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K_1S_2: KOREA, SCIENCE AND THE STATE

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The cold war has become, in large measure, a technological race for military advantage.

-- David Z. Beckler, Executive Secretary, Science Advisory Committee, 1955 [1]

To scientists concerned with national security after World War II, the miracles achieved by the wartime Office of Scientific Research and Development (OSRD) -- and especially by the dramatic results of its spinoff Manhattan Project -- demanded a permanent transformation of the relationship between civilian science and the American state. National security was understood to depend, henceforth, upon technological superiority. The atomic bomb had brought the war in the Pacific to a sudden end without risking the expenditure of ground troops in an invasion of the Japanese Home Islands. Now nuclear weapons and other technological means were touted to offset the Soviet manpower advantage in postwar Europe. Technological superiority required, in turn, state-supported programs and facilities of scientific research. And, of course, staffing the programs and facilities called for overcoming the acute wartime shortages of expert personnel by steadily enlarging the nation's pool of trained scientists and engineers.

The research had to address two broad types of subjects: those clearly related to military technology (for example, the behavior

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[1] Beckler, "Notes on Science Organization and National Policy," Karl T. Compton/James R. Killian MSS, MIT Archives, Box 257, folder 21. (Hereafter, C/K MSS). For support during the period of research on this paper, I am grateful for a fellowship year at the Center for Advanced Study of the Behavioral Sciences, Stanford, California, and for a grant from the Alfred P. Sloan Foundation.

of electromagnetic radiation at the frequencies of microwave radar); second, those falling under the rubric of pure science, often defined by a logic internal to the field and commonly exemplified, in the discussions of the late 1940s, by the nuclear explorations that had made possible the invention of the atomic bomb. The first would contribute directly to the development of military technology; either could yield radically new weapons in the future. Some of it could be conducted in government laboratories. But among the key lessons of OSRD was that a significant part of it had to exploit the civilian scientific sector outside government, the laboratories of both industry and — for the most innovative work — of academia. Here — at least in the view of the civilian scientific veterans of OSRD — was where fresh thinking and activity on the frontiers of science were the norm. Here was where the ideas for radical new weapons and weapons systems would most likely originate — especially if its knowledgeable civilian scientists were kept involved in the forging of national strategic policy. As Vannevar Bush, the head of OSRD, had argued as early as 1941, only by drawing upon scientific experts familiar with the latest laboratory products could military planners know the best way to exploit new weapons. Only by having access to the military's strategic requirements could defense scientists best understand the kinds of weapons that needed developing.[2]

By 1949/50, the eve of the Korean War, a series of policy initiatives and political compromises had transformed relationships

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[2] Kevles, The Physicists (1987), p. 308.

between science and the American state to a considerable extent. In fiscal 1950, the federal government spent some $1 billion for R&D, which was almost $300 million more than it had spent for the purpose in 1946, the year of demobilization. Most of it — 90% — came from the Atomic Energy Commission (AEC) and the Department of Defense (DOD). The DOD R&D budget totaled somewhat more than $500 million, which supported at least 15,000 different projects. Some 54% of the department's R&D obligations were for work in industry; about 9% for research in universities and other non-profits. The Defense Department's role in American science was an intensified version in 1950 of what it had already started to become in the immediate postwar period, when the director of the Research and Development Division of the Army General Staff had declared that "the publically owned laboratories and drafting rooms, as well as the research and engineering staffs of our educational institutions, industries and foundations, are being put to work in as orderly a manner as possible by the research and engineering agencies of the War and Navy Departments."[3]

However, about 36% of DOD research dollars went to government laboratories, including such civilian facilities as the National Bureau of Standards, but mainly to the installations of the armed services themselves, and many civilian scientists found defense research in the service laboratories decidedly unattractive. While pay scales were said

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[3] Paul Forman, "Behind Quantum Electronics: National Security as a Basis for Physical Research in the United States, 1940-1960," HSPS (1987), p. 180; James Forrestal to Karl T Compton, Sept. 30, 1948; Chart, "Research and Development Obligations of the Department of Defense," Fig.2, attached to "Science Advisory Committee, Summary, Mtg. No. 3," Sept. 18, 1951, C/K MSS, Box 245, Folder 16; Box 256, folder 10.

to be competitive for junior, less distinguished personnel, at the senior level they were thought to be noncompetitive with those in industry and academia.[4] Then, too, at a number of service laboratories, civilian scientists had to work under the control of military officers and to submit to their judgment in technical matters. Among the worst offenders in the management of civilian scientists was the Air Force's principal R&D facility at Wright Field, in Dayton, Ohio, where slights against civilians included prohibiting them from using the Officers' Club. The Air Force, having long relied for technical advances on industrial contractors and the National Advisory Committee for Aeronautics, had no tradition of civilian-scientific management; it was in the process of building up its R&D capacities virtually from scratch. Still, the military's traditional jealousy of its prerogatives pervaded the other two service branches. Not only at Wright Field but in several Army and Navy laboratories, it was difficult to get and hold first-class civilian scientists.[5]

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[4] Chart, "Research and Development Obligations of the Department of Defense," Fig.2, attached to "Science Advisory Committee, Summary, Mtg. No. 3," Sept. 18, 1951, C/K MSS, Box 245, Folder 16; Box 256, folder 10; William T. Golden, Memo to File, "Conversation with Robert F. Bacher . . . ," Nov. 6, 1950, p.2, William T. Golden MSS

[5] William T. Golden, Memos to File, "Conversation with Brigadier General L.E. Simon and Major General A.C. McAuliffe, March 1, 1951 as of Feb. 28, 1951, p. 1; "Conversation with Lt. General Hull and Dr. Robertston, Director and Deputy Director of the Weapons System Evaluation Group," Nov. 21, 1950 as of Nov. 15, 1950, p. 1; "Meeting with Roger W. Jones, Assistant Director in Charge of Legislative Reference, Bureau of the Budget," Oct. 11, 1950, p. 1; "Conversation with Dr. Ellis Johnson and George Shortley, Director and Deputy Director, Operational Research Organization, U.S. Army (Johns Hopkins Contract) Nov. 21, 1950; "Conversation with Mr. William A. M. Burden," Feb. 27, 1951 as of Feb. 18, 1951, pp. 1-2; Golden MSS. John Manley, assistant to the director at Los Alamos, thought that the military had

Each of the armed services had gotten around the pay-scale constraint — and compromised on the control issue — by extending into peacetime arrangements that had originated during the war under which leading universities managed major weapons research facilities for defense agencies. Perhaps the best known was the Los Alamos Weapons Laboratory, which the University of California operated, first for the Manattan Project, then for its successor, the Atomic Energy Commission. (In 1949, J. Robert Oppenheimer remarked with irony that "it is a great liberal university that is the only place in the world, as far as I know, that manufactures, under contract with the United States governmnent, atomic bombs." He added, "I have sometimes asked myself whether we can find any analogy to this situation in the practice of the monastic orders that devote a part of their attention and derive part of their sustenance from the making of their private liquers."[6]) Operating in the shadow of Los Alamos but also products of the war were several university-connected laboratories under DOD sponsorship. Typical of them were the Jet Propulsion Laboratory at the California Institute of Technology and the Applied Physics Laboratory of The Johns Hopkins University, the former a ward of Army Ordnance, the latter of Navy Ordnance — and both devoted to basic research related to the

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learned to use scientists since the war and was managing to get and keep good ones. William T.Golden, "Notes of Conversations re Study of Military and Scientific Research and Scientific Mobilization," [Sept./Oct. 1950: conversation with Manley, Sept. 21, 1950], Golden MSS.

[6] J. Robert Oppenheimer, Uncommon Sense, eds., N. Metropolis, Gian-Carlo Rota, and David Sharp (1984), p. 30.

development of guided missiles.[7]

Defense research loomed large everywhere in the civilian scientific sector. The military supplied about 15% of the Bell Telephone Laboratory budget. It spent $350 million dollars on research in industrial laboratories, accounting for about 25% of the total dollar performance in the industrial R&D sector. About two thirds of the budget of the National Bureau of Standards came from other government agencies, mainly the military. The nominally civilian National Advisory Committee for Aeronautics had been reallocated in the U.S. Code from Title 49, "Transportation," to Title 50, "War," partly in recognition that its budgetary growth had been based "entirely on military considerations."[8] The Army Signal Corps sustained the MIT Research Laboratory in Electronics -- 85% of the MIT research budget

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[7] Clayton R. Koppes, JPL and the American Space Program: A History of the Jet Propulsion Laboratory (1982), pp. 18-34; Michael Aaron Dennis, "No Fixed Position: University Laboratories and Military Patronage at Johns Hopkins and MIT, 1944-46," unpublished paper (1987). Army Ordnance's sponsorship of JPL expressed sharply the change in the military's attitude toward civilian science. The footsoldier's Army had long been the most backward of the services with respect to scientific research. Ordnance, which received about two thirds of Army R&D funds, had traditionally been prone to rely on its own laboratories, such as the Aberdeen Proving Grounds, and to distrust civilian establishments. William T. Golden, Memo to File, "Meeting with Roger W. Jones, Assistant Director in Charge of Legislative Reference, Bureau of the Budget," Oct. 11, 1950, Golden MSS. See the comments on contract-operated government laboratories in Oliver Buckley to the President, May 1, 1952, attached to Science Advisory Committee, "Summary, Meeting No. 11," May 9, 1952, C/K MSS, Box 256, folder 12.

[8] William T. Golden, Memo to File, "Conversation with E. U. Condon, Director, National Bureau of Standards, and Messrs. Hugh Odishaw and N.E. Golovin, Assistants to the Director," Oct. 31, 1950, p.3, Golden MSS; "Research and Development in the United States, 1941-1952," table attached to Oliver Buckly to James Killian, Oct. 26, 1951, C/K MSS, Box 256, folder 10; Forman, "Behind Quantum Electronics" (1987), p. 211; Roland, Model Research (1985), I, 260-61.

came from the military and the AEC — the Radiation Laboratory at Columbia, and the Croft Laboratory at Harvard. The Atomic Energy Commission funded the big accelerator installations at the Radiation Laboratory, in Berkeley, and at Brookhaven. The AEC was also supporting some 800 fellowships a year in the physical and biomedical sciences, while the Office of Naval Research — by far the principal military patron of academic science and currently the sponsor of some 1200 research projects in almost 200 universities — was assisting some 2,500 science students towards their Ph.D.s. In 1949, the Defense Department together with the AEC accounted for 96 percent of all federal dollars spent on the campuses for research in the physical sciences. For every two of those dollars spent by the AEC, the military spent at least three.[9]

The powerful military patronage of academic science worried a number of the nation's scientific leaders. In 1949, Lee DuBridge, the head of the Radiation Laboratory at MIT during the war and now the president of the California Institute of Technology, declared, "When science is allowed to exist merely from the crumbs that fall from the table of a weapons development program then science is headed into the stifling atmosphere of `mobilized secrecy' and it is surely doomed —

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[9] Forman, "Behind Quantum Electronics" (1987), pp. 156, 204, 186-7; Chart, "Research and Development Obligations of the Department of Defense," Fig.2, attached to "Science Advisory Committee, Summary, Mtg. No. 3," Sept. 18, 1951, C/K MSS, Box 256, folder 10; Kevles, The Physicists (1987), pp. 355, 359; William T. Golden, Memos to File, "Conversation with Kenneth Pitzer, Director, Research Division, AEC," Oct. 31, 1950, p. 1; "Conversation with Rear Admiral T. Solberg, Director of Office of Naval Research," Jan. 15, 1951 as of Jan. 10, 1951, p. 1, Golden MSS.

even though the crumbs themselves should provide more than adequate nourishment." Unversity scientists were constantly — and rightly — apprehensive that the military might impose security restrictions on their research. Some worried that the military's overwhelming presence in university science would distort its intellectual direction.[10] However, DOD supported not only basic research recognized, to quote a later Defense Department directive, "as an integral part of programmed research commited to specific military aims"; it also provided a good deal of money for projects in pure science free of most restrictions, security or otherwise. In any case, in March 1950 President Harry S Truman signed into law the bill establishing the National Science Foundation, which was intended to be the flagship of fundamental science in the United States and was expected in many quarters to take over much of the pure-research activity of the military.[11]

While all this patronage gave the military leverage over the course of civilian science, in the postwar period civilian scientists also gained influence in the shaping of policy for the technology of national security. Some of the influence arose from consultantships and summer studies, like that begun in late 1949 by the MIT physicist Jerrold R. Zacharias, who agreed to head an investigation for ONR on ocean transport and antisubmarine warfare. (The study, conducted during

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[10] Forman, "Behind Quantum Electronics" (1987), p. 185; Kevles, The Physicists, pp. 378-79;

[11] Department of Defense Directive, "Policy on Basic Research," June 19, 1952, C/K MSS, Box 256, folder 13; Kevles, The Physicsts, p. 356; William T. Golden, Memo to Files, "Conversation with Dr. Vannevar Bush," Dec. 5, 1950, Golden MSS.

the summer of 1950, was dubbed Project Hartwell, because the civilian scientists who carried it out dined frequently at the Hartwell Farms Restaurant, which was near the MIT field station in Lexington, Massachusetts, where they did the work.)[12] Some of the influence also derived from participation in analytical service cadres for planning and evaluating weapons systems. The Army had an Operational Research Office; the Navy, the Operational Evaluation Group. The Air Force had several groups of such experts attached to its various commands and also the RAND Corporation, in Santa Monica, California. At the top of the armed services, attached to the Joint Chiefs of Staff, was the Weapons Systems Evaluation Group (WSEG), comprising some 25 civilian scientists along with an equivalent number of military officers. More general policy influence came from participation in key standing scientific advisory committees. In the most portentous area, there was the General Advisory Committee of the Atomic Energy Commission, which was loaded with world-class physicists. In the workaday areas of practical military postures, there were, notably, the Air Force Scientific Advisory Committee, the Naval Research Advisory Committee, and the Army Scientific Advisory Panel, each populated by prominent scientists and engineers from industry as well as academia.[13]

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[12] Hartwell ran formally from March through December 1950 and cost $124,000, much of which went to pay the summer salaries of the 21 civilian scientists responsible for the study. T. J. Crane to James R. Killian, July 23, 1954, C/K MSS, Box 257, folder 18; Jerrold R. Zacharias, with Myles Gordon, "Military Technology: One of the Lives of J.R. Zacharias," ms of a draft autobiography (1986), chapter I.

[13] Kevles, The Physicists (1987), p. 355; Herbert York and Alan Greb, "Military Research and Development: A Postwar History" (1977), pp. 16-17; William C. Foster to John Stennis, April 23, 1952, C/K MSS,

The most wide-ranging and, at least nominally, powerful defense-science advisory group was the Research and Development Board (RDB), which had been established by the National Security Act of 1947 to advise the secretary of defense upon the progress and needs of scientific research and development in connection with national security. While the RDB comprised representatives of each of the armed services, it was by law headed by a civilian. It was empowered, among other things, to consider and advise the Joint Chiefs upon the interaction of R&D with strategy. It was, in short, designed to institutionalize Bush's vision of a coequal interplay between civilian scientists and professional military officers in the formation of policies for the development and use of new weapons.[14] Indeed, Bush had been its first chairman, and he was succeeded, in 1948, by Karl T. Compton, the prominent physicist, president of MIT, veteran of the wartime OSRD, and Bush's good friend. When Compton took office,

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Box 256, folder 12; William T. Golden, who was surveying defense research, noted, "Advisory committees are becoming increasingly fashionable." Golden, Memos to File, "Conversation with Brigadier General L.E. Simon and Major General A.C. McAuliffe," March 1, 1951 as of Feb. 28, 1951, p. 3; File, "Conversation with H.P. Robertson, Deputy Director, WSEG; Dr. Louis Ridenour, Special Adviser to the Secretary of the Air Force and to the Director of Research and Development of the Air Force; and Professor Marshall Stone," Dec. 8, 1950, pp. 1-2; "Conversation with Lt. General Hull and Dr. Robertston, Director and Deputy Director of the Weapons System Evaluation Group," Nov. 21, 1950 as of Nov. 15, 1950, p.1, Golden MSS.

14 U.S. Statutes at Large, Vol. 61 (1947), Pt. 1, pp. 506-7. The revision of the National Security Act, in 1949, left the duties of the Board virtually unchanged. U.S. Statutes at Large, Vol. 63 (1949), Pt. 1, pp. 584-85. The RDB replaced the Joint Research and Development Board, which had been established in 1946 and which was, in turn, an outgrowth of the wartime Joint Committee on New Weapons and Equipment. York and Greb, "Military Research and Development: A Postwar History" (1977), 14-15.

Secretary of Defense James Forrestal told him that, in his view, the chairman of the RDB was "the center in the National Military Establishment of the application of science to war," his principal adviser in that area, and essential to the Joint Chiefs of Staff for introducing into war planning adequate consideration of the evolution of weapons.[15]

By 1949, as a result of directives from the Secretary of Defense, the RDB was charged with drawing up and putting into effect a "complete and integrated program of research and development for military purposes." It was also to keep tabs on the activities and budgets of the various individual service agencies, and force shifts in their programmatic emphases if necessary. To carry out these considerable duties, the RDB had a full-time staff of about 250 people, distributed over numerous committees, which called upon some 2,500 civilian and military individuals for advice.[16]

In early November, 1949, Compton, who was about to leave the chairmanship of the RDB for reasons of ill health, summarized the defense research situation to President Truman and pronounced it good. In the preceding year, not only had the RDB reported to the Joint Chiefs on the status of every R&D item that might impinge upon future military strategy but, in cooperation with the Joint Chiefs, it had

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[15] Forrestal to Compton, Sept. 30, 1948, C/K MSS, Box 245, folder 16.

[16] Secretary of Defense [Louis Johnson], "Directive Research and Development Board," Sept. 14, 1949, C/K MSS, Box 245, folder 17; William T. Golden, Memo to File, "RDB - Conversations with Messrs. Loomis, Walker, and Cornell," Nov. 13, 1950 as of Nov. 10, 1950, Golden MSS.

prepared a systematic plan for military R&D "based on the strategic thinking of the Joint Chiefs," a plan that the departments and the Board had used in preparing their budget estimates. Particularly exciting to Compton, it had been possible to recommend a military R&D program for the next year that was not significantly affected by shortages in technical personnel. The postwar shortage had eased considerably. Henceforth, Compton hoped, the military R&D budget could be "determined on the basis of military value in the light of national policy, rather than by the more arbitrary standards which of neccesity had to be applied previously." [17]

About two months before Compton wrote his summary, the President announced that the Soviet Union had detonated its first atomic bomb. Later in 1949, China was declared to have "fallen" to the control of the Communists under Mao Tse Tung. But while the budget of the AEC was expanded considerably and a commitment to a crash hydrogen-bomb development program was made, there was no overall increase of funding or activity in the non-nuclear area of defense research. Quite the contrary: The general defense R&D budget had already fallen from $530 million in fiscal 1949 to $510 million in fiscal 1950. The Truman administration recommended for fiscal 1951 its lowest overall military

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[17] Compton to the President, Nov. 2, 1949, C/K MSS, Box 245, folder 17. Even Vannevar Bush thought that defense research was in pretty good shape, certainly in far better shape than it had been in 1940. William T. Golden, Memo to File, "Conversation with Vannevar Bush," Oct. 24, 1950, p. 3, Golden MSS. In the view of insiders, the RDB was thought actually to control all DOD R&D funds. See William T. Golden, "Notes of Conversations re Study of Millitary and Scientific Research," [Sept./Oct. 1950], especially the conversations with Willis Shapley and John Manley, Golden MSS.

budget since the end of the war. In the spring of 1950, Congress approved the budget virtually unchanged, including funds for defense R&D virtually unchanged from the previous year, meaning lower absolutely than in fiscal 1949 and, in constant dollars, lower still. Beneficiaries of ONR support of basic research were apprehensive, and rightly so. The ample patronage that ONR was providing academic science had its critics at the highest levels of the Navy; indeed, the Navy's General Board had delivered itself of the opinion that "expenditures for this purpose should be assigned a relatively lower priority if further curtailment of the total research and development budget is necessary."[18]

Then, too, despite Compton's optimism, the armed services were by no means making civilian scientists full partners in their strategic planning. The physicist Lawrence Hafstad, a civilian scientific insider as head of the Reactor Development Division of the AEC, judged that the Navy was generally disinclined to admit scientific outsiders to its high councils. In Hafstad's view, both Army and Navy Ordnance were still ruled by tight, exclusionary cliques. The Air Force, reportedly, kept trying to have the Weapons System Evaluation Group eliminated.[19]

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[18] York and Greb, "Military Research and Development" (1977), p. 17; Forman, "Behind Quantum Electronics" (1987), pp. 157-58 and n. 13; Karl Compton, "The Research and Development Budget of the Department of Defense," Oct. 30, 1950, attached to Compton to E. O. Lawrence et al, Oct. 31, 1950, C/K MSS, Box 245, folder 19; Harvey Sapolsky, "Academic Science and the Military: the Years Since the Second World War," in Reingold, ed., The Sciences in the American Context (1979), pp. 387-88.

[19] William T. Golden, Memos to Files, "Conversation with Dr. Lawrence Hafstad, Director, Reactor Development Division, Atomic Energy Commission," Nov. 8, 1950, p. 2; "Telephone Conversation with Dr. H.P. Robertson," Jan. 25, 1951, Golden MSS.

And the Research and Development Board was in trouble. In part, the difficulties of the RDB derived from the immensity of the job it had taken on — the policing of the entire defense R&D budget --which many of its civilian scientific members and consultants found daunting and which earned it the enmity of a number of armed service branches. The Board also suffered from lack of leadership between Compton's resignation and the appointment of his successor, William Webster, a 1920 graduate of the Naval Academy and a 1924 alumnus of MIT, who had spent his post-Navy days mainly in the electrical utilities industry, and World War II in OSRD. But once Webster took office, early in 1950, he found that he was only rarely invited to sit with the Joint Chiefs of Staff during their deliberations on R&D and he felt himself very much an outsider.[20]

Thus, on the eve of the Korean War, what civilian scientists took to be the requirements of defense R&D had not been entirely fulfilled. While the military's involvement in civilian science was decidedly more substantial than it had been in 1940, its devotion to enlarging the pool of fundamental knowledge was questionable and its

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[20] Karl Compton to the President, Nov. 2, 1949, R. F. Rinehart to Hanson W. Baldwin, Feb. 4, 1950, C/K MSS, Box 245, folders 17, 19; William T. Golden, Memo to File, "Conversation with Mr. William Webster, Chairman, Research and Development Board, Department of Defense, Nov. 1, 1950, Golden MSS. According to Admiral Arthur C. Davis, the director of staff for the Joint Chiefs, the chiefs did not as a group concern themselves with the details of new or improved weapons, nor with their implications for war plans. Golden, Memo to File, "Notes of Conversations re Study of Military and Scientific Research and Scientific Mobilization," [Sept./Oct. 1950], Golden MSS.The dissatisfaction with the participation of civilian scientists in strategic planning is evident in Vannevar Bush, Modern Arms and Free Men, (1949), pp. 251-53, 261.

resources for the purpose were limited. Moreover, the armed services on the whole remained committed to their traditional insistence upon controlling defense R&D and equally traditional reluctance to cooperate with civilian scientists in strategic planning.[21] Still, in the Atomic Energy Commission, the Applied Physics Laboratory, the Jet Propulsion Laboratory, and wherever else civilian scientists were tied to the military but independent of its close control, radical new weapons -- the hydrogen bomb, certain types of guided missiles, and a variety of other hardware innovations -- were aborning. All suggested what institutionalized civilian science might -- for better or for worse -- contribute to national defense, given enough resources and proper integration into national defense planning.

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The outbreak of the Korean War, in June 1950, provoked a mood of grim-faced preparedness among policymakers in the United States. If the Soviets had previously seemed to rely on subversion to achieve their aims, now they were perceived to threaten the West with armed aggression -- a challenge that demanded not only a major and immediate increase in military strength but, perhaps, an even larger boost in defense R&D. Karl Compton reflecting, in October 1950, on the defense

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[21] William T. Golden, Memo to Files, "Conversation with Dr. Lawrence Hafstad, Director, Reactor Development Division, Atomic Energy Commission," Nov. 8, 1950, p. 2. For the difficulties that scientists faced in the strategic planning area during World War II, see Kevles, The Physicists (1987), pp. 309-323.

research budget, noted the "danger of military aggression, like Korea, in other quarters, which could lead to piecemeal defeat or all-out war" and added: "The United States cannot match its potential adversary in numbers. . . . Our main source of military superiority is in those technological developments which multiply the per capita fighting effectiveness of our forces." [22]

In short order, the defense R&D budget followed the overall defense budget into the stratosphere, doubling to slightly more than $1.3 billion in fiscal 1951, and rising still higher, to about $1.6 billion in fiscal 1952. By late 1951, it was estimated that DOD and AEC contracts accounted for nearly 40 percent of all industrial and academic research effort. Defense research was estimated to be occupying some two thirds of the nation's scientists and engineers. At the American Physical Society meeting earlier that year, perhaps the principal non-technical topic of conversation was the wholesale and high-powered recruiting of scientists by defense agencies, especially the Air Force. Planners were once again concerned with shortages of technical manpower, and the draft status of young scientists, particularly in such critical fields as nuclear physics and electronics, was once again a matter of policy debate. [23]

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[22] Compton, "The Research and Development Budget of the Department of Defense," Oct. 30, 1950, attached to Compton to E. O. Lawrence, Oct. 31, 1950, C/K MSS, Box 245, folder 19.

[23] Oliver E. Buckley, "An Appraisal of Some Indicated Needs of Defense Research . . . ," Dec. 31, 1951, attached to "Science Advisory Committee, Summary of Meeting No. 6," Dec. 11, 1951; Karl T. Compton, "The Research and Development Budget of the Department of Defense," Oct. 30, 1950, attached to Compton to E. O. Lawrence, Oct. 31, 1950, C/K MSS, Box 256, folder 11; Box 245, folder 19; William T. Golden,

A series of administrative moves inside DOD expressed the sense of technological emergency. In mid-1950, Secretary of Defense Louis Johnson attempted to beef up the Research and Development Board by allocating $25 million in the Board's fiscal 1952 budget for distribution to departmental R&D programs. In February 1951, Secretary of Defense George C. Marshall formally enlarged the Board's powers in a directive that authorized it to "originate research work" of military value for which the various armed services had no projects.[24] (However, the enormous increase in the defense program further overwhelmed the oversight capacities of the Board. To cope, Chairman William Webster concluded that, "instead of striving to achieve the soundest possible balance within a total research and development program bounded by a fixed over-all dollar limit, we must now seek to insure that we recognize the major challenges to research and development, that no stone is left unturned to meet these challenges." In his view, the RDB committees ought no longer to engage in "routine scrutiny" but to focus their attention on programs of "greatest consequence.")[25]

Memo to File, "Conversation with Dr. Robert F. Bacher," Feb. 6, 1951 as of Feb. 3, 1951, p. 2, Golden MSS; Forman, "Behind Quantum Electronics" (1987), p. 167, n. 32.

[24] William Webster to Robert E. Wilson, July 6, 1950; "Directive Research and Development Board," Feb. 1, 1951, C/K MSS, Box 245, folder 19; Box 246, folder 4.

[25] William T. Golden, Memo to File, "Conversation with Mr. William Webster," Dec. 20, 1950 as of Dec. 18, 1950, Golden MSS; K. T. Compton to Robert P. Russell, Dec. 26, 1950; William Webster, "Memorandum for Chairmen, RDB Committees, Draft 143, Jan. 9, 1951, C/K MSS, Box 246, folder 2, folder 3.

In 1950, Secretary of Defense George C. Marshall established an Office of the Director of Guided Missiles in the Defense Department and appointed as head of it the industrialist K.T. Keller, who quickly became known as the "missile czar." Civilian scientists were brought in and given authority at the top of the Air Force and an independent Research and Development Command was created at Wright Field. In March 1950, the Air Force was given exclusive jurisdiction over the development of long-range strategic missiles. In the meantime, the Army and Navy accelerated their short-range missile programs. The Army transferred a team of missile engineers to the Huntsville Arsenal, in Huntsville, Alabama, where, under Wehrner von Braun, work commenced on the development of a tactical ballistic missile. In Pasadena, California, the Jet Propulsion Laboratory obtained authorization from Army Ordnance to move beyond basic research into the development of the Corporal guided missile, which would be designed for tactical use carrying atomic warheads in the European theater. Between 1950 and 1953, the JPL budget more than doubled, to $11 million a year, and its staff similarly multiplied.[26]

The expansion in defense R&D prompted the administration to come to grips with a variety of issues in the mobilization and management of civilian science, some of them predating the outbreak of

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[26] York and Greb, "Military Research and Development: A Postwar History" (1977), pp. 17-18; Michael Armacost, The Politics of Weapons Innovation (1969), pp. 26-27; Ernest J. Yanarella, The Missile Defense Controversy (1977), pp. 37-38; William T. Golden, Memos to File, "Conversation with Mr. William A. Burden and Henry Loomis," Jan. 30, 1951; "Conversation with . . . Burden," Feb. 27, 1951 as of Feb. 18, 1951, Golden MSS; Koppes, JPL and the American Space Program (1982), pp. 43-48.

the Korean War. There was the approaching activation of the National Science Foundation. There was the recommendation to create a new OSRD in the event of another war emergency, a move that had been urged in a June 1950 report from a committee of the RDB chaired by Irvin Stewart, who had been a high-ranking aide to Vannevar Bush in World War II. There was the suggestion -- it had originated with George F. Hines, a lobbyist for the state of Massachusetts and an associate of Congressman John McCormack, Majority Leader of the House of Representatives, who brought it to the attention of the President -- that all military R&D should be under the direction of civilians and independent of the armed services. In mid-October 1950, the director of the Bureau of the Budget reminded Truman of all these issues, pointing out in addition "the emphasis which the increasing responsibilities of the U.S.A. in world affairs places on the relationship between strategic plans and scientific research and development" and urging a review of all activities related to defense science. The review was to be conducted by William T. Golden, an investment banker in New York City and devotee of science. Truman approved the review on October 20, 1950, and Golden went promptly to his task.[27]

Golden worked assiduously, discussing the intricacies of defense R&D with dozens of people, including officers in all the armed

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[27] William T. Golden, Memos to File, "Meeting with Deputy Secretary of Defense Robert A. Lovett," Oct. 17, 1950; "Meeting with George F. Hines," Oct. 10, 1950; F. J. Lawton [director, Bureau of the Budget], "Memorandum for the President: Scientific Research and Development of Military Significance," Oct. 19, 1950, Golden MSS. The report of the Stewart Committee was: "Report of the Committee on Plans for Mobilizing Science," June 26, 1950, C/K MSS, Box 256, folder 8.

services as well as academic, industrial, and governmental scientists. He concluded that there was no need at the moment for a new OSRD — defense research was generally vast and well in hand — though, in the event of another war emergency, there might be need for a new one, to provide a place, he reported to the President in December 1950, for "the successful wildcats of science" who might devise radically new weapons yet feel uncomfortable in a military organization.[28] But Golden did come quickly to think that something was required to bring civilian scientific expertise to bear upon the problems of national defense.

His conviction was no doubt strengthened by — and perhaps originated in his discovery of — the weaknesses of the Research and Development Board. Both his military and his civilian confidants stressed how the Board had been engulfed by the expansion of the defense R&D budget, that it commanded little respect among the professional military, accomplished little of significance, and was not much involved in deliberations upon the relationship of technological development and strategic policy. In his December report to Truman, Golden urged that what was in order, given the vast diversity of defense R&D, was a Science Adviser to the President — someone informed about all the research of military relevance going on in and out of the government, someone who could initiate a new OSRD if and when its

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[28] William T. Golden, "Memorandum for the President: Mobilizing Science for War: A Scientific Adviser to the President," Dec. 18, 1950, Golden MSS.

creation was required.[29]

Golden's idea of a presidential science adviser had been endorsed by a number of his confidants, but not by several members of the National Science Board of the new — weakly-funded and thus fragile -- National Science Foundation. By its authorizing act, the Foundation was supposed, in part, to secure the national defense; the dubious Board members — they included James B. Conant, the President of Harvard University — feared that the creation of a presidential science adviser would tend to debase the NSF. Golden argued to the Board, citing his numerous conversations, that the consensus of defense-research officials was that the NSF could best serve the country if it left military matters to other agencies and concentrated on fostering the advancement of basic science — a position that the Board adopted at a meeting in February 1951.[30] Golden's idea ran into

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[29] William T. Golden, Memos to Files, "Conversations with Drs. Oppenheimer, Robert Bacher, and Charles Lauritsen," Dec. 21, 1950; "Conversation with Dr. Ellis Johnson and George Shortley, Director and Deputy Director, Operational Research Organization, U.S. Army . . . ," Nov. 21, 1950; "Conversation with Dr. Ellis A. Johnson . . .," Oct. 31, 1950; "Conversation with General Maris' staff and General McAuliffe, Chief of the Chemical Corps," Feb. 19, 1951; William T. Golden, "Memorandum for the President: Mobilizing Science for War: A Scientific Adviser to the President," Dec. 18, 1950, Golden MSS. It is interesting to note that, in April 1951, Webster suggested as an individual that the Board needed to be reshaped, mainly by absolving it of responsibility for detailed oversight of the different military branches, making it into a high council on defense technology policy, and adding to it more civilian scientists. Webster, Memorandum for General Marshall, April 24, 1951, C/K MSS, Box 246, folder 4.

[30] William T. Golden, Memos to File, "Meeting with Conant, Stauffacher and Staats and Carey and Levi at Bureau of Budget," Jan. 5, 1951; "Telephone Conversation with William Webster," Jan. 4, 1951; "Conversation with I. I. Rabi," Jan. 5, 1951; Bronk, "Science Advice in the White House," in Golden, ed., Science Advice to the President, (1980), pp. 248-49.

a different type of opposition from General Lucius Clay, who was assistant director of the Office of Defense Mobilization and who freely conceded to Golden that his vision of militarily related scientific possibilities had in the past been limited. In Clay's view, any science adviser would deal with issues of mobilization; therefore, the post should be located in the Office of Defense Mobilization, with its occupant appointed an assistant to the director.[31]

In the end, Golden prevailed, though so did Clay, to an extent. On April 19, 1951, President Truman established, in the Office of Defense Mobilization, a Science Advisory Committee to provide advice not only to the director of the Office but to himself on scientific matters, particularly in connection with national defense. The advisory group comprised eleven leading scientists, including, as chairman, Oliver E. Buckley, who had just stepped down as president of the Bell Telephone Laboratories, and DuBridge, Conant, Oppenheimer, Webster, Alan Waterman (the head of NSF), James R. Killian (the president of MIT), and Detlev W. Bronk (the president of The Johns Hopkins University and head of the National Academy of Sciences). Taken together, the group represented key veterans — many of them physicists — of the scientific mobilization during World War II and key players in the postwar national security policymaking.[32]

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31 William T. Golden, Memos to File, "Conversation with General Lucius Clay," Jan. 19, 1951, Jan. 26, 1951; Detlev W. Bronk, "Science Advice in the White House," in William T. Golden, ed., Science Advice to the President (1980), p. 250.

32 Truman to Oliver Buckley, April 19, 1951, C/K MSS, Box 256, folder 8; Press Release, April 20, 1951, Golden MSS.

Some time in April, Buckley saw the President, who assured him that he could have access to the Oval Office at any time and who applauded a set of operating principles for the committee that Buckley had drawn up, particularly the principle that the group would "avoid fanfare" and "minimize public appearances." In truth, the principles were on the whole a recipe for passivity. Not surprisingly, Buckley, a self-effacing man, wrote to the membership that the committee would be "limited largely to policy and other general matters," adding, "It cannot be relied on as the principal source of imaginative, technical leadership in the government."[33] The committee met roughly once a month, carrying on with no staff assistance other than an executive secretary and a clerical assistant. In Buckley's view, the committee was in no position even to think about coming to grips with the nation's defense research program.

In its first year, the group delivered itself of several unexceptional opinions on issues concerning the mobilization of science — for example, that universities best served the national defense by training scientists and advancing knowledge — and various observations upon the difficulty of getting scientists comparable in stature to the leaders of OSRD to work in the Defense Department. Such matters occupied the committee's first report to the President, which Buckley hand-delivered to Truman on May 5, 1952 and which Truman said, in a note a few days later, that he had read with interest. Lee

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[33] "Proposed Principles for Committee," April 5, 1951, attached to Buckley to Killian, April 25, 1951, C/K MSS, Box 256, folder 8; Bronk, "Science Advice in the White House," in Golden, ed., Science Advice to the President (1980), p. 251.

DuBridge recalled, "Buckley didn't want the committee to do anything except figure out what scientists might do in another war emergency. The rest of us were frustrated. We didn't see much point in just writing reports for a file drawer."[34]

The tenor of the committee's deliberations changed dramatically after June 1952, when Buckley resigned from the chairmanship for reasons of ill health and was succeeded by Lee Dubridge. After the first two meetings over which DuBridge presided, in mid-June and mid-September 1952, the committee was resolved to deal with key issues of science and the state -- how to increase the effectiveness of defense science and to get science and technology more involved with policymaking. By the time of the committe's next meeting, early November, Dwight Eisenhower had been elected president. Towards the end of a three-day conclave at the Institute of Advanced Study, in Princeton, New Jersey, a summary of the group's conclusions was drawn up with the aim of somehow getting them to the President-elect. In the view of the Princeton gathering, there was no point in continuing the committee as currently conceived. However, it wished to stress that there was an acute need to bring scientific expertise to bear upon national security planning and it proposed mechanisms to illustrate how

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[34] Science Advisory Committee, "Summary, Meeting No. 1," May 12, 1951; "Summary, Meeting No. 2," June 23, 1951; "Summary, Meeting No. 3," Sept. 8, 1951 and attached "Scientists and Mobilization, Some Views of the Science Advisory Committee"; Oliver E. Buckley, "An Appraisal of Some Indicated Needs of Defense Research, A Memorandum for Discussion," attached to "Summary, Meeting No. 6," Dec. 3, 1951; Buckley to the President, May 1, 1952, attached to "Summary, Meeting No. 11," May 9, 1952; Buckley to Killian, July 24, 1951, C/K MSS, Box 256, folders 8, 9, 10, 11, 12; author's conversation with Lee DuBridge, July 15, 1988.

that end might be achieved.[35]

In the following weeks, DuBridge pressed the committee's views upon Arthur S. Flemming, who would become the new director of the Office of Defense Mobilization, and, on December 17, DuBridge and Oppenheimer spent an hour and a half discussing them with an attentive Nelson Rockefeller, who was looking into the organization of the executive branch of the government for the President-elect and who, at the end of the month conveyed the committee's views directly to Eisenhower. Eisenhower responded favorably to the ideas; so did Robert Cutler, a special assistant to the President, who was handling matters concerning the National Security Council.[36]

Neither Eisenhower nor Cutler seemed particularly interested in the mechanisms that the committee proposed for establishing high-level scientific advice. What they apparently cared about was obtaining that advice for national-security policymaking. Nothing in the institutional

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[35] Lee A. DuBridge, Memorandum to Members and Consultants, Science Advisory Committee, Sept. 16, 1952; Science Advisory Committee, "Summary, Meeting No. 14," Nov. 7, 8, 9, 1952 and attached "Draft Conclusion," Nov. 9, 1952, C/K MSS, Box 256, folder 13. See also Detlev W. Bronk, "Science Advice in the White House," in Golden, ed., Science Advice to the President (1980), pp. 252-53. Bronk here remembers that at the November meeting the committee sought to relocate itself more closely to the president, specifically in the National Security Council. However, one of the mechanisms proposed involved the Secretary of Defense; the other, participation in a new high council on foreign and defense policy. Bronk seems to confuse the outcome of the Princeton conclave with that of a later one, in 1955. See DuBridge to Killian, Dec. 16, 1955; "Summary of Meeting of an Ad Hoc Group on Science Organization, Sponsored by the SAC," Nov. 25, 1955, attached to David Z. Beckler, "Notes on Science Organization and National Policy," C/K MSS, Box 257, folder 21.

[36] DuBridge to Members and Consultants, Science Advisory Committee . . . , Jan. 5, 1953; April 20, 1953, C/K MSS, Box 256, folder 14.

arrangement of the Science Advisory Committee was modified, but there was a distinct change in the scope and level of duties given it. In August 1953, a month after the end of the Korean War, Cutler, now head of the National Security Council, and Flemming arranged for the committee to meet in the Executive Office Building, next to the White House, to be briefed by members of the NSC staff and to provide advice on matters pertaining to air defense. DuBridge wrote to the committee members, "You will all recognize what an important assignment this is. It is the first assignment to our Committee under the new administration and this meeting will give us all a chance to become acquainted with the members of the ODM and NSC staffs with whom we may possibly be working during coming years."[37]

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During the election, the Republican Party had hammered the Democrats on the issues of Korea, Communism, and Corruption -- K_1C_2, in the shorthand of the campaign. But if frustration with the protractedness of K_1 influenced the outcome of the election, the war also fostered a series of subtle -- and not so subtle -- changes in S_2: the relationship between science and the American state.

Unlike World War II, the scientific mobilization during Korea had produced no miraculous new weapons. Combined with the Soviet's becoming a nuclear power, however, it generated a pervasive psychology

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[37] DuBridge to Science Advisory Committee Members, August 7, 1953, C/K MSS, Box 256, folder 14.

of permanent mobilization, a commitment to an expansive technological readiness. Even during the war, the military's outlook had struck James B. Conant, as he told the National War College, as "something like the old religious phenomenon of conversion." Conant continued, "The military, if anything, have become vastly too much impressed with the abilities of research and development. They are no longer the conservatives. . . at times they seem to be fanatics in their belief of what the scientists and the technologists can do."[38]

On the side of civilian science, the psychological sea change was typically manifest in the conclusions of Project Hartwell. Though Korea had no direct bearing on the content of the project, Zacharias recalled, the conflict "heightened our sense of purpose and underlined the relevance and the urgency of the task -- what it takes to fight half way around the world." The thick, two-volume Hartwell report dealt with what the Navy should do to protect shipping against Soviet forces in a war with theaters that spread from Europe and Latin America to India, Southeast Asia, and Japan. It assumed that the Soviets would be

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38 Conant, "The Problem of Evaluation of Scientific Research and Development for Military Planning," speech to the National War College, Feb. 1, 1952, quoted in James G. Hershberg, "'Over My Dead Body': James B. Conant and the Hydrogen Bomb," unpublished ms (1987), forthcoming, p. 50. Conant suggested to a meeting of the Science Advisory Committee that, in order to get better control of military research, at key levels every proposal for a new defense R&D project should have at least one designated naysayer to make a case against it. Science Advisory Committee, "Summary, Meeting No. 7," Jan. 11, 1952, C/K MSS, Box 256, folder 12. Louis Ridenour, a physicist who was special adviser to the Secretary of the Air Force, told William Golden that any kind of project, no matter how far-fetched, could count on finding support in some branch of the military. Golden, Memo to File, "Conversation with H.P. Robertson . . .; Louis Ridenour. . .," Dec. 8, 1950, Golden MSS.

well armed and prepared to use all their weapons.[39]

The Hartwell analyses, which ranged from technologies for the destruction as well as for the detection of submarines, paid particular attention to nuclear weapons. Zacharias recalled, "We wanted the military to start thinking about how to integrate atomic weapons into the battle plan of `a conventional war,' a protracted affair, in which both sides would have ample opportunity and time to gear up, get prepared, and deploy forces -- without devastating destruction on both sides." The report sought to destroy certain myths about nuclear weapons, starting with the myth that all were big bombs deliverable only from big high-flying aircraft. Hartwell stressed that they could be built small, in both size and explosive power, and that they would be appropriate for use against submarines and their bases by a variety of small aircraft, including helicopters. Project Hartwell did not think it unreasonable for the United States to seek to equip itself soon with 10,000 such atomic weapons.[40] Hartwell decidedly influenced Navy R&D as well as its antisubmarine doctrine (though the impact on the latter has been difficult to measure because of security restrictions). Suffice it to say that years later, naval officers treasured the Hartwell report as the bible of antisubmarine warfare.[41]

The change in administrations — and, for the first time in twenty years, the change in parties — brought fresh players, fresh

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[39] Zacharias, with Myles Gordon, "Military Technology: One of the Lives of J.R. Zacharias" (1986), chapter I.

[40] Ibid.

[41] Ibid.

arrangements, and fresh doctrines into the defense policy game. A key fresh arrangement was mandated by the Defense Reorganization Act of 1953, which abolished the Research and Development Board and created two new assistant secretaries of defense, one for Research and Development, the other for Applications Engineering. The salient fresh doctrine was the "New Look," which emphasized economies of dollar cost and troop commitments in national defense in favor of relying on technological advantage to counter the perceived Soviet threat. In short order, civilian enthusiasts of technological advantage, newly arrived in the office of the Secretary of Defense, began to prevail upon the Air Force to step up its intercontinental ballistic missile program, the feasibility of which seemed all the higher as a result of the early hydrogen bomb tests, which suggested that a megaton of explosive could be delivered to the Soviet Union via a missile less powerful than had previously been assumed.[42]

While at times the insistent economizing threatened to curtail defense R&D, the demands of hi-tech armament -- nuclear warheads, rockets and missiles, antisubmarine warfare and continental defense systems, and the like -- prevented federal, including military, research expenditures from falling after the war; indeed, in areas related to these major military systems, they kept rising at a moderate

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[42] See, for example, York and Greb, "Military Research and Development" (1977), pp. 20-21; Armacost, The Politics of Weapons Innovation (1969), pp. 28-31, 56-58. Insightful observations upon the Air Force's reluctance to move rapidly into an ICBM program are advanced in Robert L. Perry, "Commentary," in Monte D. Wright and Lawrence J. Paszek, eds., Science, Technology, and Warfare (1969), pp. 119-21.

rate.[43] Defense, and defense-related, agencies provided between 80% and 90% of federal R&D monies. They made hi-tech industrial research increasingly a ward of the military, with defense projects supplying an ever-larger fraction — the portion crossed the 50% mark in 1956 --of total expenditures for industrial research. DOD and the AEC together were pervasive presences on the nation's campuses, the source of funding for the vast majority of research in physics, electronics, aeronautics, computers, and myriad other branches of the physical sciences and engineering.[44]

The situation left academic scientists well supported and comfortable. The Korean War had put a hold on any serious move to transfer support for pure science out of the military and into the National Science Foundation. When the Eisenhower administration took office, it ventured such a transfer. The Office of Naval Research had already turned against any such idea. The attitudes of many university scientists were no doubt represented by Lee DuBridge, who took arms against the move, stressing to Arthur Flemming that the poor-relation

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[43] A bête noir of the basic research community was Secretary of Defense Charles E. Wilson, who, having spent his career at General Motors, where there was no significant tradition of scientific research, tried to cut the defense R&D budget more than once during the Eisenhower administration and opined while at the Pentagon that "basic research is when you don't know what you are doing." See Killian to DuBridge, June 25, 1953, C/K MSS, Box 256, folder 14; Kevles, The Physicists (1987) p. 383; Armacost, The Politics of Weapons Innovation, (1969), pp. 32-33, 267.

[44] See Melvin Kranzberg, "Science, Technology, and Warfare: Action, Reaction, and Interaction in the Post-World War II Era," in Wright and J. Paszek, eds., Science, Technology, and Warfare (1969), p. 162; Forman, "Behind Quantum Electronics" (1987), pp. 161-64, 191-94, 220-21; Kevles, The Physicists (1987), pp. 374-75.

NSF would have to be granted appropriations "ten times their present level" to do the job properly, an amount of money that Congress would surely decline to provide. The NSF, DuBridge added, was "wholly unsuitable for the support of large research projects at large research centers. The California Institute of Technology, for example, would go broke very promptly if all of its basic research support were suddenly transferred to the National Science Foundation."[45]

DuBridge's viewpoint prevailed. The nation's scientific leadership breathed a collective sigh of relief when it became clear that very little basic research would be transferred to the NSF and that most such research would continue to be supported in the pluralist system that had grown up since 1945 under the military's generous and predominant patronage. Yet perhaps more important than the particular victory was what the process by which the victory had been achieved indicated -- that scientists like DuBridge were now exercising considerable influence at the levels of high policymaking in a way that they had not been, save perhaps in the nuclear-weapons area, under Truman.

The establishment of the Science Advisory Committee had put scientists institutionally within reach of the White House; Eisenhower took them inside of it. The President was naturally skeptical about the claims of the military that he knew so well and eager for alternative

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[45] William T. Golden, Memos to File, "Conversation with Mr. Charles Stauffacher re National Science Foundation . . .," Dec. 6, 1950; "Conversation with Rear Admiral T. Solberg, Director, Office of Naval Resarch," Jan. 15, 1951, Golden MSS; DuBridge to Flemming, August 12, 1953, C/K MSS, Box 256, folder 15; authors's conversation with Lee DuBridge, July 15, 1988;.

yet informed sources of opinion on issues of technology and national security. The committee was kept apprised of relevant discussions in the National Security Council by Robert Cutler and, eventually, by its own executive secretary, David Beckler, who sat in on NSC meetings. On its part, the committee was constantly active even outside of its regular meetings, with its members in New York, Cambridge, and Pasadena constituting themselves as local sections for discussion.[46]

At a combined meeting of the Cambridge and New York groups, on March 10, 1954, considerable attention was given to the urgency of the problems posed by new weapons and the necessity of incorporating an understanding of those problems into military planning. The committee, much impressed by Project Hartwell, thought highly of analyses of weapons as they might be integrated into strategy. At the urging of Jerrold Zacharias, the group decided to seek a meeting with the President and the National Security Council to urge the creation of a special group to study the overall problem of science and national defense.[47] On March 27, 1954, the committee met with the Eisenhower, who focused attention on the problem of surprise attack and asked that

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[46] Conversation with Lee DuBridge, July 15, 1988; I. I. Rabi, "The President and His Scientific Advisers," in Golden, ed., Science Advice to the President (1980), pp. 21-22; DuBridge to Members of the Science Advisory Committee, Feb. 15, 1954, C/K MSS, Box 257, folder 2.

[47] "Meeting of the Cambridge-New York Group of the Science Advisory Committee," March 10, 1954, attached to Killian to Beckler, March 17, 1954; Beckler to Killian, March 19, 1954 and attached "Scope of Proposed Examination of New Weapons and National Strategy," draft, March 19, 1954, C/K MSS, Box 257, folders 2, 18; enthusiasm for Hartwell-type projects was manifest at the meeting and also earlier in Oliver E. Buckley, "Notes on Report of the Committee on Plans for Mobilizing Science," draft, June 8, 1951, attached to Buckley to Killian, June 15, 1951, C/K MSS, Box 256, folder 9.

his science advisors conduct a study of the matter. The request led to the formation of the Technological Capabilities Panel under James R. Killian, which interpreted its charge broadly and set about investigating not only the gathering of intelligence to guard against surprise attack but also several other topics, including what technology might do for the retaliatory power of American deterrence.[48] In February 1955, the panel delivered its report, stressing, in a tone of foreboding, that the United States was vulnerable to surprise attack and urging, among other things, that the country establish overflight surveillance of the Soviet Union and give highest priority to the development of both long-range and intermediate range ballistic missiles. The panel presented its recommendations in an extended discussion of the National Security Council — a session that Robert Cutler recalled as the high point of deliberations during his tenure as the president's special assistant for national security.[49]

It has often been said that the President's Science Advisory Committee provided a voice of restraint against unbridled acceleration of the arms race. At least one such note was heard in the PSAC's pre-Sputnik incarnation. At the March 1954 of the Science Advisory Committee's New York-Cambridge contingent, the strongest push for a study to evaluate the broad implications of new weapons had come from

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[48] James R. Killian, Sputnik, Scientists, and Eisenhower (1977), pp. 70-71; DuBridge to Flemming, July 21, 1954, C/K MSS, Box 257, folder 18..

[49] Armacost, The Politics of Weapons Innovation (1969), pp. 50-53; Killian, Sputnik, Scientists, and Eisenhower, (1977), pp. 71-86; Killian, "The Origin and Uses of Scientific Presence in the White House," in Golden, ed., Science Advice to the President (1980), p. 29.

I.I. Rabi. His reasons, passionately advanced: thermonuclear weapons could not be thought of as nuclear weapons might have been construed in the late 1940s, solely as military weapons. Their use would risk political and psychological upheaval, and their role in strategic policy had to be assessed with regard to such implications. In Rabi's view, disarmament negotiations were imperative. American democratic institutions could not survive an indefinite arms build-up.[50]

Reaction in the gathering was mixed. Oliver Buckley, worried that Rabi's ideas might be taken as implied criticism of the New Look, proposed an alternative, and narrower, purpose for the study — "to examine strategic plans and policies in light of new weapons," with reference above all to assessment and "public indoctrination of the urgency implicit in our present danger."[51] It was, of course, Buckley's version that eventually formed the basis of the establishment of the Technological Capabilities Panel, whose recommendations helped obtain the highest national priority for the ICBM program and also precipitated what became the Thor, Jupiter, and Polaris programs.[52] In the pre-Sputnik era, what the Science Advisory Committee brought to national security-policymaking was another version of what the Korean

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50 York and Greb, "Military Research and Development: A Postwar History" (1977), p. 13; "Meeting of the Cambridge-New York Group of the Science Advisory Committee," March 10, 1954, attached to Killian to Beckler, March 17, 1954, C/K MSS, Box 257.

51 Ibid.

52 York and Greb, "Military Research and Development: A Postwar History" (1977), pp. 21-22. This account, like Killian's, of the Panel's origins, misses the role of Rabi's concerns in the creation of the TCP and, thus, the irony in the outcome. See Killian, Sputnik, Scientists, and Eisenhower (1977), pp. 67-68.

War had fostered --not so much restraint as new or stengthened forms of institutionalized opportunities, and in some ways incentives, to ratchet up the arms race.

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