Do We Need a Department of Science and Technology?

A recurring issue gets a fresh appraisal and a positive answer.

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Departmental status for science in government is not a novel idea. It was broached 85 years ago by a committee of the National Academy of Sciences reporting on the organization of government science bureaus. The committee was appointed in 1884 at the behest of a member of the National Academy, Theodore Lyman, who was also by unique coincidence a member of Congress. The scientist-congressman, whose National Academy standing was gained by his researches on the Ophiurida, was instrumental in placing a rider on a sundry civil appropriation bill which set up a joint congressional committee (called a commission) to study the organization of the government science agencies (*1*). This was a compromise measure, Lyman told his House colleagues in urging its acceptance, his main concern being to save the Coast and Geodetic Survey from takeover by the Navy (*2*). Apparent duplication between the Coast Survey and the Navy's Hydrographic Office in charting coastal waters had led the Navy to espouse merger, a proposal which had considerable appeal in the 48th Congress. The legislative rider directed an investigation of the activities and interrelationships of the Coast and Geodetic Survey, the Hydrographic Office of the Navy, the Geological Survey, and the Signal (Weather) Service. The National Academy committee, enlisted by Lyman, gave technical support to the congressional commission.

Men of science were leery then, as they are now, of military dominance in scientific enterprises. Many of them argued that science agencies should be taken from, rather than placed in, the military departments. For example, they wanted the Naval Observatory to be a *national* observatory, and the weather service to be removed from the Army Signal Corps. At the same time, they recognized that better coordination of the government's scientific work was needed, and various proposals were made toward that end. The aforementioned report of the National Academy committee crystallized the issues. This group was convinced that the science agencies should be pulled together "under one central authority," but the particular form of organization they left to the future and to Congress. Then the committee ventured this cautious but significant observation (*3*):

> . . . The best form would be, perhaps, the establishment of a Department of Science, the head of which should be an administrator familiar with scientific affairs, but not necessarily an investigator in any specific branch. Your committee states only the general sentiment and wish of men of science, when it says that its members believe the time is near when the country will demand the institution of a branch of the executive Government devoted especially to the direction and control of all the purely scientific work of the Government.

The NAS committee went on to say that, if public opinion was not yet ready to accept a Department of Science, the next best step would be to move the several scientific bureaus into one of the existing departments. Even then coordination would not be automatically insured, in the committee's view, and so they recommended the "organization of a permanent commission to prescribe the general policy for each of these bureaus." The commission would "examine, improve, and approve" plans of work and expenditures and recommend efficiency measures but abstain from administrative involvement. This would be a nine-member commission composed of scientists drawn from government and private life (*4*).

End of an Idea

The congressional commission, reporting in 1886, gave short shrift to the suggestions both for a Department of Science and a supervisory commission. A new department was held not justified by the degree of duplication in existing scientific agencies; a coordinating policy group was deemed impracticable because department heads could not very well relinquish to subordinates and outsiders their responsibilities for general direction and control (*5*). With this dismissal by an agency of the Congress, the Department of Science idea died aborning, though it was actively debated at the time in scientific circles (*6*). In the ensuing decades not much was heard about it. Proposals for government departments were made in the fields of health, education, labor, industry, commerce, and agriculture, separately or in various combinations, and three cabinet departments (Agriculture, Commerce, Labor) were established between 1885 and 1945. Not until 1946 was the Department of Science idea revived, at least in the legislative halls. Clare Booth Luce, then a Representative from Connecticut, introduced a bill (H.R. 5332, 79th Congress) to create a Department of Science and Research, stressing the need for national self-preservation in the atomic age and the importance of attracting young people to science careers. Mrs. Luce said: "Only the prestige which attaches to a regular member of the cabinet will render the findings of any scientific body of sufficient weight to command the constant attention of the highest officials of the Government in the consideration and formulation of policy" (*7*). The bill was pigeonholed by a House committee.

Vannevar Bush was working for the establishment of an independent agency, which he called the National Research Foundation, to sponsor research of military as well as civilian interest (*8*). He proposed that it be governed by a director and part-time board of nongovernment scientists. A separate group of nongovernment scientists, which he called a Science Advisory Board, would coordinate the work of government science agencies. These pro-

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posals, outlined in Bush's 1945 report to President Truman, "Science—the Endless Frontier," were modified in legislative measures to become a National Science Foundation. The bill which the Congress passed was vetoed in July 1947 by President Truman, who objected to control of government science policy by an outside board (*9*). The criticisms were reminiscent, in some respects, of those heard in 1884–5 to the National Academy committee's proposal for a science policy commission which would include outside as well as government scientists.

The Bush report was followed in 1947 by the Steelman report, "Science and Public Policy," which went over much of the same ground but with closer orientation to the routines of governmental administration. The Steelman report called for a National Science Foundation to be organized "on sound lines" and suggested that the agency be located in the Executive Office of the President until other federal programs in support of higher education were established, after which time consideration could be given to grouping all such activities, including the National Science Foundation, in a single agency. The Steelman report also favored a part-time governing board for the NSF, but government as well as outside scientists were to be included. It also recommended the creation of an interdepartmental committee on scientific research and development, a special unit in the Bureau of the Budget to review government science programs, and a member of the White House staff to be designated by the President for purposes of scientific liaison (*10*). The Steelman report eschewed any radical departure from the existing framework, presumably meaning that a Department of Science was not in the cards. Three years elapsed, however, before the differences in the several approaches to a National Science Foundation were compromised and a bill finally enacted into law (*11*).

Legislative Renewal

Sputnik generated a new debate on departmental status for science in the Congress led by Senator Hubert H. Humphrey. On 27 January 1958 a broad-based bill, S. 3126, was jointly introduced by Senators Humphrey, McClellan, and Yarborough to create a Department of Science and Technology which would coordinate and improve federal functions relating to the gathering, retrieval, and dissemination of scientific information; provide educational loans to students in certain science fields; establish national institutes of scientific research; and establish cooperative programs abroad for collecting, translating, and distributing scientific and technological information. A day later Senator Kefauver introduced S. 3180 to create a Department of Science. Both bills were referred to the Committee on Government Operations.

Jurisdictional questions were raised, presumably because the bills went beyond organizational matters into policy, and at the request of Senator Lyndon B. Johnson, they were referred anew to his Senate Special Committee on Space and Astronautics, which had been created to consider the government's response to the Russian triumph in space. Without these bills, the Committee on Government Operations was unable to hold hearings in the 85th Congress on the proposal to establish a Department of Science and Technology, which was incorporated in Title I of the bill, but it directed its committee staff to maintain a continuing study of that area. The Humphrey subcommittee did manage, after an agreement reached with Senator Johnson, to hold some hearings in May–June 1958 on a limited aspect of Title I, the proposal for a scientific information center (*12*).

To narrow the jurisdictional issue and regain control of the organizational aspect, the sponsors of the Humphrey bill, now reinforced by Senators Ervin, Gruening, and Muskie, split off Title I and introduced it, with certain revisions, as S. 676 in the 86th Congress. It proposed a transfer to the new department of the National Science Foundation, Atomic Energy Commission, National Aeronautics and Space Administration, National Bureau of Standards, and certain activities of the Smithsonian Institution. By then the impetus for a new department was considerably diminished by NASA's presence. The thrust of science organization was less to coordinate and align than to reach out and do, for Sputnik had caused hurt pride and fear in the nation. It was difficult to make a case for legislating a new department to absorb NASA when the ink was hardly dry on the President's signature to the National Aeronautics and Space Act (*13*).

Indeed, the rush of legislative events and the flurry of organizational activity in the executive branch during 1958 outpaced the committee's deliberations on the suitable form of a bill. The Congress created along with NASA an Aeronautics and Space Council and a standing committee in each house to monitor space and related activities. The Defense Education Act gave support to science education and facilities. A reorganization act for the Department of Defense established a Directorate for Defense Research and Engineering. The Advanced Research Projects Agency, previously established as the military's own response to Sputnik, was made an adjunct of the new directorate. The President acquired a Special Assistant for Science and Technology and gave White House status to the Science Advisory Committee. The Federal Council for Science and Technology replaced a looser interdepartmental committee of similar function. Science advisers were assigned to both the Secretary of State and the Secretary General of NATO. A NATO science committee signified the outward reach of science for defense, while "Atoms for Peace" and the International Geophysical Year represented a peaceful gesture to a world community of science. "Altogether," as James R. Killian, Jr., said before the AAAS in summing up government science for 1958, "the year brought an impressive array of organizational innovations for the management of government programs in science and technology and for the provision of scientific advice at policy-making levels" (*14*).

Executive Opposition

The spokesmen for science at the Presidential level made plain their distaste for a Department of Science and Technology. Killian, speaking at the AAAS meeting as the President's Assistant for Science and Technology, took pains to quote from Don K. Price's 1954 study: "In the organization of the Government for the support of science we do not need to put all of science into a single agency; on the contrary, we need to see that it is infused into the program of every department and every bureau" (*15*). The President's Science Advisory Committee in its new eminence regarded a Federal Council for Science and Technology as the instrument for achieving coordination and cooperation among

government science agencies. A single department, in PSAC's collective view, would not be able satisfactorily to administer either the mission-oriented scientific and technical functions of existing departments or the "unique" specialized programs of AEC, NASA, and NSF. This seemed to be the prevailing sentiment among scientists, though there were notable exceptions. Lloyd V. Berkner would settle for a department excluding the three aforementioned independent agencies; Wallace R. Brode would combine them with a host of others, including the National Institutes of Health, in a Department of Science and Technology (*16*).

Perhaps the strongest argument from a practical standpoint against immediate legislative action—that the President had not recommended a new department—was made by Representative John W. McCormack as chairman of the House Select Committee on Astronautics and Space Exploration. He wrote to Senator Humphrey in 1958 (*17*):

> While I believe there should be a Department of Science, I feel that until whoever is President either recommends the establishment of such a Department, or would not object to such a Department being established, it would be unwise to force such a Department upon them. I want you to know that I am strongly in favor of a Department of Science being established and, in my opinion, it is only a matter of time that one will be established.

In March 1959 in a review of the state of science affairs, the Humphrey subcommittee observed morosely (*17*, p. 19): ". . . there have been certain administrative actions taken which tend to evade the question as to whether a Department of Science and Technology is necessary or desirable, and there are a number of indications from the scientific community that there will be opposition to such a proposal, at least until the need therefor has been more clearly established."

The subcommittee held hearings in April 1959 on S. 676 and S. 586 (Senator Kefauver's bill) to establish a Department of Science. Senator Humphrey, aware of the opposition, hedged a bit. His opening statement said that the proposed Department of Science and Technology was to be considered one possible solution to the problems of centralization and coordination of federal science programs and operations, but not a final conclusion of the committee. The witnesses before the subcommittee were divided. Lewis L. Strauss, as Secretary of Commerce, opposed departmental status for science. Brode, as scientific adviser to the State Department and chairman of the AAAS, strongly favored it. Others pressed for a stronger advisory apparatus at the Presidential level or a study to determine the need for a department and what agencies should be included (*18*). It was easier to agree on a study commission which, to the advocates of a department, appeared better than nothing, to the dubious, a means of seeking more information, and to the opponents, a device for deflecting action on a controversial subject.

At the conclusion of the April 1959 hearings, the staff of the Senate Committee on Government Operations drafted a bill proposing the establishment of a Commission on a Department of Science and Technology. This was introduced in the Senate on 5 May 1959 as S. 1851, under the joint sponsorship of Senators Humphrey, Capehart, Mundt, Gruening, Muskie, Yarborough, and Keating. In a 1-day hearing (28 May) on S. 1851, S. 676, and S. 586, the subcommittee heard no comforting words from the Eisenhower Administration. Alan S. Waterman, whose NSF budget had been increased from $50 million to $136 million after Sputnik, opposed both a Department of Science and Technology and a commission to study the matter. The Bureau of Budget representative, the official spokesman on all matters dealing with reorganization, did likewise, doubting that "the scientific members of the Commission would necessarily be best able to judge the optimum form of Government organization in this field." Leonard Carmichael, secretary of the Smithsonian Institution, endorsed the study commission but suggested that, if it were established, the membership nominations be made by the National Academy of Sciences (*19*).

Notwithstanding the administration's opposition, Senator Humphrey for the Committee on Government Operations reported S. 1851 favorably on 18 June 1959 (*19*). A bipartisan commission was needed, the report said, so that "the Congress and the President may have the benefit of the recommendations of qualified experts in the fields of science, engineering, and technology" as the basis for legislation to improve federal science programs and operations. The committee justified a study commission mainly on the ground that the Congress needed more and better information. As a case in point, Killian had politely declined an earlier invitation to appear before the committee because it might conflict with his advisory role in the White House. Science policy coordination or control at that level, in the committee's belief, would not assure an ample flow of scientific and factual data to the Congress. The Department of Science and Technology, or at least a commission to study its feasibility, was the committee's proposed solution. The Senate did not take up the bill. A companion House bill (H.R. 8325) introduced on 22 July 1959 by Representative Brooks of Louisiana, chairman of the Committee on Science and Astronautics, was referred to the Committee on Government Operations but received no action.

The OST Alternative

Early in 1960 Senator Humphrey put the case for a department or a commission before the American Academy of Political and Social Science (*20*). But those who favored strengthening the Presidential advisory apparatus rather than a new department for science found a champion in another subcommittee of the same Senate committee—that on National Policy Machinery chaired by Senator Henry M. Jackson. The Jackson subcommittee held hearings in April 1960 on the role of science and technology in foreign and national defense policy. A staff report of 14 June 1961 entitled "Science Organization and the President's Office" rejected the Department of Science idea on the by now familiar ground that the diverse scientific activities of the federal government could not be conveniently extracted to form a new department. It approved such views expressed before the subcommittee by James Fisk, president of Bell Telephone Laboratories, and then observed (*21*):

> Eight departments and agencies support major technical programs and all parts of the Government use science in varying degrees to help meet the agency objective. This diffusion of science and technology throughout the Government is not a sign of untidy administrative housekeeping. Rather it reflects the very nature of science itself. Organizationally, science is not a definable jurisdiction. Like economics, it is a tool. It is an instrument for accomplishing things having nothing to do with science.

The staff report emphasized the President's responsibility for science policy direction and accordingly recommended the strengthening of his advisory support by the creation of an Office of Science and Technology. It pointed out that the President could take this step through submission of a reorganization plan rather than through the conventional legislative route. The Kennedy administration was asked to submit to the Congress by January 1962 "its considered findings and recommendations for action." On 29 March Reorganization Plan No. 2 of 1962 creating the OST was submitted, to take effect within 60 days if the Congress did not disapprove (*22*).

Before the plan was formally sent to the 87th Congress, S. 2771 was introduced on 31 January 1962, jointly sponsored by Senators McClellan, Humphrey, Mundt, Cotton, and Yarborough. S. 2771 was similar to S. 1851 of the 86th Congress, which had been reported favorably by the Senate Committee on Government Operations. The revised bill contained a broad declaration of congressional policy and objectives in science and placed more emphasis on the need for improvement in federal programs for processing the retrieval of scientific information. It also provided that the 12-member commission be strengthened by a scientific advisory panel with prescribed qualifications which included "ability to communicate not only to professional scientists but to laymen." Hearings were held on 10 May and 24 July 1962. Some moral support was provided by Carl F. Stover's report of March 1962 on "The Government of Science" to the Center for the Study of Democratic Institutions. A Department of Science and Technology, the Stover report said, would establish for science a major center of policy studies, higher stature, and a more favorable environment for scientific work. Combining all government science functions made no sense, but a single department for those functions less mission-oriented was "a sound and desirable next step in the evolution of Government action with respect to science" (*23*).

The committee now had to take judicial notice of the alternative scheme recommended by the Jackson subcommittee and seized upon by the Kennedy Administration as a sufficient response to the demands for improved science organization. Administration spokesmen pointed to OST as a needed mechanism for coordinating science policies and advising the President, whatever the organization of science functions for the government as a whole. Waterman, who was assessing NSF's truncated policy role in the wake of the OST plan, again opposed a commission, as did Elmer B. Staats, deputy director of the Budget Bureau, where all reorganization plans are put together. Their plea was that OST, being new, should have a chance to work. Furthermore, by the "statutory underpinning" of a reorganization plan, OST would give the Congress the kind of access to scientific information sought by the sponsors of S. 2771. This was the persuasive point for congressional acceptance of the plan (*24*).

Jerome B. Wiesner, who would serve the Kennedy Administration in the quadruple capacity of OST director, President's science adviser, chairman of the President's Science Advisory Committee, and chairman of the Federal Council for Science and Technology, made his first appearance before Congress as OST director when he testified on 31 July 1962 at hearings of the Holifield subcommittee (House Committee on Government Operations). In amplifying his views on science organization, Wiesner gave conditional endorsement to a Department of Science. To "set up a radically new organization" encompassing all the scientific activities of the federal government he considered unworkable. If a "less comprehensive Department of Science were created," including the Atomic Energy Commission, National Science Foundation, National Bureau of Standards, and certain other agencies, he believed the operations of these agencies might be improved. At the same time, the need would remain to coordinate and integrate the activities of these agencies with the related scientific and technical programs of the mission-oriented agencies. "In other words, the OST is neither a substitute for nor in competition with a Federal Department of Science" (*25*).

The Senate Committee on Government Operations, not daunted by the new presence of OST, reported favorably (with some technical revisions) on S. 2771, proposing a Commission on Science and Technology (*26*). The bill passed the Senate by unanimous consent on 8 August 1962 (*27*). In the House it was referred to the Committee on Science and Astronautics on 9 August, and there it died. The exercise was repeated in the 88th Congress. S. 816, sponsored by Senators McClellan, Humphrey, Mundt, Gruening, Javits, Cotton, and Yarborough, was introduced on 18 February 1963. Chairman McClellan, now the leading sponsor, emphasized that Wiesner, in his testimony before the Holifield subcommittee, maintained that OST and a Department of Science and Technology were not in conflict (*28*). The bill was approved by the Senate Committee on Government Operations and reported to the Senate on 4 March 1963 (*29*). It passed the Senate by unanimous consent on 8 March (*30*) and was referred to the House Committee on Science and Astronautics, which also had a companion bill, H.R. 4346, introduced by Representative Teague of Texas (*31*). No action was taken on these bills in the House committee.

In place of a mixed commission, the reaction on the House side was to create several new subcommittees on science. Thus in August 1963, the House Committee on Science and Astronautics created a Subcommittee on Science, Research and Development, chaired by Representative Daddario of Connecticut. And the House of Representatives, a month later, created the Select Committee on Government Research, chaired by Representative Elliott of Alabama. The Select Committee took a dim view of departmental status for science, judging by its tenth and concluding report of 29 December 1964, which contained this statement (*32*):

> The specters of overlap, gaps, conflict, and duplication among agency programs can best be met through adequate top-level coordination of agency programs. Consolidating research and development into one or a few separate agencies—such as an often suggested Department of Science and Technology—would separate such work from the purposes for which it is performed, the committee believes, with devastating effects both to the work and to the capacities of agencies to carry out their missions.

In the 89th Congress Chairman McClellan, joined by Senators Mundt, Ribicoff, Gruening, and Yarborough, reintroduced the commission bill (S. 1136) on 17 February 1965, and Representative Wolff sponsored the companion bill (H.R. 5609) in the House. By now congressional interest in the proposal had waned. No hearings were held, and the Senate committee did not bother to report it out. Humphrey, no longer a Senator, pre-

sided over the Senate as Vice President and became immersed in intricacies of space and ocean programs as statutory chairman of technical councils in these areas. Occasionally, other voices renewed the call for a department. Ralph Lapp proposed a Department of Science in his 1965 book, *The New Priesthood* (*33*). J. Herbert Holloman, after 5 years as Assistant Secretary of Commerce for Science and Technology, recommended to the Ribicoff subcommittee in 1968 that a Department of Science and Technology be a prime subject for study by a proposed Commission on Organization and Management of the Executive Branch (*34*). At the year's end, Donald F. Hornig, from the vantage point of "five years at the bench of U.S. science policy," spoke out before the AAAS in favor of a Department of Science as well as a strengthening of the President's science advisory setup (*35*).

As one traces the lines of argument for and against departmental status for science, it is apparent that they thread back to the controversy of the 1880's. The positive side, projected by the NAS committee report of 1884, is that science will benefit from the status and prestige which go with cabinet rank and large departmental resources. The negative side, well stated by Secretary of the Navy William E. Chandler before the congressional commission in 1884, is that science is not a government mission in itself but an aspect of other and proper departmental missions; consequently science bureaus or functions should be placed or remain within the department to which they are "naturally related" (*36*). Contemporary formulations haven't improved much on these themes. Proponents of a separate department for science view its secretary as a protector and spokesman of science in government councils, while opponents see a bureaucratic monstrosity in which politics prevail over scientific objectivity. On both sides attitudes are hardened by conviction or softened by practical considerations. Doubtless many who are otherwise well-intentioned toward a new department fear that it would cut down opportunities for grants and contracts given by various uncoordinated government science agencies. Others who are moved more by a concern for economy in government than for prestige in science believe that departmental organization would eliminate duplication and insure closer coordination of costly government programs.

Case for a Department

That it is impracticable to tear out research and development functions from department and agency settings and bring them all together in a new department goes without saying. But the case for a Department of Science and Technology cannot be that easily dismissed. To argue that science is a means and not an end, or that science (and technology) is not by itself a major purpose of government justifying departmental organization, narrows the issue unduly and overlooks some very practical problems. Agricultural research, let us quickly agree, is properly a part of the Department of Agriculture mission, but what about the large relatively self-contained or semiautonomous agencies with missions which fall almost completely in the domain of science and technology and which overshadow in size and importance some of the older departments? If AEC's mission is atomic energy development and NASA's is space exploration, it is merely tautological to distinguish these missions from science and technology in given fields. Then it becomes a pragmatic problem of government organization (and politics) to determine whether it is advantageous to bring together in a single department selected agencies and subagencies associated by shared purposes, related functions, or some other defining element of mutual involvement. Modern precepts of government organization and administration favor a relatively few strong departments encompassing similar or related functions in place of a profusion of independent agencies. The quest here is more compelling than a desire for organizational symmetry or housekeeping tidiness. The President, as manager of the executive branch, does not have the time to deal with scores of agencies. To maintain a proper "span of control" he must strive to bring these agencies within departmental confines and depend on the department heads to administer the manifold affairs of government (*37*).

The challenge is that government in all its diversity does not lend itself easily to departmentalizing by major purpose or mission or any other organizing principle. Most organizational arrangements are less ambitious—expedient responses to urgent problems dictated more by politics than political science. Government takes on a patchwork appearance. From time to time attempts are made to sort out and rearrange agencies and functions in more orderly patterns, even to the extent of disestablishing or reforming old departments. Not every worthy government cause which seeks wider acceptance and ampler resources through separate departmental status can be accommodated. A multiplicity of departments would defeat the rationale for departmental organization. On the other hand, if a department embraces too many missions or disparate functions, it becomes unwieldy—a conglomerate or a holding company in which the secretary struggles constantly to keep in line strong-willed administrators of operating agencies.

In a dynamic, democratic society, governmental reorganization, despite the obstacles, signifies changing policy, a new approach—and reorganization on a departmental scale makes the greatest impact. Accordingly every administration can be expected to give special attention to such possibilities. Since World War II, each President has opted for a new department—Truman for DOD, Eisenhower for HEW, Kennedy for HUD, and Johnson for DOT (*38*). The Nixon Administration has established an advisory group on reorganization, whose recommendations are yet to be made (*39*). Characteristically, the post-World War II departments each represent a coalescence of established agencies and resources to subserve a broader policy or purpose of government. In several instances, the way was prepared by interim coordinating organizations. Thus, the DOD was preceded by a looser federation formally known as the Military Establishment, HEW by the Federal Security Agency, and HUD by the Housing and Home Finance Agency. The Department of Transportation, the latest departmental creation, did not go through a transitional form but established transportation agencies were a base upon which to build.

Science and technology, comprising large sectors of government activity with various organizational forms, have a similar potential for departmental organization. When great national problems arose, requiring positive and pointed government response, independent agencies were created—the AEC for the control of atomic energy after Hiroshima, the NSF to preserve the post-World War II momentum of research and development, and NASA after Sputnik. With the passing years, as missions are completed or redirected

and as agencies mature, it is difficult to maintain the momentum and the excitement of the early days. New problems emerge, priorities are reassessed, talents are turned elsewhere. The atomic energy program is about 25 years old, the NSF has been in business 18 years, and the space agency, past its 10th birthday, will age rather quickly after a lunar landing. Reorganization generates its own excitement, infuses new energies, develops new missions.

Candidates for Inclusion

Thus AEC and NASA, independent technical agencies with multibillion-dollar yearly budgets, are prime candidates for transfer to a new department. Their interests increasingly will overlap as boosters and spacecraft come to depend more on nuclear technology. Both are sponsors of hardware development as well as basic research. Both are involved in intricate ways with Department of Defense programs. Both have large laboratory complexes and diversified resources for research and development. Both are faced with probable cutbacks and the need to reassess missions for the long term. The reassessment, in NASA's case, is associated with the moon landing, which will climax a decade of technical effort directed largely to this single goal. New vistas of space exploration beckon, but in the welfare decade of the 1970's more earth-bound causes will exert a strong gravitational pull on funds.

As for the AEC, the growth of nuclear stockpiles to what many regard as overkill dimensions and the gradual shift to industry of responsibility for nuclear power development are less climactic. The safety and regulatory functions associated with nuclear power, which some foresee as AEC's major responsibility ahead, could well be transferred to the Federal Power Commission, possibly helping to rejuvenate an old-line agency, just as the Federal Communications Commission has had to grapple with the regulatory aspects of satellite communications. Nuclear ordnance development and fabrication possibly could be shifted to the Department of Defense (*40*). The Department of Science and Technology would have, one may conceive, a space service and an atomic service, perhaps less ambitious than at present but still performing vital scientific and technical work. The reorganization also would permit a realignment and better integration of the great laboratory complexes associated with these two agencies. Indeed, the realigning process for federal laboratories as a whole could be speeded up by this means.

The National Science Foundation is a somewhat different type of agency. It maintains no laboratories except a few contract research centers and builds no large projects or systems, with the exception of the ill-fated Mohole project. It values its relative independence and freedom from political influences in supporting academic science. In terms of prospective departmental status, it could be argued that NSF has as much affinity with education as with science, and if a separate Department of Education were to be created, undoubtedly there would be advocates for inclusion of NSF. On the other hand, education reaches out toward areas of contemporary concern not closely identified with science, such as job training and placement and manpower development, so that some envisage education as the organizing principle for a Department of Human Resources (*41*). Hornig favors the science-education nexus. He would make NSF the "core" of a Department of Science, linking basic research closely with higher education. In this concept, the new department would be little concerned with technology as distinguished from science, leaving technological development to "agencies with specific tasks and missions" (*35*).

In the writer's view, the prospects for departmental status are greatly improved if technology and science are conjoined. Creating a new department is difficult enough in itself, but technology provides more leverage and power for organizational change than basic research or pure science. The new department would need a bigger core or a broader base than that offered by NSF alone. In any event, the writer sees no serious obstacle to making the NSF a component of a Department of Science and Technology. In that way grants and other financial support to academic institutions could be better integrated, since NASA and AEC also are substantial contributors to academic science. Furthermore, the 1968 amendments to the National Science Foundation Act add applied research to the agency's reponsibilities and thereby bring it closer to the technological concerns of other government agencies (*42*).

There is good logic in establishing a Department of Science and Technology to house not only older, more mature agencies but also new ones which have not yet found a suitable home. Oceanography and related disciplines or technologies may be put in this class. Numerous government agencies are engaged in marine science activities, but the Congress has been groping for a decade or more to find the organizational base for a broad program of ocean development. The 1966 legislation, which created a temporary commission and a council for marine sciences and resources, stated a policy and provided a coordinating group but sidestepped the basic organizational problem (*43*). The Commission on Marine Sciences, Engineering and Resources, on the eve of its demise, proposed that a National Oceanic and Atmospheric Agency be created as "the principal instrumentality within the Federal Government for administration of the Nation's civil marine and atmospheric programs." At the same time, the commission pointed out that it was proposing "an organization which can easily fit into a more fundamental restructuring of the Federal Government" (*44*). Clearly, the commission was leaving the door open for incorporation of marine sciences and resources in a Department of Science and Technology.

Immediate Advantages

One of the immediate advantages in creating a new government house for science and technology is the opportunity it affords for eliminating the clutter in the Executive Office of the President or at least making room for needed new services. The Aeronautics and Space Council and the National Council on Marine Resources and Engineering Development both could be abolished or, along with PSAC and OST, shifted in whole or in part to the new department, though it must be recognized that the President will continue to need a science adviser with some staff of his own. The Vice President, now statutory chairman of the space and marine councils, could retain his valuable association with government science and continue to gain the technical information and insight needed for leadership in our technocratic society by serving in some appropriate capacity, possibly as chairman of the advisory apparatus annexed to the new department. The Office of Telecom-

munications Management, for want of a better alternative, also could be housed in the Department of Science and Technology. This office needs strengthening to deal with communications problems of growing severity and technical sophistication. The Post Office and Transportation Departments each could make a claim for telecommunications management, but obviously they have enough problems of their own.

The removal from the Executive Office of its scientific or technical councils and offices is not a downgrading of science but a practical recognition that the President cannot give them sustained attention (*45*). Moreover, they have less impact on affairs than is usually supposed. Their directors parade before the government departments and agencies clothed in the uniform of Presidential prestige but are uncertain to what extent they can speak or act in his name. The department head directing a broad range of scientific and technical programs with a large budget has power and prestige of a more compelling kind. His command of resources, public visibility, and cabinet participation enable him to serve as principal science adviser to the President in a much more direct and positive way than the White House adviser or Executive Office functionary several steps removed from the scene of departmental action and operations. If the scientific community is concerned about prestige for science in government, there is considerable trade-off value in a department head as against the Executive Office coordinator or consultant.

Another advantage is that the new department could house technical agencies or bureaus which are obstacles to, or casualties of, other reorganizations. For example, in January 1967, President Johnson proposed a merger of the Departments of Commerce and Labor (*46*). He did not push the proposal when the response in congressional and some other quarters seemed unfavorable. Despite the inevitable resistance, there was merit in a merger, the objective being a department of economic affairs or economic development. Since the Department of Commerce has acquired by historical accretion a number of important technical services now encompassed in the Environmental Science Services Administration, the National Bureau of Standards, the U.S. Patent Office, and other units, it would have made sense, in the event of a Commerce-Labor merger, to extract these technical agencies and place them in a Department of Science and Technology.

Finally, a Department of Science and Technology would provide better interface with the Department of Defense. Although it would not be wise to transfer research and development commands, offices, or agencies from the Department of Defense to the civilian department in any wholesale fashion, conceivably several military-managed laboratories, agencies, or programs could be transferred on a selective basis if their relationship to military needs is limited, if they now serve many government users, and if their concern is more with science than with defense (*47*). A civil department conveniently could assume DOD responsibilities in supporting educational centers of excellence or sponsoring certain kinds of social or other research. This need not be a one-way transfer process, since formation of a new department might well involve assignment of certain functions to the military, as mentioned before in the case of nuclear ordnance. More systematic coordination and congruence of policy and program can be achieved by two major departments in balance than by one department on the military side dealing with assorted scientific and technical agencies on the civil side. Even a casual perusal of the numerous memoranda of understanding, working arrangements, and coordinating mechanisms between the DOD and NASA, for example, suggests the complexity of these interagency relationships. Complexity cannot be eliminated but it can be reduced. The logic here is even more persuasive as agencies wrestle with joint projects and interacting programs.

All the decisions as to the composition of the Department of Science and Technology need not, of course, be made at one time. If the universe of government agencies is surveyed and all possible candidates identified, then problems of transfer would seem too overwhelming for immediate solution. The important first step is to assemble the independent agencies and subagencies as the departmental core, and then to build around them. This in itself will be a monumental task, but the vision of the National Academy committee of 1884 may still be sound (*48*).

References and Notes

1. Act of 7 July 1884, 23 Stat. 219. The commission, composed of three members each from the House and Senate, was known as the Allison Commission after its chairman, Senator William B. Allison of Iowa. Lyman served as one of the House members on the commission until the end of the 48th Congress on 3 March 1885. He was defeated for reelection.
2. *Congr. Rec.* **15**, 6175 (7 July 1884).
3. The NAS committee's report was transmitted to Lyman by O. C. Marsh, president of the National Academy of Sciences, by letter dated 16 Oct. 1884. It was printed in Senate Misc. Doc. No. 82 (serial No. 2345, 49th Congress, 1st session (1886) vol. 4; also as appendix D to the *Report of the National Academy of Sciences for 1884* (Government Printing Office, Washington, D.C., 20 April 1885), p. 33.
4. The NAS committee proposed that the commission include the president of the National Academy of Sciences; the secretary of the Smithsonian Institution; two nongovernment civilian scientists of high reputation appointed by the President of the United States for 6-year terms; one officer of the Corps of Engineers; one Navy professor of mathematics skilled in astronomy (the last two to be designated by the President for 6-year terms); the superintendent of the Coast and Geodetic Survey; the director of the Geological Survey; and the officer in charge of the Meteorological Service. The secretary of the department including the science agencies would be ex officio president of the commission, and the commission would be attached to the office of the secretary.
5. Senate Rep. No. 1285, 49th Congress, 1st session (8 June 1886), p. 54.
6. See A. Hunter Dupree, *Science and the Federal Government* (Harvard Univ. Press, Cambridge, 1957), p. 215. Dupree writes of this period: "In contrast to the glorious and successful defense of the new scientific bureaus, the experts had done a ragged job for a Department of Science. The National Academy had done nothing to push the brainchild of its committee, which admitted political defeat in advance" (p. 230).
7. *Congr. Rec.* **92**, A14 (1 Feb. 1946). The Luce bill provided for a Secretary appointed by the President with Senate confirmation, and five Assistant Secretaries, appointed by the President, to head, respectively, the following bureaus: Physics and Mathematical Sciences, Public Health and Social Sciences, Scientific Education and Information, Biological Sciences, and Engineering and Technological Sciences. The Secretary would be empowered to appoint an advisory council of not more than 100 members representing all branches of science.
8. *Science—the Endless Frontier*, A Report to the President on a Program for Postwar Scientific Research (July 1945). The report was reprinted by the National Science Foundation (Government Printing Office, Washington, D.C., July 1960).
9. *Congr. Rec.* **93**, 10567 (17 Nov. 1947). See Don K. Price, *Government and Science* (New York Univ. Press, New York, 1954), p. 48.
10. *Science and Public Policy*, Report of the President's Scientific Research Board (Government Printing Office, Washington, D.C., 4 Oct. 1947), vol. 3, p. 23.
11. Public Law 81-507, 64 Stat. 149 (10 May 1950).
12. *Progress Report on Science Programs of the Federal Government*, Senate Rep. No. 2498, 85th Congress, 2d session (9 Sept. 1958), p. 14; *Congr. Rec.* **105**, 1078 (23 Jan. 1959).
13. Public Law 85-567, 72 Stat. 426 (29 July 1958).
14. Killian's address, made on 29 Dec. 1958, was printed in *Science Program—86th Congress*, Senate Rep. No. 120, 86th Congress, 1st session (23 March 1959), p. 3.
15. D. K. Price, *Government and Science* (New York Univ. Press, New York, 1954), p. 63. Price was discussing the potential role of NSF as a central science agency and not specifically a Department of Science.
16. Senate Rep. No. 120, 86th Congress, 1st session (23 March 1959), p. 26. Berkner's views were set forth in an address, "National Sci-

ence Policy and the Future," at Johns Hopkins University (16 Dec. 1958), published in the same report, appendix D, p. 110. Brode's address on the same subject as retiring president of the AAAS (28 Dec. 1959) was placed in the *Congressional Record*, along with press articles and editorials, by Senator Kefauver [*Congr. Rec.* **106**, 615 (18 Jan. 1960)]. For additional materials on the pros and cons of a department, see *Science and Technology Act of 1958*, Analysis and Summary by the Staff of the Senate Committee on Government Operations, Senate Doc. No. 90, 85th Congress, 2d session (April 1958).

17. Senate Rep. No. 120, 86th Congress, 1st session (23 March 1959), p. 29.
18. *Create a Department of Science and Technology*, hearings before the Subcommittee on Reorganization and International Organizations, Senate Committee on Government Operations, 86th Congress, 1st session, on S. 676 and S. 586 (16–17 April 1959), pt. 1, pp. 47 and 71.
19. *Establishment of a Commission on a Department of Science and Technology*, Senate Rep. No. 408 (18 June 1959), p. 6.
20. *Ann. Amer. Acad. Polit. Soc. Sci.* (Jan. 1960), p. 27; Senator Humphrey placed this article in the *Congressional Record* [**106**, 5235 (10 March 1960)].
21. *Organizing for National Security: Science Organization and the President's Office*, staff study by the Subcommittee on National Policy Machinery, Senate Committee on Government Operations, 87th Congress, 1st session (committee print, 14 June 1961), p. 1.
22. House Doc. 372, 87th Congress, 2d session (29 March 1962).
23. Senator Humphrey placed an excerpt from the Stover report in the *Congressional Record* [**108**, 11822 (27 June 1962)]. A statement by Stover supporting the commission proposal was printed in *Establishment of a Commission on Science and Technology*, Senate Rep. No. 1828, 87th Congress, 2d session (6 Aug. 1962), p. 50. The report *The Government of Science* proposed that the Department of Science and Technology absorb the activities of NSF, PSAC and FCST, along with the Weather Bureau, National Bureau of Standards, Office of Saline Water, Coast and Geodetic Survey, Navy Hydrographic Office, Naval Observatory, portions of the Smithsonian's research work, and the Antarctic programs of the Navy and NSF. Larger agencies such as NASA and NIH were cited as candidates for inclusion, though AEC was excluded on the ground that its size and operational character could overwhelm the new department.
24. *Create a Comission on Science and Technology*, hearings before the Senate Committee on Government Operations, 87th Congress, 2d session, on S.2771 (24 July 1962), pt. 2; *Reorganization Plan No. 2 of 1962*, hearings before a subcommittee of the House Committee on Government Operations, 87th Congress, 2d session (17 April 1962). Jerome B. Wiesner wrote later: "Possibly the most important consequence of providing a statutory basis for the scientific activities in the Executive Office of the President is that the Director may now appear before Congress to explain, when possible, the Government-wide views of activities and problems" [*Where Science and Politics Meet* (McGraw-Hill, New York, 1965), p. 47].
25. *Systems Development and Management*, hearings before the Military Operations Subcommittee of the House Committee on Government Operations, 87th Congress, 2d session (1 July 1962), pt. 1, p. 156.
26. *Establishment of a Commission on Science and Technology*, Senate Rep. No. 1828, 87th Congress, 2d session (6 Aug. 1962).
27. *Congr. Rec.* **108**, 15968 (8 Aug. 1962).
28. Senator McClellan placed excerpts from the Wiesner testimony in the *Congressional Record* on two separate occasions [**109**, 2395 (18 Feb. 1963) and *ibid.* (23 May 1963), p. 9299]. It was also carried in the committee report cited below (*29*).
29. *Establishment of a Commission on Science and Technology*, Senate Rep. No. 16, 81st Congress, 1st session (4 March 1963).
30. *Congr. Rec.* **109**, 3808 (8 March 1963). In remarks accompanying the bill Senator Humphrey said an independent "Hoover-type" commission was needed to (i) counterbalance the executive's excessive dependence on a small in-group of scientists for policy advice and program evaluation; (ii) review, with the aim to improve, the activities of the NAS–NRC as well as those of the government agencies; and (iii) examine federal organization for information retrieval.
31. Referring the bills to the House Committee on Science and Astronautics signified a change in jurisdictional policy. Heretofore such bills had been referred to the House Committee on Government Operations, which generally has jurisdiction over organization matters.
32. *National Goals and Policies*, House Rep. No. 1941, 80th Congress, 2d session (29 Dec. 1964), p. 49. The Select Committee expired with the 88th Congress on 3 Jan. 1965. In accordance with one of its recommendations, a Subcommittee on Research and Technical Programs was established within the House Committee on Government Operations. This subcommittee, chaired by Representative Reuss, was in existence through the end of the 90th Congress.
33. R. Lapp, *The New Priesthood* (Harper & Row, New York, 1965), p. 204. Lapp proposed that the Department of Science make basic research grants (on a lump-sum basis); manage the government laboratories; absorb all or part of the functions of OST, PSAC, and FCST; and take over the functions of the AEC (civilian part), NSF, ONR, Office of Saline Water, National Bureau of Standards, and the Weather Bureau.
34. *Establish a Commission on the Organization and Management of the Executive Branch*, hearings before the Subcommittee on Executive Reorganization of the Senate Committee on Government Operations, 90th Congress, 2d session (23 Jan. 1968), p. 58. Hollomon proposed that the Department of Science and Technology include the NSF, NASA, ESSA, National Bureau of Standards, Geological Survey, Census Bureau "and perhaps parts of NIH and the AEC."
35. D. F. Hornig, remarks at AAAS Meeting, Dallas, Texas (29 Dec. 1968).
36. Senate Misc. Doc. No. 82 (serial No. 2345), 49th Congress, 1st session (1886), vol. 4, p. 66.
37. The usual text for this organizational approach is the report of the First Hoover Commission, "General Management of the Executive Branch" (Feb. 1949), which recommended that: "The numerous agencies of the executive branch must be grouped into departments as nearly as possible by major purposes in order to give a coherent mission to each Department" (p. 34). Senator Humphrey quoted this recommendation in his *Annals* article (*20*).
38. The Department of Housing and Urban Development actually was established during the Johnson Administration, although President Kennedy pressed for its creation from the beginning of his administration. The stumbling block to congressional acceptance was President Kennedy's announced intention to appoint Robert C. Weaver as Secretary of the new department. Similarly, congressional opposition to a putative department head (Oscar R. Ewing) prevented President Truman from getting the Department of Health, Education, and Welfare, which was created in the Eisenhower Administration.
39. President Nixon announced the appointment of an Advisory Council on Executive Organization on 5 April 1969. The members are: Roy L. Ash (chairman), president of Litton Industries, Inc.; George Baker, dean of the Graduate School of Business Administration, Harvard University; John B. Connally, former governor of Texas; Frederick R. Kappel, chairman of the executive committee, American Telephone and Telegraph Company; and Richard M. Paget, member of Cresap, McCormick and Paget.
40. Lapp (*33*, p. 206) proposed that the AEC's nuclear production facilities be mothballed in part and the remainder transferred to the Department of Defense. Representative Craig Hosmer, in an address "The Science Establishment: Where Is It Headed?" [*Congr. Rec.* (6 March 1968), p. E1606] posed the AEC problem in terms of diversification or decline: "Unless AEC's charter is revised to give it a responsibility to conduct research for other government agencies, it would seem that some of these facilities and programs would be better off under an organization more fundamentally oriented toward basic research, such as the National Science Foundation."
41. R. E. Miles, Jr., *Public Admin. Rev.* **27**, 1 (March 1967). Text included in hearings before the Subcommittee on Executive Reorganization, Senate Committee on Government Operations, 90th Congress, 2d session (23 Jan. 1968), p. 115.
42. Public Law 90-407, 82 Stat. 360 (18 July 1968).
43. Public Law 85-454, 80 Stat. 203 (17 June 1966). See also Public Law 90-242, 81 Stat. 780 (2 Jan. 1968).
44. *Our Nation and the Sea*, Report of the Commission on Marine Science, Engineering and Resources (9 Jan. 1969 preprint), p. 7.
45. ". . . The easy answer to all problems in Government, scientific and nonscientific, seems to be to move them closer to the President. I don't think that tenable for all things—he is already overburdened" [D. F. Hornig (*35*)].
46. *State of the Union Message*, House Doc. No. 1, 90th Congress, 1st session (19 Jan. 1967), p. 3.
47. A current example of a government laboratory with diversified scientific capabilities and no obvious place to go upon withdrawal of military sponsorship is the Navy Radiological Defense Laboratory. It is slated for closure by the end of this year, even though its resources could be readily adapted to important research in the civil sector. The proposed closure of NRDL also illustrates the poor planning not infrequently found in government. Six months ago a $6-million cyclotron was installed for special research in biomedical effects of radiation.
48. The views expressed herein are the author's and not necessarily those of any member of the Congress.