

Science, Technology and Developing Countries

I. INTRODUCTION

This memorandum concerns science, technology and US relationships with developing countries. Its focus is on the processes by which the US government decides what international S&T activities to pursue, which mechanisms to use, and how the activities are to be financed. The memo does not contain a substantive discussion of S&T problems, nor an analysis of the policy objectives to be served by such international activities.¹

A. Purpose

The last few years have seen a sharp rise in attention, nationally and internationally, to S&T and international relations. The Administration attempted to strengthen the executive capacity for dealing with S&T and development by creating an Institute for Scientific and Technological Cooperation (ISTC). Congress, although declining to fund the ISTC after authorizing its creation, expressed concern for improving the efficiency and effectiveness of international S&T activities in Title V of the Foreign Relations Act of 1979. This act strengthened the coordinating functions of the State Department and required it to make a comprehensive annual report to the Congress on the range of international activities carried out by the various agencies of government.

In August, 1979, a UN Conference on Science and Technology for Development (UNCSTD), held in Vienna, gave strong evidence of the increased importance assigned by developing countries to enhancing their own S&T capabilities.

These are only the major actions taken; there were many more, but they illustrate that the subject is on the minds of policy-makers here and abroad. It will be on the agenda of the next administration.

This memo is intended primarily to offer policy suggestions to the Director of OSTP and operational suggestions to the newly appointed science advisor in IDCA/AID. OSTP will be instrumental in setting the goals of the next administration on this subject, and IDCA/AID will be responsible for getting the most results out of the present system.

A second purpose of the memo is to examine whether "science and technology" is a useful perspective to take in considering US relations with developing countries. There are many lenses which could be used to consider international activities with S&T content. A single activity, for example cooperative research to develop a short-cycle maize variety in Egypt, can be viewed as 1) foreign aid, 2) S&T cooperation, and/or 3) work on the world food problem. The "usefulness" of the designation will depend in part on its value in explaining to decision-makers and ultimately to the public why it is being undertaken, who will undertake it, and of what does the activity consist.

B. Approach

In order to make the subject more concrete, the recent trip to four African countries by a high-level US delegation headed by Dr. Frank Press will be used to illustrate some of the opportunities and problems connected with international S&T activities. Other examples could have been selected, such as the Administration's responses to the Waxman Amendment requiring planning for trilateral S&T cooperation in the Middle East, the efforts by AID and State/OES to define the proper role of S&T programs in our amply-funded relationship with Egypt, and the US preparation, participation and follow-up to the UNCSTD.

The advantages of using the Africa trip are that it is current, the follow-up is still in process, and it involved the participation of an unusual number of senior officials from science-based agencies not primarily engaged in foreign affairs. The disadvantage is that my knowledge of the trip is second-hand, gleaned largely from the cable traffic and conversations with only a few of the participants.

Following the discussion of the trip, the memo briefly considers the US objectives involved in international S&T activities generally, the functions that logically flow from these objectives, and some of the shortcomings of our current pattern of operations in performing these functions. This section is followed by a set of recommendations, and these are discussed in the final section of the paper.

II. THE AFRICA TRIP

A. Background

The idea of visiting four key African countries with a high-level S&T oriented delegation arose in OSTP and received early presidential endorsement. The trip was intended to have diplomatic value, to demonstrate serious US interest in helping these nations deal with the S&T problems affecting their development, and to gain a better understanding on the part of the participants of how Federal science capacities relate to the needs of these countries.

The countries selected all have special importance to the US. Newly independent Zimbabwe is a key factor in the stability of southern Africa, and has valuable natural resources; Nigeria is the most populous African state and is a vital source of oil to the US; Kenya is a stabilizing factor in eastern Africa and has recently agreed to provide increased access to US military craft; and Senegal is a leading francophone state, with a constructive and moderate leadership and strategic importance in terms of communications and transportation.

Kenya and Senegal have long hosted AID missions, Zimbabwe is the recipient of a modest economic support fund (ESF) to be administered by AID, and Nigeria is an AID graduate.

Planning for the trip began in April, involving intensive staff efforts to identify the areas of potential interest in S&T cooperation in the four countries, and the US capability to respond. OMB instructions made clear that funding for any programs which resulted from the mission would come from existing agency budget levels, or from the host country. In addition, the domestic agencies were subject to the usual constraint that their international activities must contribute to current program objectives, i.e. they must be consistent with

their domestic mandates.

An advance party from OES, AID, and OSTP made a preliminary visit to Africa in July and the main event took place during two weeks in late September. The delegation numbered around thirty people and was notable for the number of agency heads and Assistant Secretaries included. Non-government members of the delegation included the presidents of the National Academy of Sciences and Ohio State and Rochester Universities. The delegation did not include, notably, OMB or IDCA officials. (See Attachment A).

From reactions of host government officials and US ambassadors, as reflected in embassy cables, the delegation was warmly welcomed and the visit considered a great initial success. It is, of course, too early to measure the longer term results of the trip as follow-up activities are still largely at the planning stage.

B. Needs and Opportunities

Grouped below are examples of some of the topics which, from the cable traffic, arose on the trip. The grouping of these topics into five categories permits some general observations to be made about the means for dealing with them.

These examples do not necessarily reveal the dearest priorities of the host country officials. Effective advance planning and discussion served to channel interests into areas most likely to yield fruitful results.

Although serious discussions of each of these topics occurred, only a portion of them are reflected in the agreements signed on the visit (See Attachment B). The list does not represent commitments to further action in all cases.

1. Technology management. Modern technology often requires new and different policies, organizations and management practices for effective use. US experience in technological rule-making and organizational innovation was well represented in the delegation and much in demand as the following topics illustrate:

- Energy policy formulation in Senegal
- Environmental laws and regulations in Kenya
- Regulation of off-shore oil leasing and production in Kenya

- Planning for the expansion of university systems in Nigeria
- Environmental impact statements in Nigeria
- Agricultural information systems in Kenya
- Management of dairy cooperatives in Senegal
- Health management planning in Nigeria
- Design of system for linking agricultural production, decentralized processing, and product grading in Kenya
- Organization of grants programs for scientific research in Nigeria
- Development of preventive health programs in Kenya
- Organization of high-quality research institutions in Zimbabwe
- Management and maintenance system for medical stores and equipment in Kenya
- Quality control procedures for pharmaceuticals in Zimbabwe
- Collection of energy statistics in Senegal
- Critique of Nigerian plans for an overall medical research program

2. Access to Technology. Possibly due to advance planning, there appeared to be little demand for free access to proprietary technology. Interest seemed strongest in gaining access to the application of advanced technologies to survey resources.

For example:

- Assessing coal resources in Zimbabwe
- Evaluation of technical reports of the potential of an offshore heavy crude field in Senegal
- Seismic survey of offshore areas of Kenya
- Geothermal mapping of the Rift Valley in Kenya by aircraft
- Use of LANDSAT for settlement planning in Kenya
- Design of an oil spill contingency plan in Nigeria
- Soils survey in Nigeria
- Remote sensing for resources in Nigeria
- Natural resources evaluation in Zimbabwe

3. Problem-oriented Collaborative Research. Research collaboration was requested most frequently in the field of agriculture, health and energy. In many cases, collaborative programs are already underway with AID assistance or, as in Nigeria, under binational agreements between corresponding government agencies. Illustrative topics of priority interest include the following:

- Biomedical research on infection diseases, malaria, tuberculosis, leprosy, schistosomiasis, and onchocerciasis in Nigeria
- Operations research on family health project in Nigeria
- Fisheries research in Nigeria and Senegal
- Infectious diseases, nutrition and traditional medicine in Senegal
- Coal and metals mining in Zimbabwe
- Short-cycle maize varieties and food cash crops for marginal lands in Zimbabwe
- Energy research and development in Kenya

4. Technical Advice and Training. This category overlaps with the first --Technology Management-- because the response to requests in that category could take the form of expert advice and/or training. This category contains areas of interest that are more technical than procedural, perhaps more typical of AID's usual pattern of assistance than the items in the first category. The topics listed in the cable traffic are numerous; a few illustrative examples are the following:

- Senegal:

- Training of personnel of the Oceanographic Research Center oriented towards fisheries assessment;
- Training and advice on improving the quality of millet, vegetables and beans at the Food Technology Institute
- Training middle and upper level staff for research and public health

- Zimbabwe:

- LANDSAT training
- Experts on animal health
- Weather forecaster training
- Training university staff

5. Equipment. Effective advance preparations dampened requests for equipment; the needs are extensive but the delegation had little means to respond positively. Nevertheless, even in the poorer countries, the priority seems to have been placed on "software" rather than hardware.

C. Follow-up measures.

Nineteen formal memoranda of agreement or intent were signed during the trip, almost half of them with Nigeria. (See Attachment B.) The range of actions possible under these agreements is broad, but in practice their scope will depend on future actions by both sides and the availability of funds.

The OMB instructions were strictly adhered to, but, with the President's concurrence, Dr. Press is seeking to have a total of \$10 million earmarked from IDCA/AID and other agencies to ensure that meaningful follow-up action occurs. OMB is of the view that in countries where AID is active, i.e. all but Nigeria, AID should finance whatever activities ensue, assuming they fall within the AID mandate.

The Nigerians will undertake to finance all activities which benefit their country, except that the delegation agreed to the creation of a joint fund for financing specific project development. The source of the US contribution to this fund has yet to be determined.

For Zimbabwe, an allocation of \$750,000 for S&T cooperation has been made from the \$10 million ESF appropriation to that country. The State Department wishes to ensure that the fund is used to develop a set of relationships that deal both with the immediate tasks of reconstruction and resettlement and with longer-term mutual interests that may transcend those of the AID program.

In Kenya and Senegal, AID missions will be the coordinators and monitors of follow-up activities, although it was noted by members of the delegation that the AID program in Senegal is more attuned to S&T matters than the program in Kenya.

Within IDCA/AID are several potential sources of funds for follow-up activities, in addition to the ESF funds for Zimbabwe, including the following:

- AID mission budgets in Kenya and Senegal
- Africa Bureau funds centrally administered
- Development Support Bureau funds (DSB)
- The new S&T program budget of \$12 million
- The proposed grant for an S&T program to the National Academy of Sciences (part of the above \$12 million)

- Trade and Development Program (TDP), the reimbursable development program formerly in AID and now a separate component of IDCA. TDP has the authority to use a limited amount of funds to facilitate access to natural resources of interest to the US, and to stimulate programs which are likely to lead to substantial demands for US private or public goods and services.

With the possible exception of the funds available to the new IDCA/AID S&T program and the intended grant to the NAS, these potential sources of funds have been tightly programmed so that reallocations can be made for follow-up activities only at the cost of abandoning other desirable activities which are already far into the programming process. AID can be expected to take a hard look at the suggested new projects in terms of their relative contribution to the Agency's objectives.

D. Comments and Observations

The observations found here arise from the cable traffic and conversations with only a few of the participants. They need to be tested further.

1. The budget process. The trip appears to have been a considerable diplomatic success. Lasting benefits will depend upon successful follow-up activities, and arranging the financing for these will test the rigidities of our budget system. Here is a case where senior officials of US scientific agencies, the Department of State, and AID have shared an experience and generally agreed upon the actions which should follow. Even with strong White House support from Dr. Press, it may prove difficult to execute the agreements signed.

This is an illustration of a dysfunctional aspect of our budgetary system. Activities were identified which would serve US foreign policy purposes because they are valued highly by the African nations, would serve the development objectives of the host countries, and could contribute to US interest in world-wide environmental quality, food and energy production, and disease control. Yet the State Department has no funds for these purposes, AID may quite properly find them too remote from its mandate, and DOE, USDA, NIH, etc. may find them unjustifiable in terms of their domestic priorities. There is no routine way in which the values of all three agencies interested in a particular activity (e.g. State, AID and DOE in an energy project)

can be combined to reflect the composite national interest.² In the case at hand, this difficulty may be surmounted because of White House interest in the results, but more routine opportunities of this sort would have no chance of fruition.

2. AID and the Technical Agencies. It could be argued that one should not place much value on the definition of action requirements emerging from such a trip because of its brevity. In countries with AID missions, projects developed by resident staff should be preferred, particularly since most of the topics which arose are within the sphere of AID interests: agriculture, health and energy.

For some categories of activities, this is no doubt the case. Requests under the headings 4 (Technical advice and training) and 5 (Equipment) should be handled by AID missions in the usual way. A number of topics arising in category 3 (Problem-oriented research collaboration) are also within AID's purview, although there may be value in involving the research resources of DOE, NIH and USDA more directly in their execution.

Many of the activities in categories 1 (Technology management) and 2 (Access to technology for surveying resources) would not, however, normally rank high in AID's country programming. They are recognizably important to the development of these countries, but they are not grass-roots activities, and their impact on the basic needs of the poor may be very indirect. Although such activities are not formally barred by the New Directions mandate, one senses that the dynamics of the Agency lead mission directors to prefer projects more clearly targeted on the needs of the poor.

Yet the US is almost uniquely qualified to assist African countries in many of these areas, and US interests in doing so go beyond the AID mandate. The US has an interest in the ability of these African countries to formulate effective energy policies and environmental regulations, to design management systems which improve their agricultural performances and promote their research competence, to plan their university systems, and to accurately assess their mineral resources. This doesn't mean the US should do these things for them, or pay the full cost of whatever assistance is required, but some recognition of US interest should be reflected in the allocation of costs; i.e. we

should be able to pay at least a portion of them when necessary.

AID could be authorized or directed to assign higher priorities to these advanced technological activities, but there are good arguments against doing so. First, it would take several years to acquire the technical staff to competently assess opportunities and to adapt its programming process to handle such matters expeditiously. Second, AID works in a limited number of countries, generally at the low income end of the scale, and the demand for cooperation on the management of complex systems is likely to be greater in the more advanced developing countries.

Third, AID's strengths lie in working closely with countries to mount effective programs to increase agricultural productivity, improve health services and find alternative sources of energy. For the most part, the technology involved need not be sophisticated, but an intimate knowledge of local culture, social structures and political configurations is required for programs to be effectively designed. Although it is possible for an organization to combine advanced technical knowledge with expertise in intercultural programming, in practice it is very difficult. AID can and does draw on the technical resources of other agencies through inter-agency agreements, but they tend to be used in the same way contractors are employed: to fulfill tasks designed by AID in terms of its mandate.

Representatives of the technical agencies on the trip say they would approach work in the fields of their expertise quite differently than AID is doing, but there was no inclination on their part to unleash the domestic agencies en masse and allow them to entrepreneur activities abroad. All recognized that some coordinating mechanism was needed and, when pressed, thought the State Department should play the role. But this raised the question of how State could acquire the requisite technical expertise and budgetary leverage.

This is one of the fundamental problems which this memo seeks to address: how can US S&T resources be enabled to play a greater role in achieving US objectives abroad (foreign policy, developmental, and substantive) in an efficient and effective manner?

3. The private sector. The role of government in stimulating private sector S&T cooperation was not a central focus of the trip, but the discussions the university people had with their counterparts illustrates another problem. African universities are still in the process of expanding and would value American cooperation in university planning, faculty development, research and teaching. Although such cooperation would appear to have substantial value in terms of foreign relations and development, US agencies are not presently in a position to be of much assistance. TDF has helped the Nigerian Government manage a large teacher training program in the US, but cannot assist governments which are unable to pay the full costs involved.

III. INTERNATIONAL S&T AND NATIONAL INTEREST

The potential contribution of international S&T activities to US national interests has not been systematically analysed and convincingly articulated. It is a complex subject, but one which deserves attention so that we can plan more rational use of our efforts and Congress can have a more coherent framework in which to consider executive proposals. The Congressional debate on the ISTT proposal, for example, dealt only peripherally with the merits of the functions the Institute was designed to perform. Another case in point is the US contribution to the UN Interim Fund for S&T in developing countries. The fund was a product of UNCTAD where the US delegation played a leading role in its creation. Subsequently, State and OMB cut the proposed US contribution by 60%, and even that amount is in danger of dropping from the budget. The US in both cases went on record in international meetings with pledges it is unable or unwilling to redeem. It might be possible to avoid such national embarrassment if we had a comprehensive policy framework for international S&T cooperation to which both Executive and Legislature subscribed.

The chances that both branches of government could subscribe to such a policy would improve if both participated in its conception. A year ago I proposed that a presidential commission be set up, with congressional participation, to elucidate US objectives in this area. The onset of a new presidential term could be a favorable time to launch such an effort.

A. Objectives

Here one can only list the type of US objectives involved, without assigning them weights. It is a familiar listing.

1. Foreign relations. US relations with developing countries in general are not at a high point. In many international fora we find ourselves in opposition to the majority of nations represented over economic or political issues. These disagreements are unlikely to be resolved any time soon.

Increased cooperation on scientific and technological matters won't solve the issues on which there is fundamental disagreement, but it could mitigate the impression which seems to be growing in the Third World that the US is obstructionist and basically uninterested in their advancement. The efficacy of US science and technology is perhaps the most universally admired characteristic of our nation. Leaders of developing countries recognize that in the absence of a global redistribution of wealth or the discovery of oil beneath their soil, technological advances offer the only path to improving the wellbeing of their people.

There are, of course, some industrial technologies which we do not wish to share, but most of the technologies required by the Third World for industrial advance, agricultural development, improved health and lowered fertility, energy production and environmental control are in our interest to help them acquire. The acquisition process is generally not a simple matter of transferring technologies off the shelf; each nation has a particular set of economic and geographical characteristics to which technology should conform. But helping countries improve their S&T capabilities so they can better deal with their own problems must be one of the most constructive and inexpensive ways of improving the US posture towards them.

There have in the past been attempts to use international S&T cooperation to solve regional political problems, such as President Johnson's plan for the Mekong River development a la EVA and the nuclear-powered desalinization scheme for arid Middle Eastern countries proposed by another Johnson during the Eisenhower administration. It is generally agreed that S&T

cooperation lacks the power to resolve such heated disputes. Congressman Waxman's suggestion that the US use S&T cooperation "at an appropriate time" to help "build the structure of peace" in the Middle East is, however, another matter. Regional cooperation re-inforced by joint S&T activities can offer powerful economic as well as political benefits.

2. Economic. Potential economic benefits to the US from S&T cooperation are both direct and indirect. Germany and Japan assist their industries to sell and invest in the Third World to a greater extent than do we, recognizing the long-term benefits from the newly industrializing countries' utilizing their products. Drucker points out, in Managing . in Turbulent Times, that Germany and Japan have in the past 20 years analysed trends in the world economy and acted to shape their own accordingly. In contrast, the US and UK continued to manage their economies as autonomous units and achieved the worst performances of all industrialized nations in the '60s and '70s. Economic interdependence is a reality which we seem late in recognizing.

Drucker also counts the newly industrializing nations as the major factors in the world economy in the next two decades. He believes that their success in attaining full economic development will largely determine the success or failure of the entire world economy in the next decades.

Saying that the Third World economies are of growing importance to the US is, of course, easier than describing what we should do about it. The point is that we need a coherent policy response to this situation and we lack the analytical unit to formulate such a policy.

3. Development. The role of S&T in development has received a great deal of attention in the past two years, particularly by the group engaged in planning the ISTC. Although that effort has yet to succeed, IDCA and AID are moving vigorously to strengthen the S&T component of the foreign assistance program, particularly in the fields of food production, health and population, and energy.

4. Global Problems. A number of global problems threatening the quality of life on this planet will require international S&T

cooperation if they are to be resolved. The Global 2000 Report to the President summarized our knowledge of the trend lines for world food production, population growth, health status, energy production and environmental quality. None is beyond the wit of mankind to deal with, but neither are current trends reassuring.

These are problems of greater importance than urgency-- they won't yield to crash programs, they will seriously affect the lives of our children and grandchildren, but they can be, and often are, deferred by governments with more immediate interests.

Two potentially significant initiatives are currently in the planning stage in the government. A task force under the leadership of the Council on Environment Quality, an agency under threat of extinction, is charged with designing follow-up measures to the Global 2000 report. It is difficult at this stage to gauge the likely importance of that effort: much will depend upon the priority assigned to it by the incoming Administration, but at minimum it should result in improved Federal capacity to monitor and analyse world-wide trends.

The other initiative is the so-called Leadership Proposal being prepared by IDCA for special attention to alleviating hunger, stemming population growth, and meeting energy needs. This proposal, if adopted, would lead to substantially increased S&T cooperation with Third World nations.

The details of the Leadership Proposal are still classified and do not in any case need to be analysed here. It can be pointed out, however, that the proposal is put forward in the context of the foreign assistance program. This, to me, raises conceptual, political and practical problems.

Conceptually, it is not entirely accurate to credit US activities on these matters entirely to the foreign assistance account. The problems involved are of concern to the US as well as to the developing countries, and our cooperation with them is not strictly foreign aid. Both sides will contribute, and both expect to benefit.

Politically, the foreign assistance designation holds few advantages in selling the merits of the effort to Congress or the public. The foreign aid label may obscure the vital long-range interests of the US in doing more about these problems.

Practically, the foreign assistance context leaves action responsibility for the added effort in the hands of AID. It is no criticism of the Agency to point out that the greater depth of technical competence possessed by the government in these fields is to be found in USDA, HHS/NIH and DOE with its associated laboratories. It is true that AID can tap these resources through interagency agreements, but these arrangements tend to be treated by the technical agencies as service functions, not in the mainstream of their activities. Until the technical agencies are given the mandate to concern themselves with global problems, they are unlikely to accord them the importance they deserve.

It should be noted here that USDA has a broader mandate with respect to world food production, and last year, for the first time, it received a modest budget with which to develop international cooperation. This is a promising beginning, although it is far from a comprehensive approach. For example, research priorities of USDA research institutions, the formula funding program for land-grant institutions, and the competitive grants program do not take into account developing country research needs, and the Department plans to initiate cooperative programs abroad only in non-AID countries.

Another practical difficulty of the foreign aid label is AID's limited geographical scope. We are presumably interested in food production, energy creation and fertility control in middle-income countries, such as most of South America, as well as in the poorer countries of the world. IDCA itself is not so constrained, but it is not clear what instrumentality IDCA would use in cooperating with these countries if it were not AID. On the other hand, if AID was the chosen instrument, some resistance could be anticipated from the middle-income countries who would welcome cooperation on matters of mutual interest but reject the old donor-donee relationship which they properly believe themselves to have outgrown.

5. Knowledge. International S&T activities can yield knowledge of benefit to the American people, and of value in assessing future priorities. Developing countries have the lead

in relatively few areas, such as gasohol production in Brazil, but through cooperation US farmers may benefit from arid lands research done abroad, new species development, and less energy- and capital-intensive farming systems. Similarly, in the health field, cooperative research offers opportunities for field research on diseases that can only be studied in the laboratory domestically.

B. Functions

From the above discussion of the Africa trip and US objectives in international S&T activities more generally, it appears to me that the US needs to improve its functional capabilities in the following respects:

1. Policy articulation. We need better means of defining and articulating US interests in international S&T cooperation for the edification of Congress and the American public as well as to form a basis for more effective programming. This should be done with the participation of members of Congress and knowledgeable individuals from the private sector. A presidential commission is one possibility; failing that, the international advisory committee assembled by Dr. Press to guide ISTC planning could be reactivated and reconstituted for the purpose. A review of US objectives, and progress in achieving them, should take place periodically, say every four or five years, by the commission or advisory committee.

2. Strategy analysis and planning. A unit is needed which can devise the means for achieving the defined objectives. Choices need to be made on the division of labor between multilateral and bilateral efforts, public sector or private sector programs, and AID or technical agency responsibility. Such choices are preferably made by a group with no vested interest in the assignment of responsibility among agencies. An interagency committee would perhaps be the least desirable mechanism for such a task.

3. Monitoring and information. The Global 2000 study revealed that the various US agencies seeking to track world-wide developments on problems such as food and energy production and population growth have been using different and sometimes irreconcilable assumptions in their models. The CEQ task force will, one assumes, rectify that difficulty and provide for some central means of keeping the Executive Branch abreast of trends.

An analysis of information assembled by this process will reveal gaps in needed knowledge. A central information unit should have the ability to foster research by government or private agencies to fill the gaps.

4. Budgetary flexibility. The means should be found to provide funding for international S&T activities which serve foreign policy purposes by responding to the priorities of developing countries. These would include cooperative research programs with the middle-income countries, and cooperation with the poorer countries on technological matters outside the mandate of the AID program.

5. Broaden the international involvement of the technical agencies. A global concern for food production, health, energy and environmental quality must gradually come to the fore in the respective technical agencies. Increasingly, it becomes irrational to confine the nation's major technical resources to a domestic focus.

6. Engage the private sector more fully. Most of the US objectives relating to international S&T can be as well served by US private sector activities as by direct government action. Means need to be found to stimulate more international activity by the nation's industries, universities, foundations, and private research organizations.

IV. RECOMMENDATIONS

My principal recommendation is that the US make more use of the nation's main strengths, its scientific and technological capabilities, in coming to grips with the reality of an inter-dependent world. We are unable to meet the demands of the Third World for massive resource transfers, and we doubt the wisdom of many of the measures they suggest for reforming the international monetary system. But we can in good faith and at tolerable cost assist those nations in building their capacities to deal with their own problems, and bring a greater share of our intellectual skills to bear on long-range global problems which are in everyone's interest to resolve.

It will take time for our government to make the changes implied by this suggestion, time to formulate and refine feasible objectives and to forge new relationships among US agencies and with developing countries. But most importantly, it will take time to convince the Congress and the public that an S&T centered policy is in the national interest.

I would suggest a three stage process over a number of years. The first stage, for two or three years, would be devoted to getting the most out of current arrangements and laying the groundwork for stages two and three. The second stage, lasting somewhat longer, would center around a born-again ISTC with more of a "global problem" than a "development" orientation. The third stage would signal the full integration of world-wide concerns into the working agendas of our technical agencies.

A. Stage One

Leadership in this stage would rest heavily on the directors of OSTP and IDCA, and on the IDCA/AID science advisor, but concerted action would be required by a number of agencies. For convenience, suggested actions are keyed to the functions listed in the previous section.

1. Policy articulation. OSTP should take the lead in organizing a commission or committee to articulate US international S&T objectives in a cogent and convincing manner.

Thereafter, OSTP would seek presidential endorsement of the objectives, and find the means to inform and educate the congress on them. One device could be inclusion of the subject in a presidential address to Congress, such as the State of the Union message.

2. Strategy analysis and planning. IDCA would be the lead agency here, and the science advisor the principal actor. IDCA should seek to define its image as coordinator of S&T (and other) relationships with developing countries, and not as the head office for the foreign assistance program. Priority actions would include:

a. Revise the Leadership Proposal in cooperation with USDA, HHS and DOE to engage their more active participation in in program.

b. Determine international research priorities relating to food production, health, contraception, energy and environment.

It is alleged by many knowledgeable people that agricultural and contraceptive technologies, for example, are bumping up against the limits of our knowledge of basic plant and human physiology. We need to place greater emphasis on more basic research to facilitate further technological advance. This is a question requiring expert judgment.

The most comprehensive effort to devise an international research agenda in a field was the World Food and Nutrition Study undertaken by the NAS. That effort was encyclopedic, but it had a disappointing impact on government action, probably because on one in government was in a position to systematically follow its guidance. (The IDCA science advisor can be in such a position.) The WFNS was perhaps too elaborate an exercise to serve as a model, but some similar effort to establish priorities should be undertaken in all major fields. The NAS would again be the logical body to undertake these efforts, and funding would be available under the proposed new AID grant.

c. Work to gain recognition of international priorities in the research agendas of technical agencies, particularly USDA, NIH, DOE and EPA. Lacking a budget for this purpose, the impact on these agencies by the science advisor may be limited. He can, however, stimulate their interest and ensure that AID's centrally-

funded research builds on the work being funded by other government agencies. For example, research on biological nitrogen fixation is funded by NSF, USDA and AID, but the efforts are not coordinated.

d. Build links between research arms of the technical agencies and their counterparts abroad, particularly in middle-income countries. Part of the science advisor's \$12 million annual budget could be used to establish cooperative linkages for very little cost, mostly travel funds. DOE, for example, has 50,000 scientists and a \$7 billion research budget. It has no priority interest in developing international links unless they contribute to domestic objectives, but it would willingly respond to opportunities for cooperation if they were well crafted and financed by IDCA. A high level of technical expertise in the energy field would of course be required if DOE research capacities were to be effectively accessed.

e. Serve as an international contact point for access to US research capacities. UN agencies and research organizations in developing countries often have difficulty in determining appropriate contact points in the complex world of US S&T. The office of the science advisor could serve as a focal point to facilitate international contacts.

f. Cooperate with US science attachés. Science attachés could become the focal points for access, through IDCA, to Federal technical competences. Unfortunately, few are assigned to developing countries; in black Africa, for example, there are none. The State Department should be urged to enlarge its roster of science attachés with particular attention to middle-income countries. They should then be acquainted with the possibilities for technical agency response to requests for cooperation, on such matters as arose in categories 1 and 2 on the Africa trip. The IDCA science office budget or TDP should be enabled to supply incidental expenses for exploring opportunities turned up by the science attachés.

g. After a year or 18 months, begin planning for an ISTC.

3. Monitoring and information. The CEQ task force will presumably result in improved monitoring and forecasting capabilities in the technical agencies and a small White House unit to keep the President informed. If that is not the result, OSTP could take the lead in stimulating the technical agencies to sharpen their global perspectives and build on reconcilable assumptions.

4. Budgetary flexibility. OSTP and IDCA should explore with OMB the possibility of devising more liberal guidelines for the expenditure of technical agency funds abroad. One could not go far in that direction without reference to congressional appropriations committees, but more flexibility on the use of travel funds, for example, would make international cooperation more possible.

Priority should be given to enlarging the TDP program budget. That program has great potential for increasing S&T cooperation with middle-income countries, if its funds are imaginatively used.

Another source with good potential is economic support funds (ESF). ESF at the moment is a rather blunt instrument, but the principle is sound. The State Department determines when the US has a priority foreign policy interest in providing economic support for a country and initiates requests to the Congress. The funds appropriated for ESF are then routinely turned over to AID for administration. Recently, with AID concurrence, State/OES negotiated an agreement with Egypt which would allow a small portion of the ESF allocation for that country to be devoted to S&T cooperation outside the AID program.

That could be a useful precedent. As the State Department decides which countries should receive ESF and in what amounts, it could also determine the portion to be administered by AID and that which could be administered by IDCA through the technical agencies. AID understandably does not welcome other agencies' determining the application of funds entrusted to it, and the other agencies don't devote their best efforts to projects designed for them by AID. The solution may be not to turn the funds over to AID

in their entirety.

A possible logical extension and refinement of the ESP program would be to request Congress to designate funds for international S&T activities for foreign policy purposes, not attached to a particular country. These funds could be assigned to IDCA for administration in regions or on topics identified by State/OES as being of particular foreign policy interest. IDCA could employ the funds by generating and supporting international activities by the technical agencies. The science attachés would be instrumental in helping OES define its priorities for the program. This would remedy a serious deficiency in our present system, i.e. that foreign policy interests in S&T cooperation have no means of budgetary expression.

5. Broaden the international involvement of the technical agencies. This, of course, is the central long-range objective of this paper and suggestions of ways to begin are found among the above paragraphs. It seems to me inevitable that as the global crises already on the horizon worsen, and the world becomes ever more interdependent, the principal technical resources of this country will become more internationally engaged. To move gradually but firmly in that direction, we should now take measures to raise international cooperation on the agendas of the leadership of these agencies, and make clear that they will eventually have global responsibilities. They can begin now to strengthen their information systems on global problems, review their research priorities with international needs in mind, and plan the gradual expansion of their scope.

6. Engage the private sector more fully. This is a tough but important issue which deserves more attention than I have so far been able to give it. At this point it seems that the most promising instruments for increasing private sector involvement are TDP, for private industry, and the NAS, for the universities, foundations and private research organizations. The participation of those two bodies in mapping strategies should be invited, perhaps by the IDCA/AID science advisor.

One strategy commends itself at this point: to find ways for joint planning of activities by the private sector and the government. It is unlikely that programs wholly conceived in

government will generate the level of responsible participation of private groups which would be desired.

B. Stage Two

It is difficult not to conclude that the failure of the ISTC to win the support of the Congress was a very considerable loss. The suggestions for action in Stage One outlined above for the most part involve activities which would have been the responsibility of the ISTC. In its absence, a tremendous burden devolves on the office of the IDCA/AID science advisor. Within a year or two, another attempt to create an ISTC should be made.

Next time, however, the Institute should be less identified with foreign assistance and more explicitly focused on global problems. It could still appropriately be located within IDCA, assuming IDCA succeeds in becoming more than a development agency, and S&T for development could be important in its work, but it should be recognized that our interests in food, energy, population, health environment and industrialization transcend our concern for poverty.

It will be important in planning for ISTC II to engage the direct participation of the technical agencies. The ISTC will represent a way station on the path to global mandates for these agencies and they should help shape the institution in such a way as to facilitate their participation in its efforts.

By the time of its creation, we should have succeeded in better defining our international objectives and establishing research priorities. The ISTC will be needed to mount programs and fund research accordingly, often through the technical agencies themselves.

C. Stage Three

In time, we should have the experience and awareness required to assign primary responsibility for dealing with global problems directly to the appropriate technical agencies. Central coordination would still be necessary because of the inter-related nature of the problems, but the agencies should have international mandates and budgets to permit them to act on their own. ISTC can become a policy and evaluation unit, quite removed from day-to-day operations.

All of this assumes that the interests and knowledge of Congress have grown to the point that it shares an awareness of an interdependent world that renders our present allocation of responsibilities obsolete. It will be a continuing task of the Director of OSTP to promote that learning process.

Footnotes:

1. For substantive discussions of priority problems, the government documents most helpful are the ISTC Congressional Presentations of 1979 and 1980, the Global 2000 Report to the President, of 1980, and the FY 1981 IDCA budget presentation (classified, but with an unclassified annex on S&T).
2. See papers on the budgetary system problem by Eugene Skolnikoff and Courtney Nelson (titles and dates to be added).