

## 4. ALLOCATION OF RESEARCH SUPPORT

### ALLOCATION OF GOVERNMENT RESEARCH SUPPORT

Hitoshi OSAKI

#### 1. Budgeting system

As the allocation of government research support is made through budgeting, budget-making process is of vital importance. There are three stages in budget-making process.

- (1) Each ministry prepares its budget request and submits it to the Ministry of Finance. This is closely interwoven with policy-making process. All factors that are concerned with policy and budget, such as preceding debates in the Diet, recommendations from advisory councils, public opinion and so on, are taken into consideration. Each ministry pays special attention to the policy of ruling party. It consults and negotiates with relevant committees of the ruling party about its budget request.
- (2) After budget requests are submitted to the Ministry of Finance, the Ministry of Finance negotiates with other ministries on the basis of their requests. Through this process, the Ministry of Finance plays a principal role in coordinating various request from different ministries and making government budget, keeping close contacts with ruling party. Finally the budget is decided by the cabinet and submitted to the Diet.
- (3) The last and definitive stage is debates and votes in the Diet.

#### 2. System for research support to university sector

There are two ways to extend research support to the university sector; one is through universities the form of which vary by national, municipal and private sectors, and the other is directly to scientists. The methods of allocation are devised on the principle of full respect for university autonomy and initiative of researchers.

- (1) National universities are playing a significant role in research activities. The main features of the research support to them are as follows:
  - a) Financing of university expenditure is the responsibility of Monbusho (Ministry of Education, Science and Culture).
  - b) Research support is granted according to the standard commonly used for all universities on the basis of chair or researcher as unit, so that every scientist would be guaranteed at least a certain level of support.
  - c) Provision of new facilities, equipments, chairs, etc. is made to appropriate programmes proposed by each university, giving due consideration to the priorities set by itself.
- (2) Monbusho gives block grants to most private universities and some municipal ones (mainly medical schools) to subsidize staff salary and teaching and research activities, goal being to cover half of the required recurrent expenditure to be determined according to the standard set for the national universities. In addition, Monbusho gives grants to municipal and private universities for the purchase of research equipment.
- (3) As for the direct support to scientists, Monbusho provides grants to selected research projects with good promise. The Science Council of Monbusho has a sub-committee to examine applications from scientists and recommends the Minister on the way to distribute the grants. The members of the Sub-Committee are appointed on the recommendation of the Science Council of Japan, an autonomous body the members of which are elected by all scientists.

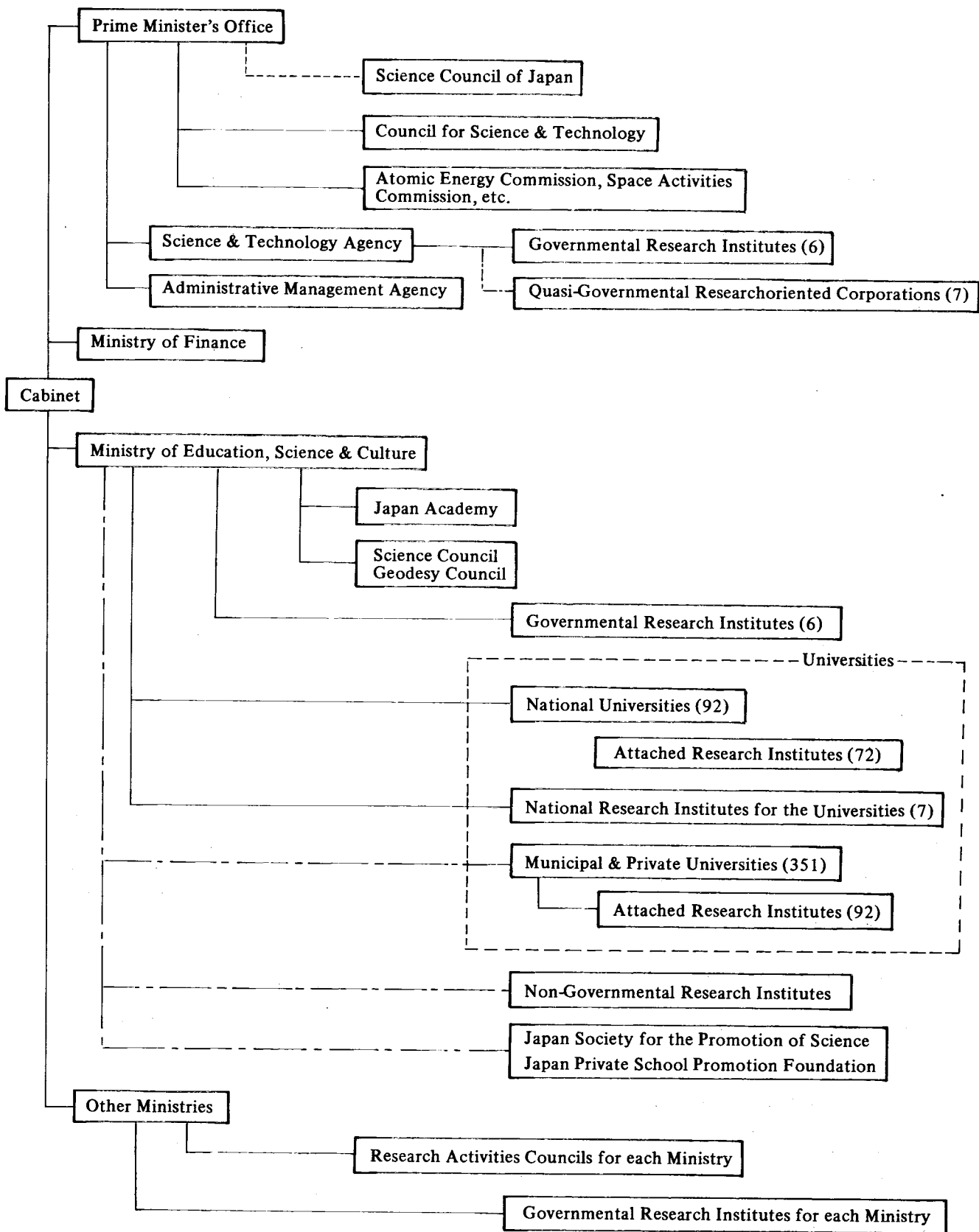
#### 3. Ways and means to respond to specific needs

There is a growing need to give priorities to certain fields of research and to introduce better planning, coordination and organization in order to make researches more relevant to both academic and social needs.

Monbusho has been endeavouring to ensure best balance between university autonomy and initiative of researchers on one hand, and growing demand for more organized research support in order to respond to various policy needs, on the other.

- (1) In taking the initiative to promote researches in specific fields, Monbusho asks the Science Council, which consists mainly of leading scientists, to recommend principles and measures to be taken and pays full respect to its recommendations.

# 1. Organization of National Science Administration



The Council studies problems with the help of Monbusho's officials, taking into account policies of other agencies which are often expressed in the form of recommendations by such bodies as the Science Council of Japan, Council for Science and Technology, and other councils dealing with particular fields such as atomic energy, space development, ocean exploration, etc.

(2) Followings are the measures taken by Monbusho to promote researches in specific fields:

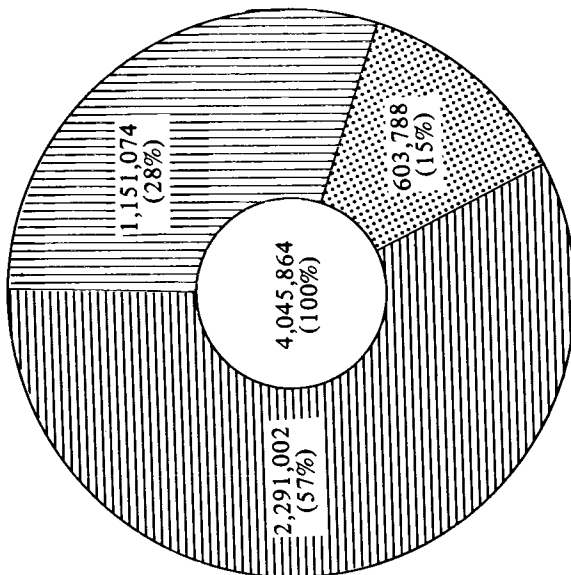
- a) Establishment of national research centers which are expected to be utilized commonly by scientists from different universities and institutions, and to play key roles in planning, coordinating, and promoting research activities in the fields concerned.
- b) Making policies and guidelines known to public, in order to encourage universities and scientists to propose research programmes in line with them in applying for research fund, and giving priorities to such proposals.
- c) Assisting researchers to formulate appropriate research projects and organize research groups, and providing them with research grants.

## 2. Government R&D Budget for Science and Technology (1980)

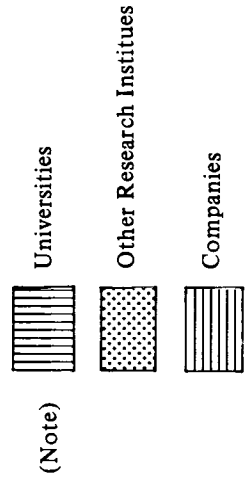
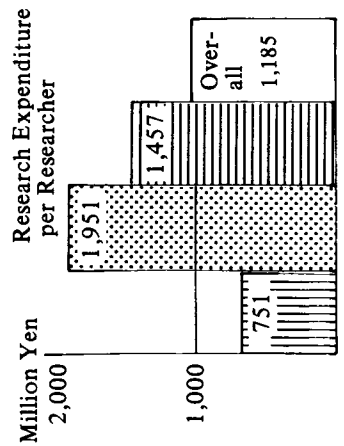
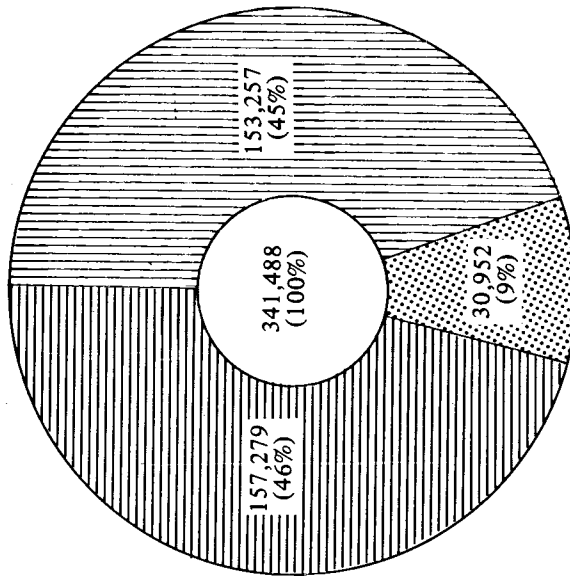
Government Agencies	(thousand yen)	(%)
Ministry of Education, Science and Culture	641,537,130	49.9
Science and Technology Agency	334,898,594	26.0
Ministry of Health and Welfare	25,274,197	2.0
Ministry of Agriculture and Forestry	56,097,206	4.4
Ministry of International Trade and Industry	152,837,787	11.9
Ministry of Transport	11,680,113	0.9
Defense Agency	29,598,583	2.3
Environment Agency	10,673,623	0.8
Others	23,443,146	1.8
<b>Total</b>	<b>1,286,040,379</b>	

### 3. Share of the Universities in the National Research Activities

Research Expenditures (Fiscal 1978 Million Yen)



Number of Researchers (As of April, 1979)



# ALLOCATION OF U.S. FEDERAL RESEARCH SUPPORT

Ronald M. KONKEL

The formulation of the Federal budget plays a central role in the allocation of resources to various research and development activities. Although the budgetary process is by no means the sole mechanism for establishing national science and technology policy, the making of the budget in the Administration, and its review and modification by the Congress, have become increasingly important in establishing the future directions for Federal R&D programs.

Given the budget's short-term focus on a single Fiscal Year, and the ever more intense competition for scarce resources, there is some concern whether the United States can sustain major long-term commitments to research activities whose social rates of return might otherwise justify an aggressive national effort. The issue is by no means settled — the cases of Defense and Health R&D represent areas in which the U.S. continues to invest heavily in expanding programs of direct Federal support. Moreover, in recent years, the Administration has pursued a conscious policy of increasing broad support for basic long-term research as a means of undergirding the country's economic and strategic position.

This paper is largely descriptive of the mechanisms and organizations that are involved in the allocation of U.S. Federal support for research, but it also touches on some general issues affecting the level of the Federal R&D support and its allocation to the various departments and agencies of the government.

## I. Overview of the Planning and Budgetary Process

There is no single organization in the United States government with centralized responsibility for planning a coordinates national research and development effort. Various Administration offices and Congressional committees share responsibility for oversight and coordination of the programs and activities of the many Federal agencies with R&D programs. Detailed program planning is largely carried out within the specific departments and agencies responsible for program execution, although the use of interagency coordinating committees is a fairly common technique in the Executive Branch for dealing with programs that involve multiple agencies. For example, within the President's Office of Science and Technology Policy (OSTP) there is a standing committee structure — the Federal Coordinating Committee on Science, Engineering, and Technology — which includes subgroups with responsibilities for coordinating broad program areas such as weather and climate, materials R&D, and food and agriculture.

The identification of important long-term policy issues in science and technology is a diverse process — inputs can enter the political process in either the Executive or Congressional Branches both from within the Federal R&D establishment and from the broader research community outside of the government. At various times proposals are made to establish a broad science and technology "agenda" for the Nation. A recent example of an attempt to survey the broad issues in a five-year context is *The Five-Year Outlook: Problems, Opportunities and Constraints in Science and Technology*, published by the National Science Foundation to fulfill in part the requirements of the National Science and Technology Policy, Organization, and Priorities Act of 1976 (Public Law 94-282). A requirement of this Act which mandated a formal two-year study of science and technology-related issues by a Presidential-level committee has never been implemented.

Within the Executive Office of the President, the two principal organizations with responsibilities for formulating and coordinating Administration science and technology policies are the Office of Science and Technology Policy (headed by the President's Science Advisor, who also serves as the Director of OSTP) and the Office of Management and Budget (OMB).

OSTP's formal charter focuses on science and technology issues and problems. The Office has taken a very active role in attempting to influence the internal Administration budget formulation process, much more than the predecessor Office of Science and Technology. OMB's charter is more general, including providing broad staff support for the President in developing his annual budget; in overseeing and organizing the administrative management functions of the executive agencies; and in coordinating the President's legislative proposals. Its broad responsibilities and authority inevitably make OMB a major actor in developing Administration policies, including science and technology policy. Other offices within the President's Office, such as the National Security Council, the Council of Economic Advisors and the Domestic Policy Staff, are also involved in science and technology matters depending on the nature of specific policy issues being addressed. To simplify the case somewhat, the key

actors for R&D policy and planning in the Executive Office of the President are OSTP and OMB, except for defense-related issues in which the National Security Council plays a central role.

*Program* planning, as opposed to *policy* formulation, in the Executive Branch is carried out by a large number of departments and agencies charged with specific functions or "missions" (e.g., the Departments of Energy and Agriculture or the Environmental Protection Agency and the National Aeronautics and Space Administration).

Planning for science and technology issues in the Congress is carried out by means of substantive *Committees* of Members in the Senate and the House of Representatives, supported by professional staffs who are knowledgeable about the programs and activities of the agencies over which each committee has jurisdiction. Congressional committees exercise control over the agencies and provide policy direction through a process of "oversight" hearings and through the passage of legislation which *authorizes* activities and programs and provides Congressional guidance for carrying out the responsibilities assigned by the Congress to the Executive Branch agencies.

There are a large number of specialized *authorization* committees in each House of the Congress. These Committees, along with the *appropriations* committees, and the relatively recent *budget* committees – through a process of negotiation and accommodation – together establish the budget allowances which are finally passed as appropriations to carry out the programs of each Federal department and agency. (The Congressional budget process is described further below.)

Summing up, the planning process for R&D in the United States is a dispersed activity involving a large number of participants in the Congress and the Executive Branch – any of whom may seek to initiate actions or redirect ongoing policies and programs. The tangible outcome of this process is most clearly seen in the annual process of establishing a budget for each department and agency. Legislation involving the establishment of a new program or agency or redirection of ongoing areas is an additional means of establishing goals, objectives and institutional mechanisms for carrying out the will of the Congress.

## II. Elements of the Budget Process

The annual budget for the Federal government is the principal means for establishing short-term program directions for the various government agencies and for reconciling the competing demands for available resources. Detailed flowcharts are provided as attachments to this paper explaining the major steps of the budget process for a single Fiscal Year. In summary, these major steps of the process include:

- *formulation of the President's budget proposal* in the Executive Branch – completed in January of each year;
- *Congressional review and modification of the President's proposals* – ideally completed by the beginning of the Fiscal Year on October 1, and
- *Execution of the enacted budget*, frequently but not always completed within the Fiscal Year ending the following September.

The breadth and scope of Federal R&D programs can be seen in Table 1 which provides summary statistics based on the President's budget submitted to the Congress last January. These figures are no longer accurate since the President submitted a revised budget proposal in March, but the figures do indicate the scope and the general distribution of the Federal R&D effort.

Following a long and detailed process in the Executive Branch, each January the President submits to the Congress a comprehensive, integrated budget for the U.S. government that includes his proposals for operating the various departments and agencies and his plans for financing these programs through taxes and other sources of revenues. The Presidential budget documents are voluminous. In addition to the budget estimates, they provide various special analyses and a Presidential message outlining his priorities and fiscal policies and a general assessment of the impact of projected economic conditions on the government's finances. Congressional committees also receive highly detailed program justifications and oral testimony from the departments and agencies in support of their specific budget requests.

The Congressional review of the Federal budget is also time-consuming and highly complex, involving a large number of Congressional committees, as shown in Figure 1 which identifies the principal committees that directly influence budgets for science and technology activities. This process has become increasingly complex in recent years because of the budget Reform Act of 1974 (Public Law 93-344) which established a whole new Congressional apparatus for achieving improved overall control of the budget totals.

The general functions of the various types of committees can be summarized as follows:

- *Authorization* committees have responsibility for establishing in law the policies, programs, and organiza-

Table 1. Summary of the President's FY 1981 Budget Proposal

	Obligations in (millions of dollars)			
	Total R&D		Basic Research	
By Major Agency:	Amt.	%	Amt.	%
Defense	\$16,565	46%	\$ 523	10%
Space & Aeronautics	5,617	16	581	11
Energy	5,106	14	593	11
Health & Human Services	4,011	11	1,840	36
Science Foundation	1,056	3	952	19
Agriculture	786	2	324	7
Environmental Protection	445	1	19	—
Interior	415	1	78	2
Labor	385	1	NA	NA
Transportation	379	1	NA	NA
Commerce	379	1	36	1
All other	992	3	128	2
Subtotal	\$36,136	100%	\$5,074	100%
R&D Facilities (not distributed)	2,000			
Total — Federal R&D . . . . .	\$38,136			

Source: Office of Management and Budget

tional arrangements for carrying out Congressional directions. With respect to R&D programs, these committees determine what should be done and also follow up through oversight hearings to see that Congressional policies are carried out. In many areas of R&D such as NASA, annual authorizations of programs are undertaken reflecting the importance Congress attaches to careful review of these programs and projects.

— *Appropriations* committees exercise the “power of the purse,” and determine how much can be spent on various programs and activities in a particular Fiscal Year.

— *Budget* committees have responsibility for establishing overall dollar ceilings for the Federal budget and for allocating those totals to broad functional areas within the budget. In general, they do not determine budget priorities for particular programs and projects, but do address issues of general priority such as how much to allocate to defense and non-defense purposes.

The Budget Reform Act has increased the complexity of the Congressional Budget process and increased the amount of time that agencies and the Congress spend in justifying and debating issues related to the budget. Whether the process will succeed in constraining the size of the overall Federal budget and how the process will, over time, shape the priorities of broad program areas in the budget remains to be seen.

There is some interest in the Congress and the Executive Branch in moving toward a multi-year planning and budgeting system. A highly structured system of this kind has existed in the Department of Defense since the 1950's. An attempt was made by President Johnson to implement this approach (called a Planning, Programming and Budgeting System, PPBS) across the government in the 1960's. The PPBS experiment was not successful. Notwithstanding the PPBS experience, the budget process is likely to evolve over time toward a multi-year orientation because of the recognition that major changes in program direction and priority in the budget can only be achieved over a period of years. The benefits of a formal multi-year planning/budget system would, however, clearly have to be weighed against the costs of increased complexity in a system that is already cumbersome and time consuming.

The Administration has already implemented a system of providing 3-year budget “planning ceilings” to Federal agencies. The budget documents are now providing longer range projections of program costs. The House of

Figure 1  
Congressional Committees Having Responsibility for Federal R&D Budgets

SENATE	HOUSE OF REPRESENTATIVES
<p><b>AUTHORIZING COMMITTEES:</b></p> <p><b>Major Role:</b></p> <p style="padding-left: 40px;">Commerce, Science, and Transportation</p> <p style="padding-left: 40px;">Agriculture, Nutritioj, and Forestry</p> <p style="padding-left: 40px;">Armed Services</p> <p style="padding-left: 40px;">Environment and Public Works</p> <p style="padding-left: 40px;">Energy and Natural Resources</p> <p style="padding-left: 40px;">Labor and Human Resources</p> <p><b>Lessor Role:</b></p> <p style="padding-left: 40px;">Foreign Relations</p> <p style="padding-left: 40px;">Governmental Affairs</p> <p style="padding-left: 40px;">Judiciary</p> <p style="padding-left: 40px;">Select Small Business</p> <p><b>OTHER COMMITTEES:</b></p> <p style="padding-left: 40px;">Appropriations</p> <p style="padding-left: 40px;">Budget</p>	<p><b>AUTHORIZING COMMITTEES:</b></p> <p><b>Major Role:</b></p> <p style="padding-left: 40px;">Science and Technology</p> <p style="padding-left: 40px;">Interstate and Foreign Commerce</p> <p style="padding-left: 40px;">Merchant Marine and Fisheries</p> <p style="padding-left: 40px;">Agriculture</p> <p style="padding-left: 40px;">Armed Services</p> <p style="padding-left: 40px;">Public Works and Transportation</p> <p style="padding-left: 40px;">Interior and Insular Affairs</p> <p><b>Lessor Role:</b></p> <p style="padding-left: 40px;">Education and Labor</p> <p style="padding-left: 40px;">Foreign Affairs</p> <p style="padding-left: 40px;">Government Operations</p> <p style="padding-left: 40px;">Judiciary</p> <p style="padding-left: 40px;">Small Business</p> <p><b>OTHER COMMITTEES:</b></p> <p style="padding-left: 40px;">Appropriations</p> <p style="padding-left: 40px;">Budget</p>

Representatives recently passed a bill that would require the President to provide more detailed estimates of future year program requirements for Federal R&D programs but would not require Congressional committees to change their procedures for authorizing these programs. It is not yet clear how this proposal will fare in the Senate.

### III. Factors Affecting the Allocation of Federal Support

As a general rule, the accepted principle in budgeting for research and development in the Federal budget is that R&D represents a means not an end of public policy. There is not a specific budget for R&D as such. Rather, R&D is budgeted as a component of the overall budget of each separate "mission agency" of the government — i.e., the Department of Agriculture decides within its overall budget allowance how much to allocate to gricultural research; the Department of Defense decides how much to allocate to defense R&D; and so on. There are some exceptions to this general rule.

On occasion, the President will choose to focus on a particular area of R&D to emphasize as a defined Presidential initiative. An example would be President Kennedy's 1961 decision to commit the United States to the Apollo landing on the Moon, which shaped the entire U.S. civilian space program for at least a decade. The proposal to establish an Energy Research and Development Administration following the 1973 oil embargo would be another example.

The Carter Administration has emphasized basic research as a focal point for its science and technology policy. Major initiatives have also been proposed relating to automotive research and deep ocean margin drilling.

Examples of Presidential actions to redefine or redirect Federal R&D programs in this Administration might include the Breeder Reactor program and the decision to cancel the B-1 bomber.

Congressional interests in research and development span the broad range of Federal interests and responsibilities. Statements of Congressional intent are reflected in specific authorization and appropriation actions and also in the reports which accompany these actions. These Congressional directions play an important role in shaping

the budget proposals of the agencies and the Administration. Some examples of areas in which the Congress has exerted interest in increasing the budgetary priority for specific areas of research and development would include civilian space applications (especially remote sensing satellites) and health research. The Congress is about to pass a bill that would provide strong impetus for the nuclear fusion program and accelerate the completion date of major fusion experimental test facilities. An example of a strong action to reverse an Administration policy decision was the decision in the Senate in 1972 to kill the American Supersonic Transport (SST) project.

A final example in which the Administration and the Congress have jointly shaped the future direction of a major program initiative is the recently passed \$20 billion program to develop a domestic synthetic fuels industry. This follows a similar proposal advanced by the President in 1975, which failed to pass by a single vote in the House of Representatives.

As a final point, it should be noted that both the Congress and the Administration make periodic assessments of the overall state of science and technology activities in the United States. Oversight hearings by both the House and Senate committees with jurisdiction over the Office of Science and Technology Policy are a principal forum for this review. The Administration's statement of general policies and perspectives were summarized in a special message, *A Science and Technology Policy for the Future*, which President Carter transmitted to the Congress on March 29, 1979.

#### **IV. Current Issues in Federal R&D Support**

There are no generally accepted or well-defined criteria for determining what activities will receive support in the Federal budget or how much they should receive in any given budget year. The dollar allowances for specific R&D activities are the outcome of an elaborate negotiating process in both the Executive Branch and the Congress. This process has been described in broad terms above. It may be useful to conclude with some personal observations and an assessment of issues and trends that are currently of importance in establishing the context for the allocation of Federal research support.

- *Basic Research* — A strong philosophical case can be made in support of a major Federal role in direct support of long-term basic research in the national interest. This viewpoint has gained wide bipartisan political support. The Carter Administration has enunciated a general policy (outlined in the President's Science and Technology Message) of promoting "real growth" above inflation in Federal support of basic research to offset a previous decline in such support during the late 1960's and early 1970's. There remain, however, major issues of how much basic research is enough and which areas deserve priority support in a given Fiscal Year. In the absence of any better approach, the issue of funding levels is now resolved by the essentially political process of negotiating the budget. No clear alternatives are in sight.
- *Applied Research and Development* — The key element in obtaining Federal budgetary support for applied research and development is to have a strong established agency "champion" such activity and to justify it in relation to that agency's particular mission and functions. Without such "mission-oriented" support, attempts to generate a "technology push" for even good ideas and welldeveloped technology concepts are likely to flounder in the Federal budgetary process.
- *Public/Private Sector Roles* — Uncertainties about whether a technological activity should be conducted by the government or left to the private sector can cause even technically successful projects supported by the Federal government to fail to become successful innovations. Planning for the U.S. operational remote sensing satellite system is an important current example of the difficult policy problems such uncertainties can cause. This general problem is likely to persist in the United States, although there are strong incentives for the Federal government to improve its methods for "commercializing" the results of technology development with Federal financial support. This is a particularly crucial issue for Energy R&D programs.
- *Economic Growth and Productivity* — Concern about declining productivity growth and perceptions of reduced international competitiveness are forcing a reexamination of Federal programs and policies that effect the role of technological advance in the U.S. industrial sector. Japanese experience and policies are of great interest as the U.S. debates whether it should adopt an "industrial policy" appropriate to the U.S. experience and culture. A key issue in the debate is what role the government should play in fostering innovation and structural change and the relative efficacy of various direct and indirect incentives and policy interventions. The outcome of the debate is far from clear, but the implications for Federal R&D programs and policies could be substantial.

## **V. Summary and Conclusions**

The Federal budgetary process is a complex mechanism for allocating R&D resources and for addressing major policy issues that affect the long-term direction of Federal science and technology programs. This process has become more complex in recent years, and future innovations in the planning and budgetary process may be needed if the U.S. is to address successfully the major issues of technology and economics that are now coming to center stage in the U.S. and other countries.