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ABSTRACT

This document presents a summary of the proceedings of a symposium in which participants gathered to discuss the education and training of foreign students in the United States and the relationship between this experience and the use of science and technology for development. A basic contention underlying the symposium was that the transfer of technology from the United States and other developed nations to developing nations is a very important process, and that the hundreds of thousands of foreign students who study in the United States form a significant component in this transfer process. A goal of the symposium was to explore ways to make the educational experience of foreign students as successful as possible in preparing them for effective roles in promoting appropriate development in their communities through the use of science and technology. Four recommendations are identified and summarized in this report. Lists of symposium participants and papers presented also are included. (DB)

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# The Role of the Foreign Student in the Process of Development

A Report of a Symposium  
Held at Snowmass, Colorado  
June 9-12, 1982

Hugh M. Jenkins  
*Rapporteur*

NATIONAL ASSOCIATION FOR  
FOREIGN STUDENT AFFAIRS

1983

The National Association for Foreign Student Affairs is a nonprofit membership association that provides training, information, and other educational services to professionals in the field of international educational exchange. The membership is composed of more than 4,500 representatives of postsecondary institutions, school systems, community organizations, and educational associations. Members implement association programs and participate in the determination of policies and activities through the Board of Directors and more than 35 committees, commissions, and special interest groups.

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## CONTENTS

1. ORIGIN AND ORGANIZATION	1
2. INTRODUCTION	2
3. PREAMBLE	4
4. THE PROCEEDINGS	6
The Dimensions of the Task	6
The Process of Transfer	9
Agents of Change	12
Partners in the Process of Development	16
5. THE RATIONALE	21
6. CURRENT ISSUES	23
7. SUMMARY OF RECOMMENDATIONS	24
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LIST OF PARTICIPANTS	26
FINAL RECOMMENDATIONS	29
PAPERS PRESENTED AT THE SYMPOSIUM	36

## **The Role of the Foreign Student in the Process of Development**

### **THE ORIGIN AND ORGANIZATION OF THE SYMPOSIUM**

In 1979, Cassandra Pyle, then president of NAFSA, recognized that since its establishment in 1948 NAFSA had done little to involve academic faculty directly in its activities. She created a Task Force on Faculty Involvement and asked that body to determine ways of achieving greater faculty involvement. The idea of something like the Snowmass symposium was among the first recommendations of that Task Force. Over the next three years, that idea underwent a number of evolutionary developments. Initially, the task force itself attempted to define the purposes and scope of such a symposium, but the task proved too complex for such a small body. Eventually, a planning body was appointed, involving representatives from several groups: John F. Reichard and Robert B. Kaplan from the National Association for Foreign Student Affairs (NAFSA), Denise Weiner from the International Office of the American Association for the Advancement of Science (AAAS), Aaron Segal (and later Eduardo Feller) of the National Science Foundation (NSF), Sam McKee of the National Academy of Sciences (NAS), and Marjorie Gardner (in part representing NSF but also representing the Fulbright Alumni Association). This committee, later joined by Hugh Jenkins in the role of rapporteur, organized an advisory committee, sought funds, gradually evolved the structure of the symposium, chose the site, selected participants, and generally was responsible for the organization and structure of the event.

The symposium, however, could not have been organized without the financial support of the following organizations:

the U.S. Agency for International Development; the Continental Oil Company; the Electrical Corporation of the Kingdom of Saudi Arabia; the Ministry of Industry and Electricity of the Kingdom of Saudi Arabia; the Saudi Arabian Fertilizer Company; the Saudi Basic Industries Corporation; and the Saudi Consulting House.

In addition, the cooperation and professional guidance of AAAS, NSF, NAS, and the University of Southern California were essential to the project. The participants wish to express their gratitude to the contributors and to the several sponsors and to acknowledge the importance of their role in making the symposium possible.

## INTRODUCTION

The symposium on the role of the foreign student in the process of development, held in Snowmass, Colorado, June 9-12, 1982, was unique because of its composition. It was organized by NAFSA, in cooperation with AAAS, NAS, and NSF, and funded by agencies of the U.S. and foreign governments and by private organizations. The project brought together 29 participants, including representatives of countries concerned with providing technological resources and of countries seeking these resources; faculty members responsible for educating and training students in technological development, especially in the fields of science and engineering; and persons involved in international educational interchange, especially in advising foreign students in the United States. The following report is derived from the papers prepared in advance of the symposium, the supplementary information provided when the papers were presented, and the subsequent discussion in which a number of new issues were raised.

During the proceedings, a number of issues commanded the attention of the entire group. The particular reasons for concern were not universal, but rather reflected the different experiences and goals of individual participants. Thus, mutual interest was not always the result of an identical rationale nor was there agreement on each proposed remedy. However, the areas of agreement and consequent recommendations, recorded in this report, carry additional weight because they were restricted to areas in which there was unanimity among a group of participants who were experts in respective fields.

In reviewing the history and current status of the education of foreign students for their role in the development process, certain characteristics become apparent. A significant change has occurred in the relationship between the United States—a major source of training and education in science and technology—and the developing countries from which the majority of the foreign students seeking these resources come. The increasing urgency of the need for development now requires a greater understanding of development problems among the members of the U.S. academic community who must evolve a perceptive contextual framework for transferring information. This increase in understanding among U.S. academics must be accompanied by a national climate of understanding in the developing countries to encourage the process of development. Involved in the process are a complexity of environmental, cultural, and economic factors; a variety of methods of transfer; and a multitude of individual foreign students—all of whom must find their own means of serving as effective agents of change.

It was apparent that the symposium was a timely event. The various continuing and emerging problems, the potential for improvement, and the opportunity to consolidate existing achievements all demand a careful review of the current situation, an examination of the available data on past activities, and some educated projections for the future. In these circumstances the symposium may be seen as the beginning of an ongoing analysis, an opportunity to clarify reciprocal objectives in educating and training foreign students and to establish criteria to evaluate the effectiveness of transferral.

The ensuing report and recommendations are a measure of the efforts of the symposium participants to initiate this process of examination.



## PREAMBLE

(Note: The following statement was developed as the discussions continued over the three days of the symposium.)

For more than 30 years, the United States has been involved in a massive educational activity, serving students from a great many countries. In the 30-year period, the relationship between the United States and the countries whose students seek education in the United States has changed significantly. The character of the activity is now sufficiently different that its underlying suppositions need to be reexamined and redefined.

There is abundant and steadily increasing evidence of growing global interdependence and of increasing complexity in that interdependence. The exchange of students and scholars among developed and developing nations is central to the achievement of peaceful coexistence among nations. Accordingly, we in the United States now confront a new period with fresh questions and opportunities pertinent to the fulfillment of our common purposes as a nation.

The use of science and technology in development must begin with the needs expressed by the nations in the developing world; the need for technology must originate there. To the extent that resources in the United States are available, they should be responsive to these expressed needs.

The development of societies is measured in many ways. Among these measures are the growth of indigenous industry, an increase in efficiency among institutions for the management of the economy, the development of educational institutions, the attainment of elevated standards of health, an increase in concern for the plight of the less fortunate in the society, and an enhanced degree of economic and political stability. Selection of the relative emphasis to be placed on the various goals of development and of means by which these goals are to be attained is a responsibility of each nation. Whatever national choices are made, educational goals, investments, and strategies are an important part of total national development strategy. This report deals with one element of the educational sector of development—the education and training of foreign students in the United States and the relationship between this experience and the use of science and technology for development.

The present status of education and training of foreign students is reviewed on the assumption that some accepted principles will be reaffirmed, some modified, and some new ones identified. The principle that developing countries will identify their own needs—including the nature and extent of their needs for

science and technology—is paramount. The problem must be approached on the assumption that education and training must be defined in terms that extend far beyond those of traditional educational institutions leading by formal programs to traditional degrees. The entire enterprise will entail new sets of relationships among academic institutions, professional associations, the scientific and educational communities, the private business sectors, governments, and individuals. The aims and processes of the education and training of foreign students in the United States will be affected by, and will affect, all of these basic changes. Recognizing the importance of foreign government agencies to devise their own criteria for the selection of students to be sent to the United States, the U.S. academic community should nonetheless encourage these agencies to consider the merits of selecting students from the diverse geographic, social, and economic sectors of their countries.

The objectives of colleges and universities involved in foreign student education and training are many. Among them are to equip such students to become responsible and articulate contributors to the world community, to expose both domestic and foreign students to the cultural diversity and interdependent nature of our world, and to assist students from less developed countries in acquiring the skills and understanding necessary to help determine their societies' agendas for future programs in all fields of endeavor. These students should be provided the opportunity to acquire the capabilities needed to formulate these agendas, to work as professionals in their attainment, and to help in the development of institutional infrastructures necessary to support and sustain these efforts. Further, the objective is to enable individual foreign students to take whatever steps they deem necessary during the educational process in the United States to permit them to relate their education to their home countries' agendas.

## THE PROCEEDINGS

### The Dimensions of the Task

From the papers presented in advance of the symposium and from the subsequent discussions emerged a general recognition that, in providing education and training in the United States to prepare students for their role in the process of development, two factors are of paramount importance: the place where development is to be achieved and the field of study that is involved. These two considerations determine the magnitude and the nature of the educational/training program. As Mr. Berendzen noted, "it is simplistic and misleading to analyze the current foreign student situation in the United States, much less the future one, by grouping too many fields and nations. The generic term of 'foreign student' needs to be considered almost on a country-by-country basis; similarly, generalities cannot be made about disciplinary fields, even within the restricted area of the sciences."

In this context, the transfer of technology cannot be seen as a single task or uniform procedure, but rather as a series of specific projects, each tailored to fit the particular characteristics of the receiving country. This point was emphasized further by Mr. Kidd, who pointed out that there are many kinds of developing countries, and "the needs and desires of the least developed countries . . . are different from those of the advanced developing countries." The problem is complicated by the existence within some of the advanced developing countries of areas of poverty that have all the characteristics and needs of the least developed countries. This indigenous nature of the problems of development is particularly compelling in that field of technology known as "appropriate technology" (using the definition as being that which will help the rural poor). In this case the local physical and cultural conditions will govern the nature of the efforts to achieve some improvement and prescribe the extent to which these efforts are successful.

The discussions in which the problems of technology transfer were examined from the perspective of the various areas of the world, such as Africa, the Middle East, and South America, noted that, while such transfers may be approached in the context of regional needs, they must be carried out in terms of national and even local conditions. In a country like Brazil, for example, the enormous internal differences in stages of development and in the physical and cultural environment must all be taken into account in planning technology transfer. The existing conditions in their home countries are a critical factor in the education and training programs provided to prepare foreign students for their role in the

development process. In his paper on the African perspective, Mr. Ekong noted, "on their return to their home country African scientists face enormous problems which frustrate their efforts in carrying out productive scientific work," and pointed out that their education "must include the development of an appropriate orientation to the environment in which the student will operate."

From another perspective, it was noted that, even in those countries that enjoy special advantages, such as Saudi Arabia, with its relatively greater economic resources, the problem remains of ensuring that the process of change conforms to the imperatives of local conditions—for example, adapting new techniques to the recognized role of women.

In more general terms, Mr. Manassah referred to the impediments to technology transfer, which he termed "Middle Eastern realities" (a topic which he said still requires exhaustive study), stating that "the specter of religious fundamentalism and theocracies poses a threat to all modernization efforts." Mr. Manasseh said that many area study programs in U.S. institutions are too restricted in their field of interest and do not include an examination of the issues relevant to technology transfer. He recommended that, in order to be in a position to prepare students to cope with the local conditions that play such an important part in the success or failure of technology transfer, the traditional field of U.S. area study programs should be expanded to include research on those indigenous issues that "constitute the backbone of any strategic planning or program implementation for technology transfer, adaptation, and development." In summary, therefore, irrespective of their field of study, the preparation of students for their role in the process of development must include an accommodation to indigenous physical characteristics, natural resources, cultural concepts, and religious convictions. The impressions of early upbringing and of the lessons learned in childhood in their different homelands are also a factor to be reckoned with in educational and training programs. In order to acquire the necessary knowledge and expertise students will have to reconcile their cultural and religious inheritance to alien ideas and acquire skills and attitudes that will be, for them, unusual and even unacceptable. When they return home, in order to use their new knowledge and skills, they may have to overcome the opposition that springs from inertia, ignorance, and the mistrust of new ideas. They may also have to face what may be a total lack of the facilities and equipment to which they have become accustomed in their training.

In addition to cultural and environmental conditions, the state of knowledge in a particular field of study in a given country will affect the kind of educational program that will be most effective in preparing foreign students to play their part in the technology transfer process. In this respect Mr. Moravcsik noted that "there is only one science and one technology, but there may be significant differences in the context in which this science and this technology is embedded in different parts of the world." Thus, the scientist who will be working in a developing country must not only learn about science (which Mr. Moravcsik suggested is something we "do," rather than learn, through "a process of asking new questions and finding new answers to the new questions") but in the educational process must also find out how to create the circumstances in which science can be "done." Thus, in addition to the basic curricula, the scientific education of students from developing countries must include some examination of the contextual problems of science, ranging from how a library works or a machine shop operates to how research projects are evaluated or a national science policy is constructed.

Among the various definitions of the difference between science and technology, one was that the product of science is knowledge and that technology uses scientific knowledge to solve problems. Mr. Morgan presented a further definition: "Technology is that combination of tools and techniques—both hardware and software—that gets things done." From an educational point of view, the definitions of technology take on additional significance in the training of students for their role in the process of development. This is emphasized by Mr. Kidd's proposition that each country has its own interpretation of "development" that provides the setting in which transfer of technology must be considered. Dealing specifically with the problem of making engineering education more relevant to the needs of students from the developing countries Mr. Morgan referred to the continuing discussions that include opponents of change as well as those who want to design entirely new curricula. It was his contention that the truth lies somewhere in between. Recognizing that engineering has an applied, design, or synthesis component and that in the United States most applications studied in school are oriented toward the United States Mr. Morgan pointed out that the principles and methods of analysis are universal and that it should be relatively easy to build into the design synthesis experience work that has a developing country setting or relevance.

Despite the idiosyncracies apparent in different fields of study when related to the education of students from developing countries there was a consensus that

in both engineering and science—and in other disciplines—the basic curricula should not be modified to take care of the needs of these students. There was general agreement that the quality of the curriculum and the parity of requirements and standards for all students, whether native or foreign, must be preserved in U.S. colleges and universities. The special needs of students from the developing countries should be taken care of by supplementary courses such as management training, science administration, planning and budgeting for research projects, public administration, practical training, and so on that would enable the students to perceive and tackle the problems they would inevitably face upon their return home.

It was recognized that the two critical factors in educating and training students for their roles in the process of development, geography and field of study, are in many ways interrelated and together constitute the basis for the special needs that must be met in educational programs designed to effect the transfer of technology. The suggestion was made that there should be some clearly defined and recorded objectives in the programs designed to educate students for their role as agents in technology transfer so that there would be a benchmark for evaluating the success of such programs.

#### The Process of Transfer

There is a natural sequence in the transfer of technology from the developed to the developing countries. From the experience of the Agency for International Development (AID), Mr. McDermott described the progression as one that begins with the transfer of materials that are the products of technological expertise in the developed country; followed by the establishment of centers in the developing country where, with the assistance of experts from the developed country, these materials can be made locally; and completed when an indigenous technological capacity is created to carry on and make further advances in the technology required to meet the needs of the developing country. However, the process is not entirely immune from the impact of special interests. The agencies in the public and private sectors that control the means of transferring technology and that can determine what may be transferred have their own responsibilities and concerns. For the former, there is the question of preserving national interests, especially national security; for the latter, there is the question of protecting the investment of those who paid for the research and development that produced the technology and its products. Inevitably these concerns lead to some conflict of interest

between the developed and the developing countries. The developing countries are impatient to establish their own technological capacity, unencumbered by the fees, rights, and patents of the companies that developed the technology. These companies, in turn, complain about the "pirating" of technological processes and products. Perhaps one of the key problems in this aspect of the transfer of technology was pointed out by Mr. Kidd in his analysis of the question of property rights and profits: "the aspects of the system which disturb the developing countries are precisely those which account for the ability of the concerns to generate the technology in the first place."

In addition to accommodating the various interests involved, to be successful the process of technology transfer must also overcome a number of other barriers. Perhaps the most important of these is the cultural confrontation that inevitably accompanies any major change in national lifestyle. Both Mr. Birnbaum, in his paper on the necessary conditions for technology transfer in East Asia, and Mr. Kidd, in his paper on barriers to use of technology for development, made specific reference to a cultural and institutional rigidity that inhibits the process of transfer by rejecting the potential contribution of those trained to carry out this task. Thus, as Mr. Kidd pointed out, education is not by itself sufficient to ensure a successful transfer. It must be accompanied by a change of attitude—both nationally and, particularly, in the educational community—that is much more difficult to achieve.

A further problem, especially in the field of science, is that of isolation, which Mr. Moravsek described as "the most important single impediment to the flourishing of science in the Third World." Also noted as a particular difficulty was the problem of relevance, especially in relation to the economic needs and resources of the developing country. Thus a prerequisite for successful technology transfer is identification of the areas of industrial and economic activity most appropriate to the developing country. The discussions of the barriers to technology transfer revealed that these impediments are universal and are encountered irrespective of stage of development, wealth, or lack of natural resources in the developing country.

Over the years a number of strategies and procedures have been discovered to combat the problems of cultural barriers, isolation, and relevance; some have been put into practice with very satisfactory results. Overcoming cultural and institutional rigidity requires both time and patience and will be fully achieved only when the developing nations become educationally self-sufficient in the

contemporary world. An effective approach to this goal has been found in the development of regional centers for teacher and research training, and Mr. Birnbaum noted that graduates from these institutions are readily accepted in the regions. At another level, the cultural barrier may be overcome through "popular education"; funds may be provided for the development and wide distribution of books and pamphlets designed to popularize the various elements in the development process.

Mr. Moravcsik pointed out that some relatively simple ways to overcome isolation include using the supply of current journals, reports, bibliographies, and other up-to-date scientific resources; continuing person contacts through correspondence; and participating in professional meetings. More substantial efforts, also suggested in the papers on the Middle East and Africa and mentioned in the discussions, included collaborations between institutions and professors and their alumni in the developing countries and cooperative endeavors in research and development organized and funded through international and national agencies and professional organizations or associations.

To achieve the relevance essential for successful technology transfer, the developing nations themselves must participate more actively in the process. In the final analysis, Mr. Kidd suggested, one of the essential conditions is that "development must be defined and guided from within the developing countries." Several ventures have been successful in bringing both the developed and the developing nations together, or have the potential to do so. These ventures include, on the international level, the International Organization for Chemical Sciences in Development (IOCD) and the Swedish International Seminar on Chemistry and Physics. On the binational level, in addition to such agencies as AID and its counterpart in other countries, the programs of the National Science Foundation and the American Association for the Advancement of Science provide examples of collaborative efforts designed to give priority to the relevant needs designated by the developing countries themselves.

In reviewing the successes and failures in the process of technology transfer, Mr. Moravcsik's comments seem particularly relevant: "Since the subject is not new and much has been said about it, the main emphasis of the symposium is not so much on the formulation of programs as on their implementation."



### Agents of Change

Students are an essential element in the transfer of technology and play a key role in the development process in Third World countries. Their individual attitudes and aptitudes, what they learn during their study abroad, and how they are able to implement that education and training upon their return will determine, to a large extent, how well and how quickly an indigenous technological capability will be created in the home country. For this reason, the role of the student in the development process was the recurrent theme in all the papers presented at the symposium and in every discussion session. Thus, although the role of the student requires separate treatment, the subject cannot be presented in isolation. It is reflected in every other aspect of the process of technology transfer.

At the present time and in the conditions prevailing in their home countries—which are the prime reason for their study abroad—foreign students from the developing countries are burdened with special responsibilities and face some extraordinary problems. Confronting these problems is a task that must be shared by those in U.S. colleges and universities who are seeking to provide education and training responsive to these special demands. Thus, in addition to becoming competent in their particular fields of study, many of the students from developing countries must be assisted in developing skills in management, in administration, in human relations, and in institutional and national liaison and persuasion. Only in this way will they be successful in making changes, overcoming inertia, and finding support, all necessary prerequisites for the process of development. For the students to be completely successful, those in authority and those who are leaders in the educational community in the home country must develop a receptive attitude, although the student may need to be instrumental in creating the attitude.

Certain personal qualities must be sought in selecting students for education and training. Mr. Kidd noted that these qualities include "a desire to help in the process of development, flexibility in the sense of being willing to work on problems other than those for which the student has been specifically trained, the ability to work easily with others regardless of their level of education or hierarchical position, willingness to perform manual labor when necessary to get a job done, and the capacity to evaluate people in terms of their contribution to whatever task they may be engaged in and not in terms of their status." The discussions brought out that a more sensitive qualification for students is the ability to recognize the limitations imposed by their own inherited attitudes and

make the personal adjustment required to develop an educational environment based on values different from their traditional ones.

To begin the process of education and training for development, students must identify their particular needs and find an institution that can provide the educational program to meet those needs. Graduate students, especially, need to define their research interests and ensure that they will be given the opportunity to focus on specific areas of inquiry. Although some progress has been made in developing adequate counseling services and in matching student needs and institutional resources, much remains to be done to improve application and admission procedures. Mr. Ekong noted, for example, that very little information is available in African universities for graduate students who seek further education in the United States. The point was made that, in some fields, U.S. institutions have difficulty making an informed judgment on a graduate applicant's previous education. At least one program has evolved to alleviate this problem: When physics professors from U.S. institutions travel abroad, they meet with the applicants in their home countries and send back to the institution (not necessarily their own) an evaluation of the applicant's academic status and proficiency in English. This program has proved very successful and is now being developed in chemistry as well.

English language proficiency is essential if students are to be successful in their educational programs. To help foreign students cope with both classroom and disciplinary demands, there is occurring a proliferation of programs in English as a second language (ESL). These courses have now been augmented by courses in English for special purposes, geared particularly to the different needs of science, engineering, and other disciplines.

Another critical problem is that of finances; the sums required for study in the United States are, of course, greater when the cost of English language instruction, or of any of the other supplementary courses which may be deemed necessary to provide for a complete educational and training program, are added.

Mr. Kaplan, in his opening remarks, called particular attention to the language issues, suggesting that language proficiency questions go well beyond the mere question of the kind of proficiency necessary to pass a course. He suggested that technical information exists largely in English and that scientists, in particular, must be proficient in English to be able to access international information storage and retrieval networks, to deal with the descriptors that define storage in a sophisticated network, and to be able to place their own information

into the extant networks. He suggested that the translation process was not adequate to these needs, on the grounds that translation is slow and expensive; that it makes information available only in raw form; does not deal with questions of the fit of any given information into a different environment from the one in which it was created; does not deal with the appropriateness of information; and does not deal with complex questions of economic, political, social, cultural, linguistic, or ethical fit between information and the society that receives it. Mr. Kaplan went on to elaborate a technical point of the way in which various societies view information, claiming that orate societies and recent transitional societies have different views of fact and of truth from those of literate societies. He asked the participants to consider the language issue broadly and to consider the possibility that foreign students need more than minimal language proficiency as defined by standardized tests. He also asked the participants to consider the costs involved in the language issue—costs accruing both to the student and to the admitting academic institution.

Thus, despite the various grants or scholarships available for developmental education from international, bilateral, national, or private sources, there is still a need for further expansion and investment in this area. The fact that two-thirds of the more than 300,000 foreign students now in the United States are supported by personal or family funds suggests that the number of students in developing countries who can take advantage of the opportunity for education and training abroad must be limited by the lack of other support. In his report, Mr. Ekong noted that "many intending African graduate students face enormous financial problems in gaining entry into graduate programs in the United States of America." Although the provision of financial support was recognized as a responsibility that confronts all those involved in training for development, in the United States additional funds must be found to support postdoctoral activities and there is even greater need for funds for postgraduate study. Participants agreed that the critical question of funding must be continually brought to the attention of all the sources of financial support in both the public and the private sector.

The content and the conditions of the educational and training programs for students from developing countries must be designed to prepare them for their roles as agents of change in the development process. Although the participants recommended no changes in the basic curricula—and noted that any generalization about educational content must be avoided—they agreed that emphasis on certain courses and the addition of other courses could ensure that the educational

program would meet the special requirements and individual needs of the foreign students. Speaking specifically of Arab students, Mr. Manassah noted three major problems that must be addressed: English language skills, scientific literacy, and laboratory dexterity. In further discussions, other qualities were identified as desirable objectives for educational and training programs: to foster in students the ability to perceive problems clearly and use creativity in dealing with them and the ability to administer and manage projects using the limited resources that may be available in the home country. Educational and training programs should include, in addition to the basic curriculum, special opportunities for practical training, apprenticeship in postdoctoral positions, and interdisciplinary courses involving such subjects as public administration, which may be provided in summer courses. Mr. Kidd noted that, "above and beyond the formal education and training there is an urgent and substantially unmet need to give foreign students, particularly those in engineering science and management, exposure to practical experience on the job and exposure to problems such as planning and budgeting for research laboratories and an understanding of the interface between research and administration." The major deterrent to the provision of such comprehensive programs appears to be lack of funds.

Students engaged in education and training for development need all the assistance that can be offered. In addition to information and advice on selecting the most appropriate educational program, so that the right student gets to the right institution for the right reasons, they need counseling and encouragement all through their educational program. Mr. Moravscik noted the need for "a knowledgeable, sympathetic yet determined adviser for educational, professional, and bureaucratic guidance and encouragement." Mr. Morgan emphasized that these students need more guidance than their U.S. counterparts in both academic and everyday living matters, and he pointed to the need for faculty members who take a special interest in students from developing countries. Mr. Moravscik noted that another special need of foreign students is a continuing contact with authorities in the home country, especially university staff, while they are in the United States, so that they may receive up-to-date information on changing conditions in the home country. This information can help them decide which courses are going to be most useful to them. When they return home, these students will still benefit from continuing support as they strive to overcome problems of isolation, institutional rigidity, and social rejection and obstruction—already noted elsewhere

in this report—which they will find among the people who have not shared their educational experience and are fearful of the impact of new ideas and processes.

As the discussions on the role of the foreign student from the developing country as an agent of change continued, the idea emerged that attempting to develop any uniform or general programs to meet their needs is both difficult and unwise. The differences among students coming from widely differing conditions in countries in varying stages of development are such that individual approaches are necessary to meet their needs. An urgent need exists for more knowledge about the success of the programs provided in U.S. institutions and for more research on the subsequent achievement—or lack of it—of these students after they return home.

### Partners in the Process of Development

#### a. The Role of the United States

Clearly, the United States plays a predominant role as a major technological resource and is thus a key factor in the international process of development. As Mr. Berendzen noted, "Despite our lack of competitiveness in scientific and mathematic instruction at the secondary level with respect to many other technologically advanced nations, the United States nonetheless remains the world's preeminent technological nation. And aside from reality, that most assuredly is the world's perception." An example of the prevalence of this opinion among the developing nations was provided by Mr. Ekong in his paper on the African perspective. He said that many African countries have found the United States the most attractive country with which to seek educational links, citing as the reasons the magnitude of its educational resources, the flexibility of its educational system, and "the dominance and prestige of the United States of America as probably the world's leading scientific and technological power."

As a result of this perception there is an impressive foreign participation in U.S. high technology. The flow of foreign students to the United States has grown steadily over the past 30 years, until we have now a foreign student population of more than 300,000. An increasing proportion of these students, now the vast majority, are from the developing countries, and the largest group is to be found in the fields of science and engineering. In his paper, "Technology and the Foreign Student in U.S. Universities," Mr. Morgan noted, "From 1949 to 1979, more than two million students from developing countries have studied in U.S. universities, land-grant colleges, and community colleges, including large numbers of engineers,

agriculturalists, and scientists who have returned home to key positions on university faculties and in research institutes, government ministries, and public and private enterprises."

As is to be expected in the context of technology transfer, the increase of foreign students has been particularly great at the graduate level in applied technological fields, such as the sciences, engineering, and computer science. Some indication of the success of these students was provided by Mr. Berendzen who noted that, in 1979, five out of ten engineering doctorates earned in the United States were awarded to foreign students. Mr. Birnbaum gave an example of the effect of this kind of educational activity in saying that "a key to Japan's return to technology was the hospitality given Japan's young scientists by the graduate schools of the United States." Although, as a result of the development of international educational interchange over the past 30 years, it may be said that "the United States is regarded as the graduate school of the world," the point also was made that there is an urgent need for continuing support if the graduate schools in this country are to continue to enjoy that reputation. In this respect Mr. Pelczar said that "graduate education must be considered as a national investment in knowledge."

The role of the United States as a major contributor to the process of international development is by no means clearly understood or appreciated in this country. Mr. Morgan suggested that the main problem is political, and he stated that the agenda of things to be done to improve the situation must include "a need to develop an understanding of the role of science and technology for development among the scientific and technological professional community, the politicians, and among the public at large." Some groups—for example, U.S. labor and business interests and elements in state and federal governments—for economic and nationalistic reasons are particularly concerned about the role of the United States in technology transfer. Recognizing that the complex question of deciding the economic costs and benefits of educating foreign students is still to be determined, discussion group members agreed that an immediate need exists to examine perceived problems and document the actual benefits that accrue from this role. For example, the expertise on the technological problems of the developing nations is certainly a saleable commodity, and science and technology may be seen as an instrument of U.S. foreign policy. It is, however, in the total context of a growing global interdependence that the opportunities and responsibilities of the transfer of technology between the developed and the developing nations can be properly

assessed. The suggestion was made that perhaps the two greatest tasks facing those in the United States who are concerned with the process of international development are, first, to identify the reasons why it is desirable for the United States to play the role it does in this process and, second, to disseminate these reasons so that there will be a general acceptance of this role, recognizing that the motivations involved may include such diverse ones as financial gain, the advancement of education, and an interest in global survival.

#### b. The Role of the Developing Countries

"No matter what development goals the intermediate and advanced developing countries may have, one important aim shared by all of them is access to western technology on fair terms and in a manner that makes the technology useful to them. . . . They want to be less dependent upon the consumption patterns of developed countries. . . . They wish to develop indigenous processing, manufacturing, and distribution systems that will strengthen the entire economy. They wish to exert greater control over the specifications of the goods they produce. . . . Finally, they perceive . . . that economic and political independence are closely united." In discussing the concerns of the countries seeking technology transfer participants recognized that Mr. Kidd's comment, in his paper on barriers to the transfer of technology, provided a common factor among a very different group of countries. The range includes such advanced countries as Saudi Arabia, which is an excellent example of a country with its own resources, its own ability to absorb technology, and, consequently, its own particular development program as a rapidly developing country. A different picture is seen in Brazil, which also has great resources and is now in a stage of rapid development, especially in the field of education: although the 1970s saw an expansion in quantity, the 1980s have ushered in a period of relative exclusion in search of quality. Yet another set of circumstances is now revealed by the renewal of educational interchange with the People's Republic of China, with its recent history of the Cultural Revolution and the consequent tremendous need to develop a national program in science and technology. (Participants quickly agreed that the unfolding picture of the process of development in the People's Republic of China is far too great a topic to be considered appropriately in the brief course of the symposium, but recognized the subject will demand increasing attention.)

The aims of developing countries outlined by Mr. Kidd were underscored by Mr. Ekong in his description of the attitude of African countries. Noting that

technology transfer is frequently "the disposal in developing countries of plant, machinery, equipment, or processes which have become obsolete in the industrialized countries," he stated that many African scientists and science policymakers hold the view that self-sustained technological development will be achieved in Africa only when the necessary scientific and technological base and infrastructure have been established. This urgent need for self-sustaining development from within the developing country was a continuing theme in the discussion of the role of technology transfer in the process of development. The theme was summed up by Mr. Birnbaum in his paper on East Asia: "No nation can be considered developed which does not have its own system for preparing people for technology and which, in the long run, is not substantially independent of other national school systems." Mr. Birnbaum's description of the development process in Japan and the current position of that country as one of the "developed" nations gives a startling picture of this process.

Although indigenous education of Third World students in their own home countries is preferable to education abroad, until sufficient centers of higher learning have been established within these countries, the number of students from developing countries coming to the United States for the next few years will probably increase.

In these circumstances the role of the students from developing countries acquires a special significance, and the treatment they receive before, during, and after their period of study abroad is especially important. In addition to the advice they receive before leaving their country—for example, explicit assistance and encouragement in the selection of a broad educational program related to home country needs—the students need a continuing relationship while they are away from home. Mr. Moravcsik observed that a science student "needs to maintain his educational and scientific ties with his home country while being educated in the United States." Finally, the developing country is responsible for providing incentives to draw its students back home after their studies are completed. A number of programs, such as ICETEX (Colombian Institute for Educational Credit and Technological Studies Abroad) in Colombia, are specifically designed to accomplish these goals; through such programs, developing countries receive the maximum benefit from their students' study abroad. Another example of this kind of planned use of study abroad was reported by Mr. Manassah, who quoted an Arab science policymaker as saying, "Chief among our strategies (for technology transfer) is our program for sending our brightest students abroad, mainly to the United States, to pursue higher studies."



The process of development is almost always turbulent; exigencies, targets of opportunity, emergencies, all suggest the need for flexibility. Participants recognized, however, that this flexibility must be based on clearly defined long-term plans and objectives. Lack of such planning has led to the overexpansion of university systems, resulting in enormous and uneven pools of trained manpower. Attention was also given to the problem of creating a climate of public opinion in which development can be nurtured, and to the strategies of local education and the provision of materials in the native language which can contribute to this end.

Finally, participants agreed that an essential element in the partnership in the process of development is collaboration. In this respect, developing countries may be quite willing to provide the funds needed for research projects and other educational or developmental programs that are in their own interest. Much was said during the entire sequence of discussions in the symposium about the opportunities for mutual programs involving interinstitutional or individual professional relationships between colleges and universities in the United States and those in the developing countries. The genesis of the U.S. AID participant training program is a development project collaboratively designed with the government of the respective developing country. In this context, Mr. Morgan includes in his agenda of necessary actions "the need to support efforts to develop and gain support for effective programs of international scientific and technological cooperation, both bilateral and multilateral." In summary, in the partnership it is the developing country which must be given the initiative, as Mr. Kidd observed in his conclusions:

"One of the most basic (conditions) is that development must be defined and guided from within the developing countries. . . . All contributions from outside—including the education of students abroad—are peripheral, and they are likely to be ephemeral in the absence of fundamental cultural change and in the absence of institutional reform."

## THE RATIONALE

The symposium, recognizing that

1. the increasing flow of foreign students to U.S. educational institutions is a part of a larger international education process which also includes
  - a. the flow of U.S. students and professionals to other countries;
  - b. the training by the U.S. academic and business communities of foreign nationals in the United States and abroad;
  - c. research and other contract activities for multinational corporations, foreign business and industry, and other governments;
  - d. collaborative research between scholars in U.S. and other countries; and
  - e. a wide variety of other educational activities that involve international interchange;
2. societal development occurs within a broad comprehensive cultural context with social, political, economic, linguistic, and ecological dimensions; and
3. international educational activities—although one of the more effective instruments of foreign policy—have not consistently received adequate attention and support as an element of U.S. foreign policy,

has undertaken an examination of the problems. Specific programmatic recommendations of the symposium are based on the following assumptions:

1. Students from developing countries should receive education and training that is essentially the same as that provided to all students, although designing supplementary educational experiences or admissions policies that take into account the particular socioeconomic or educational conditions in the students' home countries and enhance the value of their formal training may be desirable.
2. The further building of cooperative linkages, at the level of individuals and institutions, is a necessary concomitant to education and training in the United States.
3. The education and training of students from developing countries should contribute to the creation of infrastructures for national development and for the self-sustaining development of science and technology capabilities.
4. A continuing concern for the personal and professional development of students and scholars at varying stages of their careers must be maintained.

This report of symposium recommendations acknowledges that the accommodation of developing-country students at U.S. academic institutions results in mutual benefits. Students gain knowledge, cross-cultural experience, and professional credentials, and establish scholarly relationships; U.S. faculty receive assistance in the conduct of their research. In addition, the door is open to future collaboration in such areas as interinstitutional relationships, continuing personal relations, and bilateral cooperative projects. As this process continues, mutual benefits continue to grow.

As a coda to the rationale, Dr. Walter A. Rosenblith, offered the following statement.

In the course of history, human curiosity has led to the edifice of modern science, a set of disciplines and activities whose application in the industrialized countries has powerfully modified the human condition, as well as our views of the cosmos and ourselves. The laws of nature transcend national boundaries, but to harvest the benefits of science and technology for development demands that human institutions and laws be designed appropriately in different cultural contexts. The foreign students and scholars who choose to come to the United States are eager to become our colleagues and partners in a peaceful world tomorrow and we in turn are eager to cooperate with each other effectively to our mutual benefit.

## CURRENT ISSUES

(The following statement was offered by Dr. Kenneth Cooper on the last day of the symposium. The participants were most interested in the statement, but the constraints of time precluded full discussion. The statement is provided here as an important individual view in the hope that it will receive the discussion and consideration it deserves in some future review of the issues.)

1. U.S. higher education in science and technology has attracted hundreds of thousands of the world's most talented students, most of whom ultimately become leaders in their home countries.
2. The development paths that the United States has followed, which have resulted in an attractive societal model, have depended on extensive use of science and technology.
3. These traditional development processes are, today, universally encountering problems. They are dependent upon a voracious appetite for the world's limited resources, threatening long term survival and environmental destruction, and they are failing to reduce inequities between and within societies. Pursuing the limited resources while failing to solve the problems together lead to severe competition and threat of mutual destruction.
4. Present relationships between Center countries and most of the Third World perpetuates unequal access to various essential ingredients for development, science and technology being two of those ingredients.
5. A thesis of this symposium is that mutual collaboration and cooperation between the United States and Third World countries toward the development of self-sustaining, indigenously based technology in all countries will build a healthy global infrastructure of benefit to all countries.
6. It is recognized that hundreds of thousands of foreign students who study in the United States form an extremely significant component in this linkage between the United States and Third World development.
7. Therefore, an objective of this symposium is to explore ways to make the educational experience of foreign students as successful as possible in preparing them for effective roles in promoting appropriate development in their countries through the use of science and technology.

## SUMMARY OF RECOMMENDATIONS

- I. To strengthen the international process in science and technology development (or in the transfer of technology) by
  - a. expanding funding from government and industry for related research, special publications and pilot projects;
  - b. encouraging multinational corporations to employ U.S.-trained foreign nationals;
  - c. furthering public support by correcting existing misconceptions, providing specific information regarding the costs and benefits of educating foreign students, and identifying the advantages implicit in the transfer of technology to U.S. industry, educational institutions (faculty and students), and many other segments of U.S. society; and
  - d. facilitating institutional acceptance of foreign grants for the establishment of new programs.
- II. To improve the international training/educational programs in science and technology development
  1. Through activities designed to provide the most effective educational experience in the United States:
    - a. provide a contextual education to enable foreign students to cope with the special conditions that prevail in their home countries while maintaining the same academic curricula and standards required of U.S. students, by offering supplementary courses (e.g., in management and development) directly relevant to the responsibilities the foreign students are likely to assume upon their return home and by making available opportunities for practical experience (e.g., summer or poststudy employment) to enhance and expand their formal education;
    - b. enable students in foreign countries to identify the most suitable educational opportunities in U.S. colleges and universities by preparing special brochures that give information on curricula, available elective courses, on-going research projects, extracurricular activities, and other matters of interest;
    - c. ensure that promising foreign students are helped to find some way of overcoming language difficulties if their lack of proficiency in the English language interferes with the learning process;

- d. conduct a survey of U.S. faculty to ascertain the level of knowledge about special problems of foreign students and develop ways of improving U.S. faculty advising and counseling skills in dealing with foreign students.
2. Through activities designed to create in the developing countries self-sustaining science and technology capabilities:
    - a. encourage foreign governments to make active efforts and offer needed incentives to pull their students back home and
    - b. foster the writing and publication of text materials in the language of the country in which they are to be used, thus making the mastery of areas of knowledge accessible to large numbers of individuals who do not have a proficiency in English.
  3. Through activities designed to build cooperative linkages between individuals and institutions:
    - a. expand the scope of area study centers in U.S. universities to include technology and development;
    - b. encourage collaborative research enterprises involving scientists and engineers from the developing countries; and
    - c. encourage participation by foreign students and scholars in professional conferences and meetings in the United States.
  4. Through activities designed to reflect a continuing concern for the personal and professional development of foreign students and scholars at varying stages of their career:
    - a. develop and maintain contacts between U.S. faculty, foreign student advisers, and organizations (professional associations, etc.) and foreign students after they have returned home;
    - b. develop research projects to examine the effectiveness and relevance of the U.S. educational experience in the context of the foreign students' subsequent career in the home country; and
    - c. offer mid-career educational opportunities to selected foreign professionals.

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## FINAL RECOMMENDATIONS AGREED ON AT SNOWMASS SYMPOSIUM

1. Contextual Education. Strong efforts needed to encourage foreign students to avoid narrow technical education and broaden their course selection to include courses that will help them see development in cultural, social, political context. Sending government agencies should offer explicit encouragement to students before departure for United States. Receiving U.S. faculty should be helped to understand importance of encouraging foreign students to make these choices.
2. Alumni Contacts. Need for U.S. faculty, foreign student advisers, and organizations to strengthen contacts with foreign students after they have returned home. Could include specific assistance and support during difficult transition time when students are attempting to apply knowledge, usually under difficult circumstances. Contacts would give U.S. universities much better understanding of kinds of problems encountered and of components of U.S. educational process most helpful or least helpful in development process. Such contacts facilitate scientific exchange of many kinds. Contact process should start soon after the student returns home.
3. Practical Experience. Beneficial to foreign students to take summer or poststudy employment that would enhance and expand formal education. Most foreign students would benefit from the right kind of practical, hands-on experience. Main obstacles: restrictive U.S. immigration laws limit such opportunities; limited jobs of this kind U.S. industry has been willing to offer.
4. Expanded Funding from Government and Industry. Infusion of money needed in many areas, especially if movement is to occur on some recommendations. Research, special publication, pilot projects, require funding, at least in their initial stages. Educational institutions unlikely to have money for such projects. Essential to help various government agencies and components of U.S. business understand what national political and economic purposes are served by supporting these enterprises.
5. Expanded Scope of Area Study Centers. On U.S. campuses, centers concerned with languages, history, and cultural and politicoeconomic forces

and trends in certain countries and areas of the world. Focused indirectly on current technological and developmental issues and problems. Close relationships between traditional areas of concern and technology and development exist. Need to encourage funding support when possible, some area study centers to bring technology and development issues under their main umbrella and to use their great expertise to help students, scholars, and government representatives from certain countries confront difficult problems within a broader context. Expect some centers to become directly involved in research and publication dealing with current technology and development issues.

6. Supplementary Programs for Enrichment. Important for institutions to maintain the same academic standards, expectations, and curricula for foreign students as for U.S. students. U.S. faculty should understand the value of helping foreign students select courses to help apply the core curriculum most productively in special conditions in students' home countries. Courses might involve enrollment of an extra term, might be taken during the summer, might deal with management or development and be directly relevant to responsibilities foreign student is likely to assume along with technical or scientific work.
  
7. More Effective Advice and Counsel. Majority of faculty on U.S. campuses have positive attitudes toward foreign students but many not fully sensitive to special needs and interests of foreign students, especially from developing countries. Need to provide faculty additional information about different high school backgrounds, different study habits, different cultural baggage, etc., which many foreign students bring to U.S. campus. Special booklets (such as recently prepared guide on advising foreign students in the sciences issued by AAAS), are valuable tools for U.S. faculty eager to improve advising skills. Workshops on this subject can be developed on campus by foreign student advisers and other knowledgeable persons. Probable results: greater faculty sensitivity and increased readiness to explore career plans in the context of special development needs of home countries when students make crucial curriculum choices.\*

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\*Useful in developing new methods for providing this information to faculty would be a survey of U.S. faculty in certain key disciplines to measure more accurately their level of knowledge, interest, sensitivity, etc., in advising students from developing countries. If done carefully, a small sample could indicate areas in which new educational efforts for faculty should be mounted.

8. Employment of U.S.-Trained Foreign Nationals in Multinational Companies. Recruiting and hiring practices of many of these companies often limit access of U.S.-trained foreign nationals. Need efforts to inform companies of gains from employing talents of such individuals, not only when they return to home countries, but in training opportunities in the U.S. or in countries with similar industrial and developmental operations.
9. Follow-Up Research on Foreign Students. Some research efforts have attempted to examine effectiveness and relevance of U.S. educational experience in context of foreign students' personal and professional successes and failures several years after return home. These efforts rarely, if ever, fully realized their stated objectives. Much could be learned about actual process of transferring technology mastered in the United States if research carried out with care and thoroughness. Such research likely to shed new light on forces which tend to inhibit transfer process.
10. Collaborative Research. Strong agreement that this area deserves a great deal of attention and financial support. A number of countries, especially in Europe, have developed effective models for encouraging collaborative research enterprises involving scientists and engineers from a number of developing countries. The United States has made some efforts, especially at institutional level, but not as much as could be done. Potential for gain is enormous. Many foreign scientists and engineers work in relative isolation from scholars with similar research interests in other countries and are deprived of the kind of collegial support and stimulus that U.S. scholars take for granted. Ultimate productivity of the foreign scholars would be greatly enhanced by academic interchange that occurs in most collaborative research.
11. More Complete Information for Prospective Foreign Students. Foreign students and agencies that help some of them select the most appropriate U.S. university for their study do a better job of choosing than was once the case, but far too many choose a program or a school based on incomplete information about curriculum; about flexibility possible in choosing electives; about research interests of departmental faculty and research projects in which they have a chance to become involved; and about relevant

out-of-classroom educational opportunities. Few college catalogues shed much light on many such central questions. Special brochures or flyers should be prepared for prospective foreign students that would give detailed answers to many of these questions so students and sponsoring agencies can make more intelligent choices among institutions and programs.

12. Mid-Career Educational Opportunitites. Many professionals in developing countries who have risen to responsible positions could benefit greatly from the opportunity to study and/or carry out research in the United States for a year or two at a mid-career point. Programs like the Humphrey Fellowship Program have shown that these mid-career professionals represent a solid investment. Can select those who have demonstrated above-average scientific and leadership skills and who hold positions with considerable decision making power. Too often, special scholarship programs for scientists and engineers are aimed at those who have just finished undergraduate programs, to the exclusion of those who might have finished their formal education some 10 or 15 years ago. Some difficulties may arise in getting back into a formal educational program after a long absence, but such problems are usually overcome readily by individuals with great ability and motivation. More attention should be paid to offering study and research opportunities to this important category of foreign professionals.
  
13. Cost-Benefit Analysis. Intensity of questions regarding the actual cost to states and institutions, both public and private, connected with the education of foreign students is increasing. Answers have been slow in coming and anything but consistent because of the many different ways in which costs are calculated. At the heart of the ambiguity is whether foreign students represent marginal costs to an academic program—i.e., basic costs are constant whether or not there are foreign students in the program; foreign students thus do not represent the same level of per capita cost as core group of U.S. students.

Benefits accruing to the nation, the state, the campus, and U.S. faculty and students from the presence of foreign students, are even harder to quantify. Even though benefits may not be tangible or readily discernible, new attempts should be made to analyze them within a systematic framework so that decision makers at all levels can have a fuller long-term

understanding of what is gained and what is lost when decisions are made and policies are established that affect admission of foreign students or creation of certain programs aimed at enhancing foreign student education.

14. English Language Training. Increasing reliance on TOEFL scores and proliferation of ESL programs in this country have led to belief that the English language "problem" of foreign students wishing to study here is a thing of the past. The "problem" may be less acute than five or ten years ago, but is still a significant deterrent to mastery of academic disciplines for a substantial number of foreign students from non-English-speaking countries. Universities must continue to be sensitive in this area and should do all they can to make sure promising foreign students find some way to overcome language difficulties if they interfere with the learning process. English language programs should be strengthened. There will always be some foreign students deserving of the benefits of U.S. education who could not proceed without substantial help with their English proficiency.
  
15. Correcting Public Misconceptions. Not enough to dismiss negative attitudes toward education of foreign students by stating that the public simply does not understand all that is involved. Insofar as public opinion influences legislative decisions, and it often does, supporters of international education cannot afford to allow public opinion to remain predominantly negative. New creative efforts must be mounted to help public understand the many benefits that accrue to U.S. students (sharpening their understanding of a world they will have to relate to as professionals); to U.S. faculty (being able to select students from a worldwide pool; establishing long-term professional linkages with other countries); to U.S. industry (likelihood of ongoing purchases and other commercial contact with individuals likely to become the political and educational elite in many countries); and to many other segments of U.S. society.
  
16. Efforts to Pull Foreign Students Back Home. "Brain drain" has served to inhibit development process in a number of countries despite a strong tendency to exaggerate impact of loss of some students to this country. Students from certain countries rarely elect to remain in the United States. It appears that in those cases, the appeal of jobs that offer professional

growth, reasonable pay, and modern equipment combines with the natural desire to return to one's family and one's culture. Conversely, many students choose not to return, in spite of a natural inclination to do so, because of rumors that professional jobs available at home are hard to find, poorly paid, fraught with bureaucratic impediments, etc. While foreign governments obviously cannot change all negative conditions quickly, they can plan a more active role in demonstrating a high level of interest in students' return, in attempting to match students' abilities to the most interesting jobs available, and in showing willingness to remove negative forces that make certain positions unattractive. These are but a few of the ways that governments can exert more of a "pull" on students who have been abroad. They should be encouraged to examine all these options closely and not rely on patriotism or nationalism to bring students back; those factors have been shown to be insignificant in comparison with other factors students weigh before making their decisions.

17. Institutional Acceptance of Foreign Grants. Although colleges and universities have good reasons to be cautious about accepting foreign grants, schools could be more open about such grants because they have potential of establishing many worthwhile programs. Countries now have financial ability to fund specialized programs that could be more helpful in educating and training their students. If there are not objectionable strings attached and if the institution involved does not have to compromise its educational standards, there is every reason to view the acceptance of such funding as a new dimension of the strong public service orientation of land-grant colleges and universities.
  
18. Writing and Publication of Text Materials in Indigenous Languages. English has become the dominant medium for scientific communication in many parts of the world; nonetheless a need exists to encourage preparation of some texts in the language of the country that will use them, using examples and background material from the cultural and social context of that country. It has become increasingly common abroad to employ scientific texts prepared in the United States. Price paid: subject matter may appear remote from the realities. Having some texts written in the native language would also make the mastery of certain areas of knowledge accessible to larger numbers

of individuals who do not have a complete mastery of English. Scientists and engineers in other countries should examine all the aspects of this issue before turning to English texts.

19. Participation by Foreign Students and Professionals in Professional Conferences and Meetings in the United States. Number of foreign students and scholars in this country who are given this opportunity remains small. Attendance and participation in such meetings can serve not only to expand the education of students and scholars, but also to build professional linkages that result in productive contacts in future. The cost of this enterprise need not be great; the potential payoff is large.



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