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Science and Technology Advice in the White House
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NATIONAL ACADEMY OF SCIENCES
NATIONAL ACADEMY OF ENGINEERING
INSTITUTE OF MEDICINE
2101 Constitution Avenue, Washington, D.C. 20418

The Honorable George Bush
The President-Elect of the United States
Old Executive Office Building
Washington, D.C. 20501

Dear Mr. President-Elect:

Many of the issues that will demand your personal attention in the course of your Administration combine political, economic, and scientific or technological components. Industrial competitiveness, weapons programs, federal budget priorities, AIDS, and environmental regulation are a few such issues whose technical aspects are recognized but not resolved. Other national concerns of equal or greater technical complexity will almost certainly emerge during your term of office. In all of these cases, you will profit by having a senior assistant who recognizes what areas of science and technology are involved, who knows what analysis needs to be brought to bear and where it can be obtained, and who can help identify options for you to consider. As you suggested in your speech to the Ohio Association of Broadcasters in Columbus on October 25, we believe that a science and technology adviser designated as an assistant to the President or accorded Cabinet status can best serve these functions.

A science and technology adviser's principal duty is to provide objective technical advice, on a timely basis, for you to consider along with counsel from other sources on the issues you face. In developing that advice, your science and technology adviser will selectively draw upon government expertise that is often widely dispersed across agencies, remote from the White House, and colored by bureaucratic interests. He or she will exploit the resources of the academic and industrial communities without becoming their advocate. In making a decision, you may accord other advice more weight than the views of your science and technology adviser; but you can be confident

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that you are aware of technical factors that could either advance or undermine your policies.

In addition to helping you formulate policies on matters with scientific and technical aspects, an adviser of stature can serve you in several other capacities—helping your personnel director identify superior candidates for sub-Cabinet positions and agency directorships requiring scientific and technical competence; working with the Director of OMB to ensure that your priorities are reflected in proposed budgets for science and technology activities, now amounting to more than $60 billion; helping to coordinate multi-agency research and development in support of competitiveness, environmental protection, AIDS prevention and treatment, and other national objectives; and, occasionally, representing you in international discussions of sensitive issues of science and technology.

The person that you appoint to this position should have three major attributes:

- a commitment to the success of your presidency and an ability to work effectively with other senior advisers on whom you will depend;
- outstanding scientific or engineering credentials that command the respect of the industrial and academic communities and parts of the bureaucracy whose help you will need; and
- familiarity with influences on the federal role in science and technology and with the political environment of the Executive Branch.

We believe that the position of Director of the Office of Science and Technology Policy, as it has functioned in recent Administrations, needs to be enhanced to attract a person of the caliber who will best serve your needs. You have a range of options with regard to the status, staffing, budget, and external advisory mechanisms of the office. Your choices should be governed by the organization and mode of operation of the White House staff as a whole. The essential element is to enable your science and technology adviser to participate in presidential policy deliberations on a par with other senior White House advisers.

Whatever arrangements you make for the office, we urge you to proceed rapidly to select a science and technology adviser as you consider other senior White House and Cabinet positions. Otherwise, you may forfeit an opportunity to obtain the best advice on key appointments to executive positions in agen-

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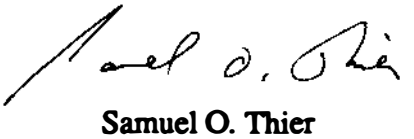
cies with science and technology responsibilities, to make adjustments to the FY 1990 budget, and to address other matters on which your early decisions will have lasting consequences for your presidency. Equally important, an early appointment will signal the importance you attach to the role of science and technology in meeting your objectives for the country.

We elaborate on these points in the attached paper, "Science and Technology Advice in the White House: Recommendations for President-Elect George Bush."

Yours sincerely,

Frank Press
President
National Academy
of Sciences

Robert M. White
President
National Academy
of Engineering



Samuel O. Thier
President
Institute of
Medicine

Attachment

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The National Academy of Sciences (NAS) is a private, self-perpetuating society of distinguished scholars in scientific and engineering research, dedicated to the furtherance of science and technology and their use for the general welfare. Under the authority of its congressional charter of 1863, the Academy has a working mandate that calls upon it to advise the federal government on scientific and technical matters. The Academy carries out this mandate primarily through the National Research Council, which it jointly administers with the National Academy of Engineering and the Institute of Medicine. Dr. Frank Press is President of the NAS.

The National Academy of Engineering (NAE) was established in 1964, under the charter of the NAS, as a parallel organization of distinguished engineers, autonomous in its administration and in the selection of members, sharing with the NAS its responsibilities for advising the federal government. Dr. Robert M. White is President of the NAE.

The Institute of Medicine (IOM) was chartered in 1970 by the NAS to enlist distinguished members of appropriate professions in the examination of policy matters pertaining to the health sciences and to the health of the public. In this, the Institute acts under both the Academy's 1863 congressional charter responsibility to be an adviser to the federal government and its own initiative in identifying issues of medical care, research, and education. Dr. Samuel O. Thier is President of the IOM.

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In its first few months, your Administration will face a range of international and domestic issues whose scientific and technical aspects are important to their resolution—weapon system acquisitions and arms control, economic growth and competitiveness, AIDS and other public health threats, space policy, trade negotiations, alternative energy strategies driven by global climate change, environmental degradation, regulatory policy, and the allocation of federal research and development funds that exceed $60 billion this fiscal year. Varied issues with complex technical aspects that are not always apparent will continue to emerge during your presidency, possibly more often than in previous Administrations.

Regardless of how you organize your staff, you will have access to technical expertise and opinion in and out of the government. Nevertheless, establishing your own source of technical advice in the White House will supplement the political and economic wisdom of your senior advisers, enable you to select the best advice, and help you avoid the pitfalls and exploit the opportunities that each of these issues poses. A science and technology adviser committed to the success of your presidency but willing to present the facts even when they are disquieting, detached from the federal bureaucracy but having its respect and that of the scientific and technical communities, can help you formulate and implement effective policies.

YOUR AGENDA AND NEEDS

In the ***international arena***, the nature of the scientific and technical issues requiring your personal attention is changing and their range is expanding.

Major weapon system acquisitions and arms control measures are inherently presidential issues because they bear on your fundamental responsibility to protect the national security and because they have a substantial impact on the federal budget. This is an area of fierce competition among interested parties with ample technical resources—the military services and defense contractors, among others. Presidents have generally relied on a strong national security adviser to help them sort through opposing views and narrow the options from which they choose. Today that task is complicated by several recent developments:

- Weapon systems, both nuclear and conventional, have become ever more technologically sophisticated, subject to conflicting claims of feasibility and performance, and vulnerable to unanticipated technical problems and human error in either development or operation.

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- As a consequence of actions by your predecessor and the last Congress, the Strategic Defense Initiative, in particular, requires your early review and decisions on technological directions and funding levels.
- The nation's defense industrial base is becoming more dependent on civilian technological advances at home and abroad. In the postwar period, the military sector typically led the development of technologies that sooner or later found civilian applications—semiconductors, computers, and numerically controlled machine tools, among others. Today, military applications frequently lag behind commercial technology. Indeed, there are grounds for concern about the vitality of the domestic technology base in the military's growing reliance on foreign commercial sources of critical components and manufacturing equipment.
- Arms control agreements increasingly hinge on the technology of verification rather than on issues of grand strategy.

The traditional strengths of the National Security Council staff need to be supplemented by expertise in these kinds of developments.

In economic and bilateral summit meetings, leaders of other industrialized countries are raising directly with the President of the United States issues of technology trade, collaboration on large-scale technology projects (e.g., a joint mission to Mars), cooperative research, access to know-how, and environmental protection. And because these leaders regard such matters as vital to their countries' welfare, they have become sophisticated advocates. In the United States, some of these are areas of more limited national government responsibility. Authority and expertise tend to be dispersed among agencies removed from the White House and its coordination. In the next four years, expert advice will be valuable to you in dealing with our allies, adversaries, and industrializing countries on:

- terms of trade in technology-based products and services;
- rules for restricting technology flows for national security or commercial reasons;
- conditions for collaborating on and sharing the results of major science and technology projects; and
- means of alleviating or adapting to man-made changes in the global environment—atmospheric warming and acid deposition attributable mainly to the use of fossil fuels, stratospheric ozone depletion resulting mainly from the use of chlorofluorocarbons, and the decline in biological diversity from a variety of activities.

In the ***global competition arena***, which affects the nation's security, foreign relations, and economic welfare, you will confront America's loss of

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world market share in several strategic industries, the relative decline of the U.S. technology base and of its performance in science and mathematics education, erosion of intellectual property protection in major foreign markets, and concern about the effects of technological change on the work force. Competitive pressures will grow as more and more industrializing countries look to technology-based domestic production as a source of job creation, exports, and in some cases debt relief.

Scientific advances and technological innovation contribute importantly to productivity growth and international competitiveness—keys to raising Americans' standard of living. But there are varied macroeconomic policy prescriptions to improve industry's innovative capacity. And despite a proliferation of public initiatives, especially at the state level, the government role in technology development and commercialization remains controversial, its influences varied but mostly indirect, and responsibility dispersed throughout the Executive Branch with little if any coordination.

Consider two important recent cases in which policies were hastily improvised, not necessarily successfully:

- The uncoordinated response to the precipitous loss of world market share by the U.S. semiconductor industry. A semiconductor trade agreement with Japan has apparently curtailed dumping on world markets but contributed to rising prices and shortages of semiconductor memory devices. The formation of Sematech with federal assistance poses the dilemma of when and how to craft effective public-private sector collaboration for technology development.
- The tepid response to breakthroughs in the field of high-temperature superconducting materials. Here there is reason to doubt that industrial and government efforts are sufficient to translate U.S. scientific prowess into leadership in commercial applications in electronics, transportation, power generation, and other industries.

In the ***domestic arena***, the challenges are equally complex. In health, they extend from allocating resources to basic research to incorporating technological advances in health care delivery, from educating providers and the public to reforming the means of financing services.

With regard to the ongoing AIDS epidemic, the federal government has primary responsibility for developing the scientific knowledge base, a function that is centralized in the health research agencies that are repositories of much of the relevant expertise. But until there are breakthroughs toward a vaccine or effective treatments, the immediate tasks are educating the public, curbing drug abuse, protecting victims' rights, and paying mounting health care expenses. On these issues, knowledge is limited, opinion sharply divided, and respon-

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sibility fragmented. Nevertheless, you will be held accountable for the adequacy of research, the responsiveness of industry and regulatory agencies in vaccine development, leadership in public education, paying a large share of medical costs, and devising alternatives to costly long-term hospitalization. White House staff must provide you with the best independent judgment available, gathered and synthesized from all available sources, on what makes sense to do and what could make the AIDS scourge worse.

Science and technology initiatives in any of these areas, international or domestic, whether to ameliorate problems or to capitalize on new opportunities, imply substantial investments in research, development, and training at a time of persistent budget deficits. They therefore impinge on one of your urgent tasks as President—to resolve the fiscal crisis. Federally supported R&D activities, including for defense, amount to more than $60 billion; and the share of that total devoted to civilian R&D represents a rising percentage of nondefense discretionary spending—the part of the budget under severest pressure from the deficit reduction imperative and where pent-up public demand for services is greatest.

In budgeting for R&D, the previous Administration increased spending, especially for basic research, beyond the inflation rate but in the end only to a level equivalent to expenditures in the 1960s. Since 1980 federal R&D (again, including military) has risen in real terms but stagnated or declined in relation to other measures—the cost of doing research, the shares of their GNPs spent by our major foreign competitors, and the proportion of U.S. GNP generated by the technology-intensive sector of our economy.

Total public R&D spending, in any case, conceals shifts in relative priorities during the last dozen years:

- an increase in military R&D relative to R&D for civilian purposes;
- from civilian applied R&D projects to fundamental research; and
- on the military side, the reverse—from basic research to development.

That these shifts are in many cases opposite to the policies of our competitors doesn't make them wrong. But they need to be reviewed carefully, in light of your principal objectives and by a process involving technically qualified advisers who are not also stakeholders.

Finally, several science and technology projects with multibillion dollar price tags have reached a critical juncture. They are poised somewhere between research and preliminary development and the much more costly construction/deployment/operations phases. In the next few months, you will have to decide whether and how to proceed with the Superconducting Supercollider, the Space Station and/or a subsidized but privately sponsored manned space facility, and, of course, the Strategic Defense Initiative. Each of these projects

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has its proponents and detractors, arguing its worth or lack thereof in terms of science, jobs, profits, national prestige, or a conception of military security. At a time of fierce competition for limited money and talent, the objective counsel of a science and technology adviser can help you assess the merits of competing claims.

FUNCTIONS OF A SCIENCE AND TECHNOLOGY ADVISER

A personal science and technology adviser can assist you and senior officials of your administration in five important ways: (1) policy formulation; (2) recruitment to executive positions in agencies with science and technology functions; (3) evaluation of R&D budgets, in cooperation with the Office of Management and Budget; (4) coordination of R&D management among the various departments and agencies; and (5) international negotiations involving issues of science and technology.

- *Policy Formulation.* None of the issues outlined above can be decided exclusively on the basis of scientific or technical considerations; they also entail an array of budget, economic, national security, diplomatic, and domestic political considerations. A technical perspective is important to a full vetting of the issues, but it is most useful to you when integrated with the analysis and recommendations of other senior White House advisers. An effective science and technology adviser and his or her staff must work closely with other White House principals and Executive Office units—the domestic policy and National Security Council staffs, Council of Economic Advisers, and Office of Management and Budget. The science and technology adviser should have an opportunity to comment on decision memoranda originating with or involving the Cabinet departments and agencies and should participate in any deliberations where his or her perspective can illuminate technical and scientific questions associated with a presidential policy decision. Once you have made a decision, you will find it advantageous to have a technically qualified spokesperson to explain your objectives to Congress and other audiences.
- *Appointments.* Some two dozen positions subject to your appointment offer you an opportunity to install scientific and technical competence at high levels across the government. No White House official can make up for deficiencies in appointees to these sub-Cabinet positions in the Defense, Energy, Health and Human Services, Agriculture, Commerce, and Interior Departments and the directorships of such agencies as the National Science Foundation, NASA, and the Environmental Protection

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Agency. But your science and technology adviser can help you and the director of White House personnel define the necessary qualifications and identify top-notch candidates whose philosophies are compatible with your own.

- *Budgeting for R&D*. The dilemma you face in allocating funds for science and technology is a function of their increasing importance to national goals and expanding opportunities in virtually every field of science and engineering at a time of severe budget constraints. The temptation in such circumstances is to invest for short-term returns and to embrace attractive new projects without adequate attention to the base of long-term research, its infrastructure, and the training of scientists and engineers.

  Support of these activities is a responsibility of several agencies, divisions of OMB, and congressional committees, as is sponsorship of research and development contributing to national objectives such as industrial competitiveness, environmental protection, and AIDS prevention and treatment. Uniquely, your science and technology adviser can play a supporting role in articulating your priorities and ensuring that they are reflected in your budget proposals in these cross-cutting areas.
- *Coordination*. Although the federal government's organization by mission separates research and development activities into at least a dozen major agency units, the issues you face and the research and technical support that may eventually help to resolve them cut across bureaucratic boundaries. Examples include

  —acid precipitation, climatic change, and techniques for amelioration;
  —water quality and quantity;
  —biotechnology regulation;
  —research and other government policies to foster the competitiveness of particular industries;
  —basic and applied research to exploit scientific breakthroughs, as in superconductivity; and
  —prevention and treatment of AIDS and other diseases.

  Although the competence of departmental and agency staff and their external advisers remains high, recent personnel policies and attitudes toward public service have discouraged retention of strong scientific and engineering talent in government. And even with the best personnel there are inevitable territorial rivalries, overlapping jurisdictions, ambiguous legislative guidance, and tendencies to support agency positions regardless of their wisdom. A science and technology adviser can play an important mediating, coordinating, and troubleshooting role to

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help you implement policies and boost the productivity of the government's research and development enterprise.

Your science and technology adviser should be encouraged to use and be included in your high-level coordinating councils for national security and domestic affairs and in appropriate Cabinet committees. On matters requiring coordination among research agencies, a statutory mechanism, the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), can play an important role. Under the chairmanship of the science and technology adviser, FCCSET can bring together Cabinet officials and agency directors to address issues of mutual interest—regulatory, administrative, or budget.

- *International Negotiations*. Presidents have often found it useful to rely on their science and technology advisers and support staffs to coordinate policy formulation on important international issues, to assume a lead role in certain sensitive diplomatic initiatives such as the negotiation of groundbreaking bilateral science and technology agreements, and to advise on technical issues that arise in summit negotiations. On international assignment, the science and technology adviser serves the interests of the White House, ensuring that the U.S. position reflects the President's policy, arrived at after wide consultation with the interested departments and agencies.

  On occasion, science and technology initiatives spearhead broader foreign policy objectives, as in the opening of exchanges with the People's Republic of China and the promotion of bilateral scientific exchanges between Israel and Egypt. In the 1990s, equally dramatic breakthroughs may arise in other parts of the world—Africa, the Middle East, or Latin America. A science and technology adviser can help you not only anticipate but also consummate such opportunities.

QUALIFICATIONS OF A SCIENCE AND TECHNOLOGY ADVISER

Your science and technology adviser should be a source of independent, objective technical counsel. But to be effective, he or she must merit your confidence and that of your closest political advisers. We therefore believe that the first attribute you should consider in choosing an adviser is the person's ability to balance respect for and candor in presenting factual evidence with a strong commitment to the success of your presidency. Other important qualifications are:

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- A broad knowledge of the science and technology enterprise and of the process of scientific discovery and its application. This presumes expertise in a field of work and experience in a university, industrial, or government research setting; but it does not imply that a background in one particular discipline or type of research institution is preferable to another.
- Professional standing and personal qualities that command the respect of the science and technology communities in the private and public sectors. Without these qualifications, your adviser will have difficulty drawing on a broad range of intellectual resources in and out of government.
- Familiarity with the federal role in science and technology is valuable and perhaps indispensable, as is an understanding of the political environment of the Executive Branch.

It follows that your science and technology adviser should not be:

- a pure technician untutored in policymaking and inexperienced in the culture of the bureaucracy;
- a constituency advocate, whether on behalf of a particular discipline, set of research performers, research program, or the science and technology community as a whole; nor
- a political partisan who bends technical argument to support positions based on ideology.

An incumbent identified as having any of these characteristics would defeat the utility of the appointment.

STATUS OF THE SCIENCE AND TECHNOLOGY ADVISER

Congress formally established a science and technology advisory function in the Executive Office of the President in 1976 (P.L. 94-282). The act provides for an Office of Science and Technology Policy with a director and as many as four associate directors appointed with the advice and consent of the Senate. Legislation has not been essential to an effective advisory office, as witness the existence of a highly professional advisory staff in the Eisenhower White House and under Executive Order beginning with the Kennedy Administration and lasting until the second Nixon Administration. Morever, congressionally mandated OSTP functions may sometimes conflict with the President's requirements. On the whole, however, the legislation provides adequate flexibility for you to organize and employ the office in the manner you judge to be most consistent with the style of your Administration.

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Your science and technology adviser's status and access should therefore be viewed from the perspective of how the White House will be organized to carry out the work of your Administration. The important issue is not a particular title or form of organization but his or her ability to contribute to your decision-making process. For example, if you rely for advice primarily on a group of White House staff members, you may wish to designate the science and technology adviser as an assistant to the President. Alternatively, if you rely on the Cabinet as an advisory body, you may find it desirable to make the science and technology adviser a Cabinet member but without portfolio. In France, the Federal Republic of Germany, the People's Republic of China, and the USSR the equivalent position carries cabinet rank. Either arrangement would signal inclusion of your adviser in the principal councils of your Administration, and it would strengthen his or her ability to serve you in policy formulation and interagency coordination roles.

An individual with the stature and experience required would, in any case, decline to serve without having access to the Oval Office and being considered on a par with other members of your senior staff.

ORGANIZATION OF THE SCIENCE AND TECHNOLOGY ADVISER'S OFFICE

No appointee will have all of the relevant technical expertise nor all of the credentials described above in equal measure. He or she must be supported by an adequate but moderate-size staff and budget. In staffing the office, you and your appointee should be guided by the need for:

- a diversity of technical expertise;
- a mix of institutional experience (e.g., industrial as well as academic), including familiarity with the requirements of R&D performance in the field; and
- experience in the Washington policy process.

Although OSTP is authorized to have four associate directors subject to Senate confirmation, at no time have more than two of these positions been filled in this manner. You may wish to consider using these relatively high-level positions to attract a combination of talents and experience that will supplement the qualifications of the Director. On the other hand, Executive Office units, such as the Council of Economic Advisers and Council on Environmental Quality, with several principal members have not noticeably benefited from additional positions subject to Senate confirmation.

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The total staff should be adequate for the scope of responsibilities assigned to your science and technology adviser. The Director should have sufficient flexibility to augment the staff as new issues arise, as inevitably they will. These considerations suggest that an appropriately staffed OSTP will be comparable in size to such other White House and Executive Office units as the National Security Council, the Office of Policy Development, and the Council of Economic Advisers. Currently, these range from about 30 to 60 full-time permanent positions.

By contrast, OSTP has shrunk from 23 full-time permanent positions in the late 1970s to only 11 such positions today. This has compelled undue reliance on borrowed staff of executive agencies and national laboratories, many of whom have not had the requisite breadth of experience. The OSTP budget has been reduced during this period. Although there are eminently good reasons to contain the growth of the White House and EOP staffs, the current resources are inadequate to the tasks described above. Joint appointments, for example to the NSC and OSTP, can facilitate White House coordination and communication without proliferating staff.

EXTERNAL SOURCES OF ADVICE

Your science adviser will best serve you if he or she has ready access to external advice and analysis of the technical and scientific issues that will arise during your Presidency. The technical and scientific communities in universities and industry have a longstanding tradition of public service; they are accustomed to and enthusiastic about serving in advisory capacities in the executive R&D agencies and especially for the President.

- *Advisory Consultants*. OSTP's budget should enable the science and technology adviser to retain technical consultants, especially on a temporary basis for concentrated work on fast-breaking issues. This need not be a large number, perhaps a half dozen full-time equivalent positions. The Intergovernmental Personnel Act authority should be used to recruit people on a temporary basis from universities, industry, and other locations. Funds should be available to enable OSTP to reimburse agencies and tap nongovernmental organizations for special assignments.
- *Advisory Committees*. In past Administrations, the White House has had one or more advisory bodies, fully briefed on the work of OSTP and able to tackle quickly an emerging issue that needs urgent attention. The appointees to such committees must be technically current in one or more areas, but they must also be experienced in dealing with issues at a

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presidential level. In the past, this advisory structure has been organized in three ways:

—ad hoc committees established to deal with specific problems and disbanded upon completion of their work;
—a standing advisory committee to the science and technology adviser; and
—a science and technology advisory committee appointed with the advice of the science and technology adviser but reporting directly to the President.

President Ford appointed a Presidential Science and Technology Committee. President Carter preferred to create ad hoc committees. President Reagan established a committee primarily to serve the science and technology adviser. There is no single best arrangement for obtaining external advice. You and your science and technology adviser should choose the committee structure that best suits the organization and operation of your White House.

Some observers of science and technology policymaking argue that the Presidential Science Advisory Committee (PSAC) that served Presidents Eisenhower and Kennedy is an essential means of obtaining external advice. Others believe that a single advisory committee cannot incorporate the breadth of technical expertise required to address the range and complexity of issues facing the President in the 1990s. Whatever mechanism best suits you, those who serve must be prepared to devote the time and effort necessary to develop sound advice; and they must do so with the understanding that White House service demands confidentiality.

IMPORTANCE OF AN EARLY APPOINTMENT

These organizational questions, although important to resolve, should not delay your selection of a science and technology adviser. If you follow the pattern of previous Administrations in appointing an OSTP director several months after the inauguration, you will forfeit an opportunity to obtain useful advice, not only on departmental and agency appointments and adjustments to the FY 1990 science and technology budget but also on issues that must be addressed in the first weeks of your Administration. More important, an early appointment, along with other senior White House staff, will signal the importance you attach to the position and help you to recruit a person of outstanding ability who can promote your objectives throughout your term of office.

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