Presidential Science Advising

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The successful launching of Sputnik I in 1957 stimulated vigorous public condemnation, both here and abroad, of the Eisenhower Administration for having allowed the Soviet Union to "forge ahead" of the United States in matters scientific and technological. President Eisenhower responded by creating the President's Science Advisory Committee (PSAC) in the Office of the President and appointing a full-time Special Assistant for Science and Technology. In this largely accidental manner (because the accusations were not justified) institutionalized science advising of the President originated.

The Rise and Fall of Presidential Science Advising

In contrast, the causes of the decay and final liquidation of this institution, later affiliated with a statutory Office of Science and Technology (OST), are several and complex. The dissection of these causes might be useful in developing a constructive proposal for a new source of competent policy advice to the President on matters related to science and technology. (That such advice would be beneficial to our country should be evident from the events of recent years.) These complex causes can be simply summarized by saying that the most recent Presidents—Johnson, in the later years of his Administration, and Nixon—preferred to deal with very different sources of information and advice and felt that they had no need for a scientifically trained adviser at their elbow. Since the entire PSAC-OST apparatus was intended to serve the needs of the President, his choice cannot be challenged, although the wisdom of that choice may be. But the historical record is really not that simple: PSAC and OST committed some political errors that contributed to the decay of their influence in the White House.

Initially, PSAC found a dearth of scientifically trained individuals in the so-called policy-making positions (that is, the presidential appointees and their career equivalents) in several departments and agencies of the Executive Branch. The special assistant and PSAC worked hard to remedy this situation. They were active in creating the high-level office of director of Defense Research and Engineering to provide the Secretary of Defense with expertise in matters of military technology. The office of Science Advisor to the Secretary of State was reactivated, and science attachés were appointed to several embassies. The National Aeronautics and Space Administration (NASA) was created, and included in it was the large technical staff of the National Advisory Committee on Aeronautics. On the advice of the special assistant and PSAC, the President established the Federal Council for Science and Technology to coordinate the relevant policies of all agencies. They also urged the appointment of assistant secretaries for research and development (R & D) in the cabinet departments lacking them. In time, several such offices were filled, and, as the total appropriations for R & D increased, the internal government machinery for allocating and administering these funds grew in the way envisaged so well by Parkinson. The picture now is not one of a dearth of such officials, but, if anything, of an overabundance. Unfortunately, they have not engaged enough in group efforts (for instance, through the Federal Council on Science and Technology) to formulate proposals for technology-related policies of national scope. Although they are now selected only after a rigorous partisan loyalty scrutiny by the White House staff, they still seem to acquire somewhat parochial views in their federal jobs. Without technologically competent guidance from the White House Office, free of local vested interests, they tend to press for their own agency "positions," with less regard for overall national needs. One striking example of such uninhibited parochialism is President Nixon's "Project Independence," designed to eliminate in 5 years the shortage of energy sources. Under the direction of the chairwoman of the Atomic Energy Commission (AEC), more than half of the project's total proposed $10-billion expenditure is to be spent on AEC projects, some very long range.

In the Eisenhower years, PSAC and the special assistant concentrated on matters of national security, such as military R & D projects, the development of a sensible space program, negotiations for the nuclear test ban treaty and other measures of arms control, and certain technologies involved in foreign intelligence operations. To a great extent, these activities were of an analytical and critical nature. Thus, on the President's instruction, a major study was set up in 1959 to evaluate the need for immediate resumption of nuclear weapons tests, at the time suspended by a moratorium. Such tests, frantically urged by the Air Force and the AEC, would have meant breaking off test ban negotiations with the U.S.S.R. Through the study, it was possible to establish to the satisfaction of the President that the case for the resumption of tests was weak. Negotiations were therefore continued. Another PSAC panel, set up at the request of the Secretary of Defense, decided upon the unsoundness of the Army's plan to test its Niki-Zeus anti-ICBM missiles against its own short-range Jupiter rockets, to be launched from Johnson Island in the Pacific. The panel recommended that, instead, the tests involve the Air Force's ICBM's launched from California, and this recommendation was adopted over the intense objections of the Secretary of the Army, who was attached to the Jupiters that were built in his home state. After the shooting down of Gary Powers' U2 plane over the U.S.S.R. and the President's decision to discontinue these photographic intelligence-gathering flights, a PSAC panel played the key role in recommending to the President a rational (and eventually highly successful) program for intelligence satellites, a program that put order into the existing chaotic situation. In 1960, with the help of NASA, a fairly detailed esti-

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mate of the cost and the time required to land a man on the moon was prepared by another panel at the President's request. Upon hearing of the $30 billion estimate (which is quite close to the *total* actual cost of the moon landing operation), President Eisenhower rejected the project out of hand. President Kennedy, who was shown this report late in 1960, was also cool to the project and changed his mind only after the fiasco of the Cuban invasion and Gagarin's successful orbit of the earth. Apparently Kennedy felt the need to focus public attention on a spectacular project of our own.

In comparison with these and other activities in the broad national security area, which involved large systems issues, the special assistant's and PSAC's successes in civilian fields were less impressive. Two early PSAC panels produced, after considerable labor, short public reports dealing with the roles of science and of public education as they relate to the continuing progress of American society. These reports were a bit long on platitudes and short on concrete proposals, although they seem to have had favorable effects on the National Defense Education Act and on changes in high school curricula. Later, in 1960, another panel report concluded that academic scientific research and graduate education in the sciences are two facets of the same essential public activity. It therefore urged changes in the more or less official federal doctrine that the government gives research funds to universities only to buy research results. That report was personally endorsed by President Eisenhower in a foreword in which he wrote that the federal government must assure the "progress of American science, one of our essential resources for national security and welfare" and concluded that "basic scientific research and the process of graduate education in universities must be viewed as an integrated task. . . ." This report had some beneficial effect on government policies, but, in hindsight, perhaps it overemphasized the need for increasing the number of graduate schools in the United States. The present situation suggests that some weaker institutions of higher education would have done better to remain colleges, rather than strive to become universities.

Especially in those years, the problems of academic basic science were but a small part of the activities of the special assistant and PSAC. Their efforts to assess and influence federal in-house and extramural R & D in the life and biomedical sciences were somewhat ineffectual, and their influence on other in-house civilian R & D activities was slight.

In the Kennedy Administration, the special assistant and PSAC acquired a far more active role in overseeing civilian R & D but lost substantially in their influence over technological national security matters. This loss was to some extent due to the fact that Robert McNamara, the incoming Secretary of Defense, and McGeorge Bundy, the new Special Assistant to the President for National Security Affairs, being more forceful personalities than their predecessors, had greater influence in the White House. Thus, the director of Defense Research and Engineering acquired a large staff. And another large office, that of Systems Analysis, was set up in the Office of the Secretary of Defense to assess the cost effectiveness of proposed weapons systems. Over several years, therefore, the Department of Defense succeeded in largely bypassing OST critique and even in greatly weakening the control of the Bureau of the Budget. Concurrently, the Assistant for National Security Affairs set up his own staff to deal with arms control matters; the science advisor was less welcome to him in the White House meetings on national security affairs than science advisors had been in Eisenhower years.

The intensified activity of OST in the civilian sector of science and technology led to numerous public reports, some quite detailed. They dealt with a widening range of issues, such as the projected needs for scientific and engineering manpower, the preservation of the quality of the environment, use of computers in higher education, and so forth. In hindsight, it would seem that at least some of them might have more advantageously come from an organization like the National Academy of Sciences–National Research Council for submission to PSAC. While thorough and constructive, they were not without faults and so were subjected to in-house and public criticism that contributed to a gradual weakening of the authoritative voice of PSAC and OST. It is in fact questionable that these reports, of which some 60 were released through 1972, contributed much in the last 6 or 7 years to the formulation of national policies.

In the beginning of his term of office, President Johnson welcomed the science advisor's participation in high-level discussions and PSAC activities, but he eventually became aware that PSAC, in common with the majority of the scientific and scholarly community in the country, was less than enthusiastic about his escalation of the war in Vietnam. His reaction, not unexpectedly, was such that in the last couple of years of his Administration the science advisor and PSAC had virtually no access to the President. This situation became known in government circles, and the hard, unwritten rule became operative: White House staff members who lose access to the President lose influence in the government, even in matters that normally do not involve the President.

During the 1960's, the makeup of PSAC underwent major changes. It consisted at first mainly of senior physical scientists, largely from academia, who had extensive governmental advisory experience and had been involved on a managerial level in World War II technical work. Starting in 1959, a conscious effort was made by PSAC to widen its representation by recommending for membership younger individuals and members from medical and social sciences and high-technology industry. However well-intentioned these efforts were, they had the unfortunate result that PSAC ceased to be a coherent, thinking organism. Any topic being discussed by PSAC in later years involved the expertise or substantive knowledge of only a subcritical minority and left the other members of the committee quite uninvolved. The membership of PSAC became largely a source of panel chairmanships.

The End of the Science Advisor and PSAC

About a year ago, the White House announced that PSAC, OST, and the post of science advisor would soon be eliminated. They were. Why? The clue is in a statement about PSAC and OST attributed to John Ehrlichman in an earlier interview—he said he needed no policy advice, only facts. The next "logical" step might have been to conclude that, just for facts, they did not need an office next door; facts could be gotten from the rest of the government. This attitude and the liquidation

were undoubtedly furthered by several factors.

By all accounts, Nixon's first science advisor was no match for the other senior staff people, and his advice was soon disregarded or even not asked for; one or two PSAC members committed the sin of disagreeing publicly with presidential decisions on policy matters that had been discussed by PSAC. These indiscretions were apparently regarded as grave by the President, and, indeed, it is difficult to see how confidential presidential advisory work, which involves access to privileged information, can be combined with public opposition to policies already chosen by the President. Overlaying these irritations might have been a feeling that PSAC and OST were too closely affiliated with the scholarly community and academia, many members of which, from the beginning of Richard Nixon's public life, have been among his most consistent opposition.

In any case, the first science advisor left and was replaced by a capable but young and publicly unknown individual. This made it easy to place him low in the White House hierarchy. A major contributing factor to the decreasing estate of OST and PSAC was Henry Kissinger: He insisted that all information for the President relating to the technology involved in national security be filtered through him, and after a while he assembled his own group of technical consultants. In matters of civilian science and technology, the last White House science advisor had to deal with the staff of the Office of Management and Budget (OMB) instead of being coequal on these issues with its director. Eventually OST became somewhat subordinate to a former SST salesman and promoter, who, despite his failures with SST, had the job of gathering and organizing new technological ideas for a federally sponsored civilian technology-innovation activity contemplated by the White House. Lacking forceful and competent guidance from the Office of the President to formulate and then defend a coherent innovative program, the parochial departmental and nongovernmental proposals, which added up to more than a billion dollars, were chopped down by the OMB to some $20 million for 1973. Only a portion of this sum was actually committed. In these various ways were OST and PSAC thoroughly undermined before their official demise.

The Present and the Recent Past

The present situation, in which the director of the National Science Foundation (NSF) is called the science advisor, has little in common with presidential science advising. While undoubtedly useful on occasions when higher placed officials assign specific tasks to him, the director of NSF reports several echelons down in the White House hierarchy and through the Secretary of the Treasury (the present Secretary is alleged to have stated in 1972 that technological innovations will be of minor importance for the future of the United States). Inasmuch as OMB controls the budget of the NSF, the science advisor has to be subservient to OMB. When matters related to technology are not settled within OMB or in the Office of the Secretary of Defense, they are taken to the President for resolution by his Madison Avenue aides and others who know equally little about the technological essence of the problems and, therefore, little about their true costs, chances of success, impact on environment, possible alternatives, and so forth.

It is not very surprising, therefore, that unsound decisions have been made by the Nixon Administration on many issues involving technology. One might bring up the almost criminal neglect and mismanagement of what has now become known as the energy crisis, the inevitability of which was predicted by experts some time ago; the ambivalence about domestic and international issues involving the environment; the abrupt and harmful changes in policies involving academic research and the training of graduate students, induced by mistaken interpretation of the temporary excess of technical personnel over available jobs; the persistence on the SST project and the forcing through of the costly Space Shuttle without due regard for their usefulness and their effects on the stratosphere; the inept performance of the Department of Transportation regarding mass transit; the phoney cancer "research" program; the insistence on Safeguard ABM (costing billions of dollars) in the face of valid negative evidence; the unnecessary and costly speedup of the Trident submarine program; the encouragement of the "binary" nerve gas munitions, although their introduction may be more dangerous to world peace than the stockpiling of plutonium.

Looking to the Future

Reviewing these and other events of the last few years, one is led to the conclusion that the dismal state of technology-related federal policies cannot be substantially improved in the current Administration. In the near future, therefore, one should mainly hope for restraining actions and initiatives from Congress, perhaps with the aid of its new Office of Technology Assessment. Looking further ahead, one sees that the leadership of technology-oriented policy innovations needs to be returned to the Executive Branch because it has far greater human resources in this domain and because all money bills must originate in the House of Representatives, where local concerns and short-range issues play such a dominant role. Therefore, the scientific-technological community should direct its efforts toward restoring a source of effective scientific advice for the next President, hopefully an individual who will wish to have this resource. What the scientific-technological community should do now is prepare a strong, documented case for the necessity of such an advisory mechanism at the President's elbow and to formulate concrete concepts for its organization. It would be advantageous to convey these arguments to the individuals who will become involved in the next campaign for the presidency, so that the President-elect in 1976 will have had an opportunity to appreciate the reasons for having a science advisory apparatus near him. This was the way President Eisenhower came to feel soon after creating PSAC, President Kennedy felt from the beginning because of the active participation of Jerome Wiesner and others in his campaign, and President Johnson felt before becoming embroiled in the Vietnam war.

Arguments about a future science organization must allow for the greatly changed domestic and international position of the United States. The days when weak and just plain foolish projects (ANP!, the Aircraft Nuclear Propulsion) could be financed and their failure accepted with equanimity are gone. The growth of science and technology now offers many more choices for costly federal undertakings than existed, say, 15 years ago. Meanwhile, the resources of our nation have become more limited relative to the costs of many proposed ventures, ventures

that have grown to rather majestic sizes. Choices early in their formulation will have to be made by the President, and these choices will have to be the right ones, whether involving matters of technology related to national security, the development of energy sources, the extent of environmental aggression that is socially tolerable, biomedical projects, or foreign policy issues, such as the treaties on the uses of the seas or on qualitative limitations of the arms race. The above-proposed thinking about a future science advisory organization should also take into account the fact that the size and competence of the senior, in-house federal technical staff has grown greatly since the days when PSAC was first created.

Last but not least, this thinking must reflect public attitudes toward science and technology. From the establishment of PSAC until well into the 1960's, the United States was euphoric about the public benefits of science and technology. Science and technology made our nation the "first of the world" and promised many returns on investment in R & D. This mood is gone, for several reasons. The scientific-engineering community acting at times in visibly self-serving ways, difficult to reconcile with their proclaimed public interest mission; the brutal and massive use of American technology in Indochina; the not-uncommon disregard of the welfare of the consumer and the despoilation of the environment by domestic industry—all contributed greatly to this change. And so the United States went through an intense and vocal antiscience period. This is beginning to be replaced by a realistic attitude, which recognizes that technology can be directed toward socially beneficial, as well as evil, antisocial ends. The key national objective must be to maximize the former and minimize the latter, not to slow down total technological progress. It should be possible, on balance, to accomplish this task if there is an adequate science advisory structure high up in the government, as well as monitoring and pressure on it by nongovernmental public interest groups possessing some technical competence. It is a task that *must* be accomplished—the wrongful uses of technology are too destructive and the unwise uses too wasteful, both in economical terms and in terms of misused human resources and missed opportunities for progress.

A new OST [perhaps a Council on Science and Technology (COST)] should be an influential, even though a small, part of the innovative process. To be effective, it should be closely linked with the senior technical personnel in the departments and agencies of the Executive Branch, and its activities should be primarily critical and analytical, avoiding managerial responsibilities for on-going projects.

Functions of a Council on Science and Technology

To be of maximum use to the President, the activities of COST should include short- and long-range problems. Of major importance among the former would be the competence and the authorization to participate in the formulation of the budget for government activities related to science and technology. This would be done in cooperation with the budgetary staff of OMB. The concern of COST, however, should be not the restraint of expenditures, but the clarification of technology-related issues in budgetary proposals of the agencies, a careful rating of priorities, and then vigorous support of worthy programs. When the evaluation by COST conflicts with that by OMB, the issues should be taken to the director of OMB and to the President for resolution. To be effective in this process, the necessary, but obviously not sufficient, condition is that COST have the authority to insist on detailed information from the agencies in order to break through the usual budgetary camouflage and perhaps even to go into the field occasionally (as the early PSAC panels did) for independent evidence. The Defense Department, including its subordinate and affiliated agencies—National Security Agency, Defense Intelligence Agency, Central Intelligence Agency, AEC, and NASA —has become relatively independent of OMB. For COST to pry into their budgetary proposals would be especially difficult, but their activities relating to COST should not be excluded or neglected.

The budgetary process is emphasized here because it is the key event within the government by which policies are transformed from words into action. Once started, authorizations and government actions are hard to stop. Furthermore, the overwhelming fraction of "line items" in the President's budget pass Congress with no major changes. The thrust of COST in the budgetary process should be firmly guided by the philosophy that sound advances in science and technology, sponsored by the federal government, are absolutely essential for the long-range welfare of the country and so deserve a very high priority in the budget. What should be most useful to the President in his budgetary meetings is a technically and scientifically authoritative voice that emphasizes neither the natural empire-building of the agencies nor the economy drive of the OMB. That is what COST must provide to earn its keep.

One might think that this is of little importance, because what is listed in the federal budget as R & D programs is but a small fraction of the total (about 7 percent now); however, this fraction determines very much larger expenditures in later years. Moreover, to every President those parts of the budget over which he can exercise some choice should be of greater interest than those which are fixed by statute or by old commitments—and these amount to more than 50 percent of the total. If, then, to the R & D portion are added those other activities that involve technological issues and that are listed in other parts of the budget, one finds that COST could be legitimately vocal on a substantial portion of the budget issues that are of prime interest to the President.

Needless to say, if the leadership of COST gains the confidence of the President, it will be called upon to perform various ad hoc tasks, such as briefing the President on current events that are of public interest in the world of science and technology, participation in the preparation of some executive orders and messages to Congress, the preparation of an annual message on the status of science and technology, and so on. However, so much depends on the personal preferences of the next President that further detailing of the potential relationship is impossible.

Concerning long-range issues, COST should take a leading role in the preparation of presidential policy proposals for the furtherance of technological innovation. Such innovation, backed up by enlightened policy on basic science, is essential to providing better standards of living for underprivileged groups without doing so at the expense of other groups in the population; it is needed to prevent damage to the environment without loss of industrial pro-

ductivity; it is indispensable to counteract the reckless rise in the costs of petroleum, to be followed, without doubt, by similar escalation in the costs of several other essential, imported raw materials; and it is needed to maintain and promote the status of our technology vis-à-vis our foreign trading partners, in order that we may continue to sell our myriad products and buy their raw materials.

Although these policies requiring statutory changes and fiscal commitments would have a common objective, they will have to be different in substance in order to cope with the diverse problems and situations with which the government must deal. Thus, to ensure adequate progress of military and space technology, the federal government, which is almost the sole customer for the finished product, has to support military and space R & D in a different way than it should, for instance, R & D on items for consumer use. Still different solutions must be found for ensuring adequate R & D on major systems for acquisition by public bodies (for example, waste reuse and disposal systems) or by regulated "public utility" industries (for example, nuclear power reactors). In this planning activity, COST should make full use of the in-house technical and planning staff in the Executive Branch by organizing interagency study groups to formulate proposals for specific technological projects and for broader policies governing them and their like. Watching over these groups, COST should try to eliminate the parochialism that might creep into some proposals; it should identify the best proposals and then make the greatest efforts to see that these are heard sympathetically at the highest levels. Needless to say, it is essential that the Council of Economic Advisors (if it be populated by enlightened individuals) and relevant parts of OMB be involved in this activity. Furthermore, this activity should not be hermetically sealed from the outside (through restricted interpretation of "privilege"), and use should be made of the resources of the Office of Technology Assessment and such nongovernmental organizations as the National Academy of Sciences–National Research Council. These innovative activities, however, should be firmly anchored in the Executive Branch. COST should be a regular component of the presidential staff, while it would be using the resources of the nationwide science and technology community, it should not think of itself as a "bridge" to this community—any more than other parts of the White House staff are bridges to their related elements in the population. This point is not of negligible importance: PSAC and OST appeared to some critics as protagonists of the "special interests" of the research-oriented community, and COST will be more effective if it does not appear in the same light. Franklin D. Roosevelt once spoke with pride of his staff's "passion for anonymity"—and that might not be a bad model for COST to follow.

One more point, perhaps superfluous: the world of Washington being what it is, COST would need to have an influential role in shaping the technology-related parts of the President's budget, to be in the position of exercising forceful leadership of the suggested interagency study groups concerned with long-range objectives. The fiasco of 1971–1972 is a case in point.

Possible Organization of COST

The organization of COST can, of course, be decided only by the incoming President. Already mentioned was a Council on Science and Technology (analogous to the durable Council of Economic Advisors), which *might* consist of three full-time members, one of whom shall have regular access to the President (on a par with the director of OMB). The responsibilities of COST can be roughly divided into three interrelated areas. One includes some issues in national security, some aspects of foreign policy, and the space programs. The second covers most civilian technology, such as energy sources, utilization of other nonrenewable natural resources, transportation and housing, and protection and control of the environment. The third is oriented toward the living world, including progress of basic sciences, coupled with the training of scientific-engineering personnel; the biomedical and other applied life sciences; protection, growth, and exploitation of renewable resources; protection of individuals from harmful side-effects of new technologies; and so forth. The way in which these varied domains should be divided among the members of COST will depend on who the individuals chosen by the President are. Each of these three broad areas should have a full-time professional staff, some brought on loan from the federal agencies and others recruited from the outside. Each member of COST should be encouraged to assemble a group of senior part-time advisors from the nongovernmental world, who should be mainly involved in long-range activities. These groups should not, however, become a PSAC. Thus, not being presidential advisors, members could reasonably freely speak out on public issues, although, of course, they would be expected to respect fully the privileged nature of the information they receive in the course of their advisory activities.

One could easily continue to elaborate on the functions and structure of what I have called COST, but it seems premature. What is not premature is for the scientific-technological community to start discussing COST. What is important is that COST, or something like it, properly staffed, be of substantial assistance to the next President in reducing the likelihood of inaction or of technologically ill-conceived projects, which, either by unsound intent or by default, too frequently burden our society.