Especially, activities of the international organizations such as the International Council of Scientific Unions (ICSU) and its related unions have been remarkable. Various kinds of international cooperation have also been made through personal interactions among individual scientists, but intergovernmental cooperation remains extremely important and needs to be promoted.

As the scale of scientific research becomes increasingly large, research work in a particular field of big sciences cannot be effectively carried out without the benefits of international collaboration, because even a big country has her own limitations in monetary and human resources. Thus, the promotion of international cooperation becomes a very important issue for every country.

2. Present status of Japan's activities in international cooperation

In Japan, international cooperation in science is carried out in many forms and it is very difficult to distinguish it from cooperation in education and culture or from cooperation in technological sciences. International cooperation is practised in Japan on three different levels: namely, the Government, private sector and non-governmental organizations subsidized by the Government. Types of these activities may be classified as follows:

1) Exchange of scientists
2) Exchange of students
3) Participation in international conferences and scientific meetings
4) International cooperative research
5) Scientific cooperation with developing countries
6) Cooperation through international organizations

The budget for typical programmes in 1980 is shown in Table 1.

1) Exchange of Scientists:

Ministry of Education, Science and Culture (MESC) has a longstanding system of dispatching Japanese scientists to overseas. In recent years, about one thousand university professors are sent abroad annually. This

system has played a significant role in training young scientists and obtaining advanced knowledge from abroad. MESC also has a fund to dispatch Japanese scientists from and invite foreign scientists to the Attached Research Institutions of national universities.

Japan Society for the Promotion of Science (JSPS) provides foreign scientists research fellowships in order to facilitate cooperative research between foreign scientists and their respective Japanese host scientists. The programme covers all fields of humanities and social and natural sciences.

JSPS also administers a number of bilateral programmes for scientific cooperation and exchange under the agreements or understandings between JSPS and various foreign academic institutions. These foreign institutions numbers 35 in 25 countries at present.

The Japan Foundation and other various organizations have exchange of scientists programmes to suit their own purposes.

2) Exchange of students

At present about six thousand foreign students are studying at Japanese universities, of which about 1,200 students are supported by the Japanese Government (MESC).

The Government support to foreign students stuyding in Japan started in 1954, and since then more than 5,700 foreign students were invited to study at Japanese universities.

Japanese people have complete freedom in studying abroad with their private fund, and therefore, it is difficult to know the exact number of Japanese students studying abroad. Some of the students are studying abroad with foreign governments' funds. In 1977, 28 countries gave scholarships to 377 Japanese students. Scholarships offered by the United States, United Kingdom, West Germany and France are most popular among Japanese students.

MESC also gives scholarships to a number of Japanese students enrolled in universities who have bilateral exchange programs with specific foreign universities.

3) Participation in international conferences and scientific meetings

MESC supports annually more than three hundred Japanese scientists working at universities and research organizations by providing fund for their participation in international conferences held abroad.

The Science Council of Japan (SCJ) supports the participation of about 90 scientists to general assemblies or international conferences sponsored by international scientific organizations of which SCJ is a member.

4) International cooperative research

MESC supports various kinds of international cooperative research. Each year, they grant some Japanese universities funds to carry on joint research with foreign research institutions.

JSPS also supports Japanese scientists who are engaged in joint research with foreign scientists by providing them with travel and research expenses.

In particular, joint research projects with American or French scientists are taken up under specific bilateral programmes with the US National Science Foundation, the US Social Science Research Council, the US National Cancer Institute, Centre National de la Recherche Scientifique (France) and Institut National de la Sante et de la Recherche Medicale (France).

5) Scientific cooperation with developing countries

We are now faced with such universal problems as those of environment, diseases, population, food, evergy and natural resources. In order to solve these problems, cooperation of the developing countries, which account for three quarters of the world's population and three-fifths of its land area, is essential.

Moreover, in the research fields such as astronomy and geophysics, which call for investigation in all parts of the world, satisfactory results can only be obtained with the participation and cooperation of researchers in the developing countries.

On the other hand, if the ultimate goal of the human being is to build a society in which everyone can enjoy dignity, reasonable abundance and a worthwhile life, without aid and cooperation from advanced countries, developing countries will be unable to make the social and economic advancement and to raise their living standard. Various kinds of aid programmes have been made by advanced countries without producing significant results, and it has been found out that technological cooperation or even scientific cooperation with developing countries is more effective than economic aid.

Japan has been promoting research cooperation with developing countries in order to assist developing countries in their self-help efforts to improve their own research capabilities and to develop their own technologies suited to their indigenous conditions.

For example, JSPS initiated a scientific cooperation with Southeast Asian developing countries in fiscal year of 1976. Under this programme, the Society invites scientists who hold leading positions in developing countries to discuss problems of common interest with Japanese scientists.

By the Science Council's advice, the Society established and initiated in 1978 the so-called core university system based on the agreement with the concerned governmental authority in the developing countries. Under this system, a specific university is selected to serve as the center of research activities in a specific field. Around this core university are a group of other universities who share interest in the same field. This group of universities in Japan promotes cooperation with a similar group of universities in a counterpart developing country on a systematic basis. Such cooperation involves exchange of scientists, joint research and seminars held in either country. Besides these programmes, JSPS provides Ph.D. dissertation scheme, in which candidates for doctorate can obtain Ph.D. degrees with the minimum period of stay in Japanese universities. In this scheme a Ph.D. candidate will carry on his research work under the joint supervision of a Japanese professor and a research supervisor in the research laboratory in his own country, and submit a doctor dissertation to a Japanese university or to a university in his home country if he wants.

6) Cooperation through international organization.

Recently, international cooperation through international organizations has become increasingly important. Japan is actively supporting and is involved in various United Nations activities in scientific field in cooperation with specialized U.N. agencies such as United Nations Educational, Scientific and Cultural Organization (UNESCO). She also supports various international organizations established at the wish and on the initiative of scientists themselves, such as ICSU, or the organizations established by intergovernmental agreements such as Organization for Economic Cooperation and Development (OECD). Relationship between International Scientific Organizations and Japanese national organizations is shown in Fig. 1.

Examples of international cooperative research organized by some of the international organizations are as follows:

a) The programmes proposed by ICSU, such as the Antarctic Research, the International Magnetospheric Study (IMS), the Global Atomospheric Research Programme (GARP), the Geodynamics Project (GDP), etc.

b) Intergovernmental joint programmes proposed by UNESCO, such as the International Oceanographic Commission (IOC) programme, the International Hydrological Programme (IHP), the International Coordinating Council of the Programme on Man and the Biosphere (MAB), World Scientific Information System, etc.

3. Science policy to promote international cooperation

As was mentioned above, up until the beginning of Meiji Era, international cooperation was not very familiar to Japan by historical and social reasons. We Japanese have lived in the small isolated islands in the Far East and have maintained unique manners and customs. Moreover, Japanese language is spoken only among Japanese people, and naturally, many Japanese scientists are hadicapped in terms of language when they work with foreign scientists.

Recent progress in science and technology, especially in communication, broadcasting and transportation, has given Japanese children more chances to interact with foreign persons and to be acquainted with their manners and customs than before. However, we should try to make more efforts to overcome communication difficulties in order to promote international cooperation.

There would be various plans, but following proposals are now in my mind:

1) Government should open the door to foreign professors to be regular staff in national universities.

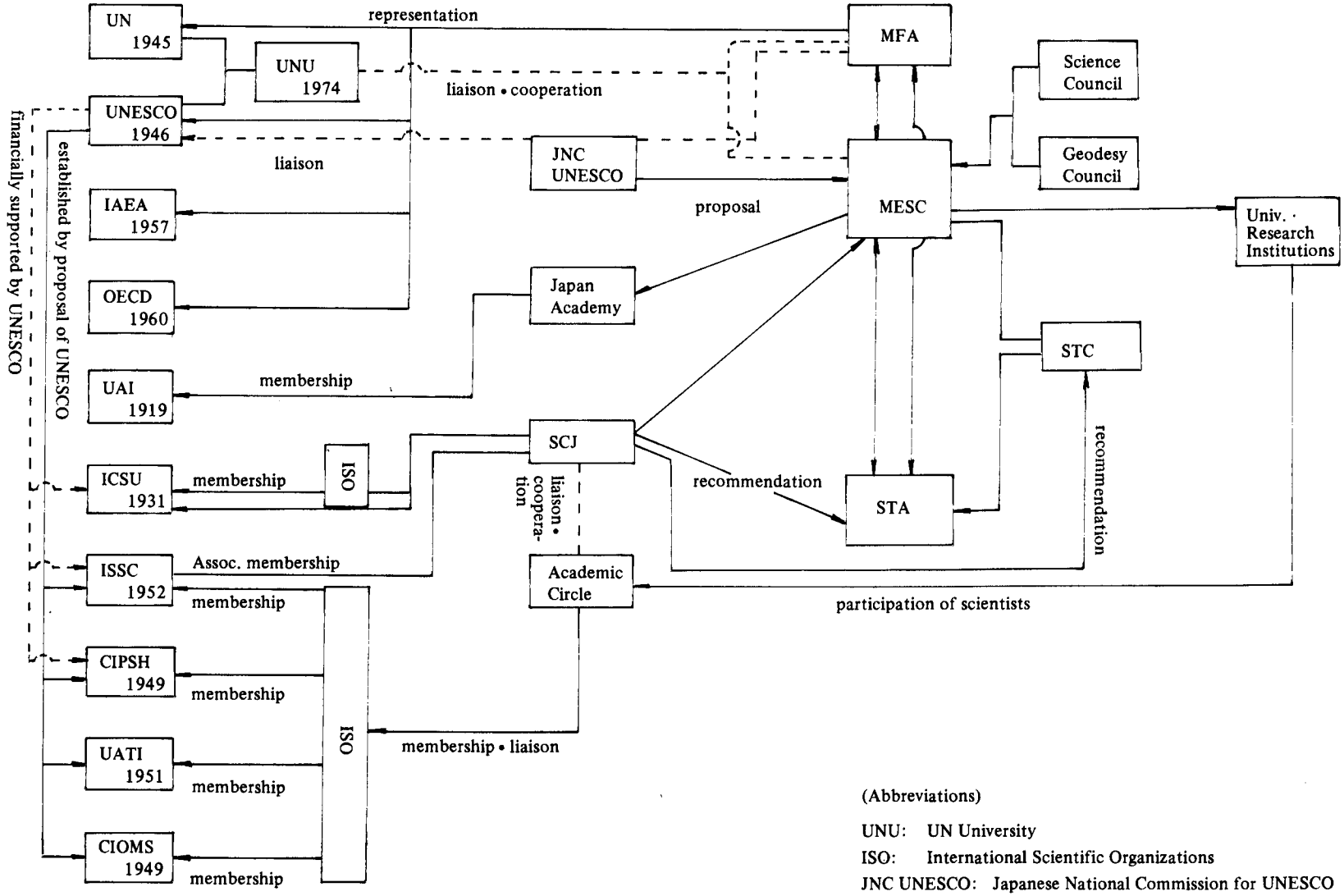
2) Government should have a scheme to encourage Japanese scientists to stay abroad for a considerably long period for the purposes of research and education. Especially, Government should initiate a programme to dispatch Japanese professors for several years to give lectures at foreign universities.

3) Plan to invite more foreign students should be carried out.

4) Plan to dispatch more Japanese students to foreign universities and schools should be carried out.

5) Plan to foster a spirit of internationalism in children should be formulated.

Fig. 1 Relationship Between International Scientific Organizations and Japanese National Organizations



Source: White Paper on Sciences of Japan, 1975, p160
Fig. 1-6-10

(Abbreviations)

UNU: UN University
ISO: International Scientific Organizations
JNC UNESCO: Japanese National Commission for UNESCO
SCJ: Science Council of Japan
MFA: Ministry of Foreign Affairs
MESC: Ministry of Education, Science and Culture
STA: Science and Technology Agency
STC: Council for Science and Technology

Table 1 Status of International-Cooperation Activities

Activities	Budget in JFY 1980 (million)	No. of Persons Concerned
1. Exchange of Scientists		
A. Dispatch of Japanese to abroad		
1) MESC		
i) As research fellows	2,023	907
ii) Researchers from attached institutes of national universities	48	42
2) JSPS	130	125
3) Japan Foundation	140	43
B. Receiving scholars from abroad		
1) MESC		
i) Foreign teacher, lecturers etc.	2,529	609
ii) Researchers for attached institutes of national universities	347	52
2) JSPS	735	220
3) Japan Foundation	664	380
2. Exchange of Students by MESC		
A. Dispatch of Japanese students to abroad	313	230
B. Receiving foreign students from abroad	3,986	790
3. Participation in International Conference and Scientific Meetings		
1) MESC		
i) Dispatch of Japanese scientists to meeting held in overseas	236	340
ii) Support of international conference held in Japan	75	/
2) MFA	36	/
3) SCJ	55	/
4) Japan Foundation	57	/
4. International Cooperative Research		
1) MESC: International cooperative research of national universities	1,216	/
2) JSPS programme, cooperative with specific countries (including JSPS-NSF project)	582	/
3) Overseas regional studies		
i) Overseas scientific investigation	798	/
ii) JSPS overseas regional center	22	/
4) SCJ	3	/
5. Scientific Cooperation with Developing Countries		
JSPS programme of scientific cooperation with developing countries	377	/
6. Cooperation through International Organization		
1) MESC		
i) Exchange of scientists		
a) Trainees in UNESCO graduate course	101	14
b) Fellowship by Japanese national committee for UNESCO	3	5
ii) International cooperative research		
a) Activities proposed by ICSU	2,571	/
b) Participation in UNESCO activities	9	/

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Activities	Budget in JFY 1980 (million)	No. of Persons Concerned
iii) Support to international organizations	630	/
2) MFA		
Support to international organizations	4,176	/
3) SCJ		
Contributions to international unions	51	/

(Abbreviations)

MESC:	Ministry of Education, Science and Culture
MFA:	Ministry of Foreign Affairs
JSPS:	Japan Society for the Promotion of Science
SCJ:	Science Council of Japan
UNESCO:	United Nations Educational, Scientific and Cultural Organization
ICSU:	International Council of Scientific Union

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INTERNATIONAL COOPERATION IN SCIENCE, TECHNOLOGY AND SCIENCE POLICY

Franklin A. LONG

I. Introduction

It is common to postulate that science is an open international enterprise in which all can participate and whose results are available to all. But it is not quite that simple. Active participation requires trained scientists and well equipped laboratories. Access to the ever-growing body of scientific knowledge requires an effective information system. It is of course the existence of these barriers that makes science often seem remote to the peoples of the less developed countries (LDCs).

The situation with modern technology is even more difficult for the LDCs. Again there is a large and ever-growing body of technology in the world. And again, information systems to gain access to it and knowledgeable people to apply technology are required. However, access to information on technologies is more complex than for science. Information on older technologies is available in the open literature, but the literature is less well-organized and less accessible than for scientific information. Information on the latest technologies is usually *not* openly available. On the contrary, it is usually kept more or less secret, and the common procedure of patenting new technologies imposes further legal restrictions to access to information on them.

These introductory comments are illustrative of the topics covered by the subject "Science Policy." The broad national concerns are with the policies that guide and control the nation's generation of, access to, and utilization of science and technology (S&T). Specific topics range from education of scientists and engineers to licensing of technology imports. But there are also international dimensions to science policy. How can information on S&T most effectively be disseminated? What kinds of regional and international collaboration are indicated? How can they best be carried out? What are the roles of international organizations and how can their effectiveness, e.g. of UNESCO, UNDP, and FAO, be enhanced? And what policy should apply to the S&T interactions between developed and less developed nations if the objective is more rapid development of the latter? This paper examines these international aspects with emphasis on the areas where more international collaboration is needed.

II. S&T Cooperation Among Developed Nations

The very large fraction of new science and technology is generated in the developed world. Formal and informal information exchange among the developed nations is well established and collaboration is substantial. Even so, one must distinguish between the western or "OECD" nations–Western Europe, U.S., Canada, Australia, New Zealand, Japan– and the Comecon nations, i.e. the U.S.S.R. and its East European satellites.

Scientific and technological cooperation among the OECD nations has grown rapidly in the last few decades and is now very substantial (Table 1). A wide variety of mechanisms for cooperation and collaboration are utilized. Some of the mechanisms are formal in the sense that inter-governmental arrangements are involved, but most of them are non-formal and involve "grassroots" decision by individuals, by universities and by business enterprises. Examples of the informal activities are: student exchanges,* research collaborations, information exchange, cross-licensing of industrial technologies. Among the more formal government mechanisms are bilateral government agreements for student exchange and research collaboration, integrated government programs for R&D in selected areas, e.g. military R&D and space research, and regional development of special laboratories, as for example the West European laboratory, CERN, for studies of high energy particle physics.

An important component of the non-formal mechanisms is the international activities of large business corporations, especially those which operate internationally, i.e. the transnational enterprises (TNEs). The TNEs constitute an effective mechanism for technology exchange as well as for collaboration in R&D. In a sense, their rapid spread within the developed world is a reflection of this. The richer nations of the western world have, for the most part, moved substantially from initial deep suspicion of foreign enterprises and foreign products to wide acceptance. The most formal illustration of this last is the development of a viable European common market, which makes most industrial products from the constituent nations freely importable. As another example there are now Volkswagon plants in the U.S. and General Motors plants in Europe.

As products of the transnational enterprises of the OECD countries have interpenetrated each other's territories, research and development activities (R&D) have also spread. Tables 2 and 3 illustrate this with data on R&D done in other OECD countries by U.S.-based TNEs and data on R&D done in the U.S. by foreign-based TNEs.

* In 1977-78 there were in the U.S. 236,000 university-level students from abroad; 9,000 of them from Japan.

A recent announcement by a large U.S.-based international oil company illustrates the character of international interdependence in technology and the role of R&D collaboration. The announcement was that the Lurgi Koehle und Mineroeltechnik company of West Germany had been selected for a design of the conversion process for a projected large coal gasification plant to be built in Southwest U.S.; the announcement noted that the Lurgi process was selected because of its "demonstrated commercial applications." Incidentally, units of this same TNE support research laboratories in five other OECD countries besides the U.S., one of them being the laboratory of a jointly owned affiliate in Japan.

In the fields of basic and applied science, research cooperation among scientists and engineers from OECD nations is large and growing. Post-doctoral research students flow in increased numbers among the countries. Table 4 for the U.S. shows that in 1977 almost a third of the post doctors studying in U.S. universities came from other countries. Numbers of foreign graduate students in science and engineering in the U.S. increases steadily. International cooperation in research itself is also increasing, as judged by the increased numbers of published research papers where the authors represent an international grouping. Data on these and other measures of international cooperation are to be found in a recent NSF publication.*

Collaboration of scientists of OECD nations with those of Comecon is considerably more difficult and hence the level of collaboration is much smaller. One part of the problem is the different structures of the economies which makes collaboration among business enterprises almost impossible. Another part is the severe travel restrictions which the Comecon nations impose on their citizens, a consequence of which is that virtually all personnel exchanges between Comecon and OECD nations occur under the aegis of formal government-to-government agreements.**

There are, however, a number of approved mechanisms whereby scholars from OECD and Comecon nations meet and cooperate. International meetings of scholars constitutes one such and Comecon participation in these is substantial, if frequently also selective and erratic. Another important mechanism is cooperation in worldwide efforts to study large-scale scientific problems, e.g. the International Geophysical Year and the Global Atmospheric Project. Here, participation of laboratories and scholars from Comecon has been large and important. Overall, however, one must conclude that, as long as serious political differences exist, cooperation of Comecon and OECD countries will mostly involve government agreements and will remain at a fairly low level.

Studies of science policy within the OECD nations occur at a variety of levels. Governments commonly support policy studies, as illustrated in the U.S. by the Division of Policy Research and Analysis of the National Science Foundation and by the Office of Technology Assessment of the U.S. Congress. Numerous other U.S. agencies also have responsibility for science policy studies (Table 5). Academic interest in the subject is high and there are now numerous policy study units in universities and several scholarly journals whose particular field is policy studies. The central headquarters of OECD has a vigorous division of Policy Studies which has published a variety of studies on science policies, both for individual OECD nations and for OECD regions. Regional policies are of particular consequence since there are numerous important problems which must be analyzed and responded to on a regional or global basis. Examples are: pollution of the Mediterranean Sea; control of acid rain; allotment of regions of the radio-frequency spectrum; international measures for preservation and control of oceanic species such as whales and major food fish. Many of these international problems have been analyzed by agencies of the U.N. such as UNESCO and the Advisory Committee on Science and Technology (ACAST), and the U.N. presence in such negotiations as the international treaty on Law of the Sea has been crucial. However, most of the U.N. effort in science policy studies has focused on problems of the poorer nations.

Japan and the U.S. both contribute to OECD studies of science policy. There have, however, not been many U.S.-Japan bilateral study efforts that focus on policy problems of mutual concern, e.g. joint programs in basic and applied research, studies of university-industry relations, joint analyses of alternative energy sources, studies of the relation of R&D to industrial innovation. Perhaps this present symposium can be a catalyst in initiating some new bilateral science policy studies.

Since the Comecon nations face many of the problems that have concerned OECD nations, one must assume that science policy studies have been important to them also. However, much less is published on them and there is no evidence of much academic or scholarly interest. Part of the problem may be the closed character of the states;

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* *Science Indicators*, 1978, published by the National Science Foundation in 1979; available from U.S. Government Printing Office, Washington, DC, 20402, Stock No. 038-000-00416-6. Capter 1 of this volume is devoted to international science and technology. Although most of the discussions and data refer to world-wide analyses, the discussions and occasional data breakdown point to the dominance of collaboration within OECD.

** During the 1965-68 years of relaxation in Czechoslovakia, terminated by the U.S.S.R. invasion, restrictions on foreign travel were greatly relaxed. As a result, more Czech scientists and engineers came to the U.S. during this three-year period than had come from the much larger U.S.S.R. during the entire 1947-'68 period.

another part may be the degree to which the ruling communist parties arrogate decisions to themselves. Scientists and engineers from Comecon nations do, however, participate in a variety of international societies and programs, and their contributions have been valuable.

In 1972 the U.S. and the U.S.S.R. agreed to a set of science policy studies to be done jointly over a period of several years. Joint working groups were established in four specific fields–fundamental research systems, R&D planning and management, financing R&D, training and utilization of S&T personnel–with annual home-and-home meetings as well as visits by study groups in each direction. In retrospect, and from the point of view of a U.S. participant, these joint studies have not been very successful. There was much good will on both sides and a genuine attempt to wrestle with problems of joint concern. But a combination of language and scheduling problems, different backgrounds and constraints and lack of comparable data made progress difficult.

III. S&T Cooperation Between Developed and Developing Nations

In principle, one is here speaking of cooperation between the richer nations and the poorer, where the former would include both OECD and Comecon nations. It will suffice, however, to discuss only OECD-LDC interactions, partly because they are much larger than for the Comecon nations, and partly because much that is done by the latter comes within the broader United Nations activities.

From the point of view of the LDCs, their situation is both straightforward and urgent. They strongly wish to enhance their stability and security and their quality of life. An improved standard of living seems essential for both. This implies rapid economic growth, and for this the developed nations appear to hold the key. The rich nations (the North) have the technology which can spur industrialization and improve agriculture. They have technical and management skills and modern educational and information systems. Since they are also the principal markets for LDC exports, trade and collaboration with them seem essential to the LDCs.

There are a variety of mechanisms available for collaboration. Working within such U.N. agencies as UNESCO and UNDP is one. Regional groupings like the Organization of American States and ASEAN are another. Bilateral programs between a developed nation and a developing one constitute another important mechanism. Finally, there are the transnational enterprises (TNEs). The TNEs see the developing nations as places where their technology and management skills can generate profitable businesses. To the LDCs, the TNEs are seen as a mixed blessing, welcomed for the goods and services they produce, feared for their power and presumed negative impact on development of self-reliance. Recent studies suggest, however, that mechanisms for control of TNEs have been considerably strengthened in most LDCs, and that the contributions from TNEs, and from private enterprise business in general, are increasingly accepted as beneficial overall. More effort on the part of the TNEs to respond to local needs and to participate more broadly in the national buldup is probably still required if satisfactory relations are to continue.

Given that the developed world has much knowledge and skills that the LDCs need, the problem of transfer remains troublesome. The original approach of "technical assistance," embodying the notion that the developed world had the answers to the LDC problems and needed only to transfer them, turned out to be both psychologically unacceptable and operationally deficient. Far too many of the LDC problems require a close understanding of the local situation and an interactive approach to applying and adapting western technology to their solution. This of course necessitates a continuing collaboration between DC and LDC workers who are concerned with the problem. Furthermore, the initiative for seeking collaboration and the final decision as to whether a given solution is acceptable, must reside with the LDC side of the collaboration. Those western organizations which accept these precepts, as for example the Canadian International Development Research Centre (IDRC), have notably been among the most successful in productive collaboration with the LDCs.

Policy studies to assist LDCs in education of scientists and engineers and in the acquisition and use of science and technology are likely to be of three types: studies within the LDCs on their appropriate policies and institutions; studies in developed nations on how best to cooperate with LDCs; joint studies dealing with particular problem areas. Joint studies can take place under several auspices: international agencies like the U.N. and the World Bank; regional associations like ASEAN; bilateral or multilateral study teams put together from experts in developed and less developed nations.

Policy studies on development have recently become of great interest to both government agencies and academic groups. A large literature has been produced and there are several active journals in which to report research findings, e.g. World Development and Interciencia. Even so, it is not unfair to conclude (a) that there remains an inadequate understanding of the most effective ways in which developed nations can assist the poorer nations in their development, and (b) that, even though there is general agreement that collaboration is an essential

Table 1: Cooperation Among **OECD** Countries

Type	Example
Student Exchanges	Von Humbolt Fellowships; Postdoctoral fellows
Jointly Funded Laboratories	CERN, EMBO
Cooperative Science Research	Cooperative Authorship
Global Study Programs	Geophysical Year
Space Missions	European Space Organization
International Science Congresses	IUPAC, IUPAP, etc.

Table 2: Local R&D by Foreign Affiliates of U.S.-Based TNEs, 1977

Industry	$ for R&D, millions
Chemical	130
Drugs and Medicines	156
Machinery	416
Electrical and Communications	253
Scientific instruments	54
Other manufacturing industries	482
Non-manufacturing	8
Total:	1499

data from *Science Indicators,* 1978, NSF

Table 3: R&D in U.S. by Affiliates of Foreign-Based TNEs, 1974

Industry	$ for R&D, millions
Petroleum	111
Manufacturing	574
Wholesale trade	78
Finance, etc.	10
Other industries	40
Total:	813

data from *Science Indicators,* 1978, NSF

Table 4: Foreign Postdoctors at U.S. Universities, 1977

Field	Foreign	Total
Engineering	650	1234
Physical Sciences	1725	4180
Mathematical Sciences	53	148
Environmental Sciences	111	376
Life Sciences	3538	13065
Psychology and Social Sciences	136	745
Total:	6213	19748

data from *Science Indicators*, 1978, NSF

Table 5: U.S. Institutions for Science Policy

Office of the President:	Office of Science and Technology Policy, Office of Management and Budget
Departments:	Energy, Commerce, Department of Defense (DOD)
Agencies:	National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), Agency for International Development (AID)
Quasi-Government:	National Academy of Sciences (NAS)
Non-Government:	Universities, Not-for-Profits
Congress:	Committees, Office of Technology Assessment (OTA)