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Abstract
This paper chronicles the often-overlooked relationship between President Dwight D. Eisenhower and Dr. James R. Killian, Jr., the first-ever appointed Presidential Science Advisor. Emphasis is placed on the role of Dr. Killian and the President's Science Advisory Committee (PSAC) in advocating curricular reform in the fields of science and mathematics, a reformation which became doubly important following the successful launch of the Soviet satellite *Sputnik I* in 1957. This essay examines the efforts of Eisenhower and Killian to keep pace with the Russian scientific advances by improving American education in the scientific and technical fields. It concludes with a discussion of the National Defense Education Act of 1958 and Killian's efforts to see the piece of legislation enacted.

Keywords
James. R. Killian, Eisenhower, PSAC, Sputnik, education, science advisor, Cold War, National Defense Education Act

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JAMES R. KILLIAN, JR., SPUTNIK, AND EISENHOWER: WHITE HOUSE SCIENCE ADVICE AND THE REFORMATION OF AMERICAN SCIENCE EDUCATION, 1955-1958

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Several months before his death, Dwight D. Eisenhower was visited in Walter Reed Hospital by James Rhyne Killian, Jr., the sixty-five-year-old former president of the Massachusetts Institute of Technology. Killian had traveled from Cambridge to Washington, D.C., on behalf of the trustees of the Atoms for Peace Award. He asked the ailing general "if he would accept the award. . . . for the great contributions to the peaceful uses of the atom he had made during his presidency." Eisenhower gladly accepted the award but insisted that the greater part of the monetary prize which accompanied it go to the newly-established Eisenhower College, for he was "anxious to advance the cause of the new college bearing his name."[1] Killian had served as Eisenhower's Science Adviser and as chair of the President's Science Advisory Committee, a varied group of scientists in whom the president had the highest confidence. In the fraught atmosphere of the 1957 Sputnik launch, Killian, PSAC, and Eisenhower had formed a close bond. As such, Eisenhower "welcomed the opportunity to talk" with Killian and "the visit lasted for nearly an hour. At one point he asked about 'my scientists,' and specifically mentioned several by name." As the meeting drew to a close and Killian was preparing to make his departure, Eisenhower said something that Killian would "always cherish: 'You know, Jim, this bunch of scientists was one of the few groups that I encountered in Washington who seemed to be there to help the country and not help themselves.'" In his memoirs, Killian concludes his account of this emotional final meeting by adding, "His statement was true."[2]

On October 4, 1957, the Soviet Union successfully launched the first of two artificial satellites. This technological blow to American prestige alarmed American scientists, engineers, educators, and government officials and set off a series of events which would culminate in the appointment of Killian, the fifty-two year old president of MIT, to the newly-created office of

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[1]James R. Killian, Jr., *Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President For Science and Technology* (Cambridge, MA: The MIT Press, 1982), 241.

[2]*Ibid.*, 241.

Presidential Science Advisor. In an age when science appeared to be the key to winning the Cold War, Killian would come to play an instrumental role in some of the Eisenhower administration's most crucial policy decisions, including the founding of NASA and the development of the Utility 2 (U2) spy plane.[3] But one aspect of Killian's tenure as Science Advisor that has been largely overlooked is his relatively modest but certainly noteworthy role in championing and advocating education reform. Upon assuming the presidency in 1953, Eisenhower made several public addresses in which he suggested that America's schools were in desperate need of attention and reform. Education critics of the period, including Killian, pointed to America's manpower shortage in the sciences and engineering professions and suggested ways to improve science education in the classrooms. The Eisenhower administration's response to these concerns was the 1955 White House Conference on Education, a colloquium in which Killian played a pivotal role.

In the aftermath of Sputnik, education reform in the mathematics and sciences became an urgent national security issue, leading the United States Congress, originally noncommittal toward legislating education, to craft an education bill. While Congress debated how to proceed, Killian gave several public addresses in which he sought to allay the anxieties of the education critics while advancing his own ideas on education reform. As the summer of 1958 approached, the House of Representatives and the president seemed stalemated. The Eighty-fifth Congress and its Democratic majority pushed for measures to increase federal funding of scientific research. Eisenhower, reluctant to use federal funding to spur the educational renaissance in the mathematics and sciences, dragged his feet. PSAC in general and Killian in particular would come to play a peripheral but important role at this stage, reminding Eisenhower that a refusal to

[3]For a brief and readable account of Killian's role as an advisor on subjects relating to space and espionage, see: Gregg Herken, *Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI* (Oxford, UK: Oxford University Press, 1992), 89-95.

compromise on an education amendment could kill the bill entirely. The president would eventually sign the bill, known as the National Defense Education Act, in September of 1958. The act would be one of the administration's greatest domestic accomplishments, a "breakthrough in federal funding for education [that] changed the face of the American educational system."[4] The historian Zuoyue Wang wrote that James R. Killian, Jr. "attempted, with considerable success, to turn Sputnik into a challenge in science, education, and presidential science advising."[5] A careful study of the relationship between Killian, PSAC, and Eisenhower, during the decade of the 1950s, coupled with a discussion of Killian's role in advising the administration to actively pursue education reform, reveals that Eisenhower's first Science Advisor played a significant role in rejuvenating American education in the fields of science and mathematics.

Over the years Eisenhower developed a profound personal interest in education and educational institutions. After returning victoriously from the Second World War, Eisenhower put the great administrative skill he had developed as a soldier to good use as president of Columbia University. The late 1940s and early 1950s witnessed a precipitous increase in students enrolling in the public schools.[6] In his first State of the Union address on February 2, 1953, Eisenhower stated, "Our school system demands some prompt, effective help. During each of the last 9 years, more than 1.5 million children have swelled the elementary and secondary school population of the country."[7] Two months before taking office, Eisenhower alluded to the importance of education as a means of winning in the Cold War in a statement prepared for the

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[4]Jean Edward Smith, *Eisenhower: In War and Peace* (New York: Random House, 2012), 647.

[5]Zuoyue Wang, *In Sputnik's Shadow: The President's Science Advisory Committee and Cold War America* (New Brunswick, NJ: Rutgers University Press, 2008), 78.

[6]"Schools Face Overcrowding," *Los Angeles Times*, October 26, 1950, B16.

[7]Dwight D. Eisenhower, "Annual Message to the Congress on the State of the Union, February 2, 1953," The American Presidency Project, published online by Gerhard Peters and John T. Woolley, available at: http://www.presidency.ucsb.edu/ws/index.php?pid=9829#axzz1puNVKae0 (accessed March 14, 2012).

National Citizens Commission, asserting, "Even in these crisis-days we are vigilant that our school system continues to improve in physical facilities, in the caliber of its teaching staff, in education for citizenship."[8]

The years between Eisenhower's first inauguration and the launching of Sputnik in 1957 witnessed a steady stream of criticism directed toward the American educational system. Between 1954 and 1955, *New York Times* journalist Benjamin Fine devoted several articles to the supposed American deficit in science and engineering training. In November of 1954, a front-page article penned by Fine warned, "While the democracies of the world, including the United States, are looking the other way, the Soviet Union and its satellites are training scientists and engineers at an almost feverish pace." He continued, "The quality of the Soviet technical schools and colleges is steadily rising."[9] Seven months later, he reiterated in more urgent tones America's need to keep pace with the rapidly-advancing Russian education system. He asserted that in the coming years the Soviet Union would graduate many more engineering and technical professionals than the United States. In the same article, he asked, "What is the cause of the engineer shortage [in America]?" He concluded that the nation needed to improve the caliber of its engineering laboratories and the quality of its equipment, ultimately bettering the working conditions for scientific and technology students.[10] Ruth W. Wolfe, an educator from Taylorstown, Pennsylvania, published an article in the journal *School Science and Mathematics* in which she claimed that Russian engineers were receiving better and more advanced training than their American counterparts. After blaming the technical manpower shortage on the failure

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[8]Statement Prepared for the National Citizens Commission, November 1952. Published in: "Eisenhower on Education: Four Statements," *The Phi Delta Kappan* 34 (1953): 1.

[9]Benjamin Fine, "Russia Is Overtaking the Us in Training of Technicians," *New York Times*, November 7, 1954, 1.

[10] Benjamin Fine, "Education in Review: Critical Shortage of Technically Trained Americans Is Causing Much Concern," *New York Times*, June 5, 1955, E11.

of the schools, Wolfe asserted that America was in the midst of "an educational crisis."[11] Killian, president of MIT, agreed with this sentiment but expressed it in much less alarmist tones. He stated, "There is shortage enough of the rank and file of competent scientists. . . . but there is a still greater need for young engineers." The same article reported that tuition at MIT would rise to $1,100 in the fall of 1956. At the same time, the university planned to provide greater scholarship aid to more students in order to boost enrollment.[12]

Upon assuming office in 1953, Eisenhower began to increasingly entertain the idea of staging an ambitious colloquium to address the state of American education in general and the issues of overcrowding and teacher shortage in particular. Known as the White House Conference on Education, this meeting was planned for the fall of 1955. The criticisms of Fine, Wolfe, Killian, and other journalists and educators contributed to a renewed discussion of American curricular reform in the mathematics and sciences among members of the National Security Council. At the October 13, 1955 meeting of the NSC, many members expressed concern over the laxity of American education in these fields. Towards the end of the discussion, Vice President Richard Nixon suggested that the subject be among those discussed at the upcoming White House Conference on Education.[13]

The conference drew more than 1,800 citizen delegates from across the entire country to the nation's capital on November 28, 1955.[14] To a large extent the administration's goal in organizing the discussion was to encourage teachers, professors, administrators, and scientists to share their criticisms, opinions, and solutions to America's manpower shortage. A series of

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[11] *Ibid.*, 64.

[12] "Leader Shortage in Science Noted: M.I.T. Head Says Education of Young Scientists Must Be Improved," *New York Times*, October 13, 1955, 33.

[13] NSC meeting minutes, October 13, 1955, Box 7, Ann Whitman File, NSC Series, Eisenhower Library. Cited in: John L. Rudolph, *Scientists in the Classroom: The Cold War Reconstruction of American Science Education* (New York, NY: Palgrave Macmillan, 2002), 72.

[14] Rudolph, *Scientists in the Classroom*, 72.

subcommittees led by a chairperson was established and each subcommittee was given a question to discuss, debate, and develop. The goal of each subcommittee was to generate an answer upon which consensus could be reached. As a member of the Science Advisory Committee of the Office of Defense Mobilization, an architect of the Technological Capabilities Panel, and—more importantly—the president of the most prominent institution of science learning in the nation, James R. Killian, Jr. was asked by the conference organizers to chair a subcommittee whose goal was to answer the question, "What should our schools accomplish?" Thus his role in the conference would be to help determine the direction of American educational reform. In the months prior to the conference, Killian prepared by seeking the advice of Alan T. Waterman, director of the National Science Foundation, on issues such as the manpower shortage and the problems of motivating talented students.[15] He also circulated among educators and scholars a written piece which outlined the competing goals of American public education.[16]

In the months following the White House Conference on Education, Killian published two articles in which he reflected upon his chairmanship of this important subcommittee—"The Shortage Re-examined" and "What Should Our Schools Accomplish?" The first piece was written fourteen months before Sputnik while the second article was written in the aftermath of the Soviet satellite's launch. Killian recalled telling the members of his subcommittee, "We cannot proceed in any orderly way to build, staff, and finance a school until we agree on the job we want the school to do."[17] Over the course of the deliberations, Killian asserted, "That we have an acute shortage of available, effectively used competence in many fields of technology there can be no reasonable doubt. Neither can there be a reasonable doubt any longer that this scarcity

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[15]Alan T. Waterman diary note, May 2, 1955, Records of the National Science Foundation, Office of the Director Subject Files, RG 307, Box 7, National Archives.

[16]Rudolph, *Scientists in the Classroom*, 73.

[17]James R. Killian, Jr., "What Should Our Schools Accomplish?," *Educational Horizons* 35 (1957): 75.

is a clear and present danger to the nation and to the entire free world."[18] He advocated numerous approaches to strengthening the quality of science teaching and to augmenting the number of American scientists while emphasizing the need to support and advance basic research through increased funding.[19] Killian was in favor of offering more grants and fellowships to professors of science as well as high school teachers, logically arguing that better teachers would produce better students. As the deliberations drew to a close, Killian reminded the subcommittee that the United States needed more teachers in the scientific fields than it did in the humanities, arguing that an increase in teachers would result in an increase in students pursuing advanced degrees in scientific fields. He closed by reiterating his main point, "In an age when science is essential to our safety and our economic welfare, it might be argued that a shortage of science teachers and of scientists and engineers is a clear and present danger to the nation."[20]

Two factions rapidly emerged within the subcommittee, with Killian and science educators on one side and educators of practically every other subject on the other. Killian and his minority of scientists and mathematicians lobbied for more exacting science curricula and argued that "the weakening of standards of intellectual performance" required that more schools "narrow their aims in order to concentrate on. . . . the education of the young in the basic mental skills and the knowledge needed in the modern world." The other position which was adopted by the majority of educators on the committee emphasized an education more in line with John Dewey progressivism. They argued that if pupils are not willing or "are not able to apply abstract ideas," they should instead, "learn as much as they can about how to live happy and useful

[18]James R. Killian, Jr., "The Shortage Re-examined: Some Elements of a Grand Strategy for Augmenting our Scientific and Engineering Manpower Resources," *American Scientist* 44 (1956): 115.

[19]*Ibid.*, 118-120.

[20]Killian, Jr., "What Should Our Schools Accomplish?," 78.

lives."[21] Instruction in citizenship, ethics, and morality should be emphasized over analytical thinking, since such instruction was likely to serve the average student better in the long run. Both sides represented a much different worldview and attitude toward the goals of education. As the discussions continued, it became increasingly apparent that a compromise was impossible to achieve.

Faced with majority opposition, Killian and his fellow advocates of education reform in the mathematics and sciences were forced to concede. The subcommittee thus decided overwhelmingly in favor of a curriculum designed to address everyday life needs of students; the scientists and their plans for improved curricula were foiled. As chairman of the subcommittee, Killian was duty-bound to present Eisenhower with the group's conclusions, even if he himself disagreed. Eisenhower had hoped that the conference would advocate at least a basic reformation of the education system. Such a recommendation from such a varied body may have proved useful in persuading a hesitant congress to begin discussion of an education reform act. Waterman lamented the fact that "the place of science in the schools of the nation was discussed in a peripheral way only"[22] while "Killian and the Eisenhower administration must have been disheartened. . . . by the sentiment expressed at the conference."[23] The White House Conference on Education revealed that Eisenhower and Killian's ideas to promote more stringent training in the mathematics and sciences were not something about which the American public or its legislators much cared. It would take a sudden and humbling blow to American prestige to awaken the nation from its delusions of Herculean technological and educational superiority. Such a jolt would arrive on October 4, 1957.

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[21]Rudolph, *Scientists in the Classroom*, 73.

[22]Alan T. Waterman to the National Science Board, January 1, 1956, Records of the National Science Foundation, Office of the Director Subject Files, RG 307, Box 18, National Archives. For more information on Waterman's reaction, see: Rudolph, *Scientists in the Classroom*, 74.

[23]Rudolph, *Scientists in the Classroom*, 73-4.

On the evening of October 4, more than fifty American and Russian scientists were attending a banquet commemorating the International Geophysical Year at the Soviet embassy in Washington, DC. At 7:00 P.M., a Moscow radio station proudly announced that the Soviet Union had launched a 184-pound man-made, spherical satellite into outer space. The American scientists were stunned, the Russian scientists elated. The successful launch of this satellite, named *Sputnik*, represented a major Soviet victory in the space race.[24] Eisenhower viewed *Sputnik* as more of a blow to American public morale than an irreversible defeat of American science. In a post-*Sputnik* letter to his brother Arthur, he wrote, "This past year—actually the period since the beginning of the Suez crisis last July—has been one of steadily mounting crises and pressures, culminating in the Little Rock situation at home and the blows to our prestige by that and by the Russian scientific achievements in the past few weeks."[25] Indeed, the greatest and deepest consequence of Sputnik was that America's confidence in its scientific, technological, and educational superiority had been shaken.

As an acting member of the Science Advisory Committee of the Office of Defense Mobilization (ODM-SAC) and as president of the nation's leading institute of technology, Killian was well-positioned to comment on the event. In his memoir, he reflected, "Like everyone else, I was stirred by the orbiting of *Sputnik I*. That a satellite had gone into orbit really did not surprise me, for I knew that the United States and the Soviet Union planned to launch satellites for scientific purposes as part of their participation in the IGY, the International Geophysical year. . . . Nevertheless, the news of Sputnik found me—and most of the nation—

[24]Robert A. Divine, *The Sputnik Challenge* (New York, NY: Oxford University Press, 1993), xiii.

[25]"D.D. Eisenhower to Arthur Bradford Eisenhower, November 8, 1957," in Louis Galambos and Daun Van Ee, eds, *The Papers of Dwight D. Eisenhower*, Vol. 18 (Baltimore, MD: The Johns Hopkins University Press, 2001), 551.

psychologically vulnerable and technically surprised."[26] He added, "That others possessed their share of technology I was certainly aware, but somehow I pictured them all laboring far behind this country. . . . Now this faith was shaken by Sputnik."[27]

Hans A. Bethe, a German-American physicist and a member of ODM-SAC, recalled that Eisenhower's response to the news of Sputnik was to call together his science advisors. Within a fortnight, the committee was assembled before the president to offer views of the situation. Bethe noted, "Sputnik was a really dramatic effect on the committee. In fact, this was because of President Eisenhower. It was a dramatic effect on him. He remembered that he had a Science Advisory Committee. He called us in for a session almost immediately."[28]At the ODM-SAC meeting with the president on October 15, 1957, Isidor Isaac Rabi, one of the nation's premier physicists and the chairman of the committee, advised Eisenhower to appoint a permanent full-time science advisor who could assist the president in making decisions involving technology and advise him on public policy matters in which science played a role. Rabi emphasized that the appointed advisor should be a person with whom the president "could live with easily." Killian agreed with Rabi and pointed out that a committee should also be established to assist this new advisor.[29] The day after the committee met, Republican Senator Charles E. Potter of Michigan wrote a letter to the president in which he asked, "What steps should be taken to stimulate development of scientific talent? Should we re-cast our entire educational system, gearing its

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[26]Killian, Jr. ,*Sputnik, Scientists*, *and Eisenhower*, 2.

[27]*Ibid.*, 3.

[28]Hans Bethe, Oral History, November 3, 1977, The Eisenhower Library Oral History Collection, available at: http://www.eisenhower.archives.gov/research/oral_histories/oral_history_transcripts/Bethe_Hans.pdf, 8.

[29]Killian, Jr., *Sputnik, Scientists*, *and Eisenhower*, 16. The history of science advice in the White House dates back to the Franklin D. Roosevelt Administration. Roosevelt had made Vannevar Bush an unofficial advisor during World War II. Upon assuming office, Truman created the post of science advisor and the science advisory committee within ODM. Eisenhower had determined to maintain this arrangement upon taking office. For a more in-depth study of the position's evolution in the period between Roosevelt and Eisenhower, see: Detlev W. Bronk, "Science Advice in the White House: The Genesis of the President's Science Advisers and the National Science Foundation," *Science* 186 (1974): 116-121.

emphasis to new scientific vistas?"[30] Five days later, Eisenhower sent a letter to Potter in response to the senator's query. He told Potter:

> I have asked the Science Advisory Committee to give me their views—not only in the field of outer space to which your letter refers, but in the fields of nuclear energy and radioisotopes, of the care of health and the cure of disease, the teaching of science, the awakening of more widespread scientific interest in our people, and so forth. The Science Advisory Committee agreed forthwith to consider the dimensions of the problem to be studied and soon to provide me with their outline. . . . Incidentally, it may interest you to know that in the conversation referred to above, my scientific friends identified as probably the most serious and difficult phase of our situation, not the proved current competence and advances of Soviet scientists, but rather the difficulties we in the United States face in strengthening, over the coming years, our personnel trained in science and attracting to this pursuit of science an increasing number of individuals of quality and promise. To this part of the problem, also mentioned in your letter, they feel we should devote efforts calculated to enlist nation-wide support. One expressed it, 'I'm not frightened concerning the present, for we have the capacity to destroy any nation on earth; but I am frightened as to the prospect we would face ten years hence if present trends continue.' We must start recruiting and educating scientists *now*.[31]

A few days after Eisenhower's meeting with ODM-SAC, White House Chief of Staff Sherman Adams called the MIT president's office in Cambridge. He told Killian that the president had been entertaining the idea of appointing a full-time Presidential Science Advisor and wanted Killian to come to Washington to discuss what the duties of this new position should be. Killian reflected that Adams "didn't say that I was being considered for the post, but I knew what he meant."[32] On October the twenty-fourth, exactly twenty days after the news of Sputnik's launch reached Eisenhower, Killian met with the president over breakfast and was offered the position of Science Advisor. He informed the president that he would gladly accept the post and returned to MIT to get his affairs in order and to request a leave of absence.

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[30]Excerpts from Potter's letter are included in: Galambos and Van Ee, eds, *The Papers of Dwight D. Eisenhower*, Vol. 18, 504.

[31]"D.D. Eisenhower to Charles Edward Potter, October 21, 1957," in Galambos and Van Ee, eds, *The Papers of Dwight D. Eisenhower*, Vol. 18, 503-4.

[32]Killian, Jr., *Sputnik, Scientists, and Eisenhower*, 20.

News of Russia's most recent technological triumph created a climate of fear and anxiety throughout the United States which bordered on hysteria. Killian reflected that his appointment to the office of Science Advisor "came as a result of the successful launching of Sputnik I by the Russians. The Soviet achievement created a climate of near hysteria in the United States with many people jumping to the conclusion that the Soviets had surpassed the United States."[33] In his memoir *Waging Peace*, Eisenhower called this period "one of anxiety" and stated "Sputnik had revealed the psychological vulnerability of our people."[34] Scientists, politicians, and educators began to publish articles and give public addresses in which they decried the American deficit in education. These criticisms focused upon the difference between the American and Soviet education systems, contrasting the stringent Russian science curriculums with the much more relaxed American curriculum. They asserted that Russian students were far ahead of their American counterparts in developing analytical and technological skills. Killian observed:

> From that point the line of reasoning was simple and direct; it was education that had made the scientists; it was American education, therefore, that was at fault. A storm of criticism directed toward American education blew up with astonishing rapidity. Little of this criticism was well informed and thoughtful; nonetheless it struck close to home. After all I was president of a major educational institution devoted primarily to science and technology; and if there was indeed any serious breakdown in the American educational system, I was among those to blame.[35]

Indeed, little of the criticism which surfaced in October of 1957 and the immediate aftermath of *Sputnik* was "well informed and thoughtful." To the contrary, it was alarmist. Some of the most outspoken critics of American education were Admiral Hyman G. Rickover and Roy D. Welch, Jr. Rickover was a four-star admiral and chief of the Atomic Energy Committee's Naval Reactors branch while Welch was a science textbook author and publisher for Rand

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[33]James R. Killian, Jr., *The Education of a College President* (Cambridge, MA: MIT Press, 1985), 326.
[34]Dwight D. Eisenhower, *Waging Peace, 1956-1961* (Garden City, NY: Doubleday, 1965), 226.
[35]Killian, Jr., *Sputnik, Scientists, and Eisenhower*, 191-2.

McNally & Co. Rickover made the alarmist claim that the domestic "shortage of scientists is more dangerous to the United States than the Red Army's 300 odd divisions—its recent stock pile of A bombs and H bombs."[36] Welch followed up the admiral's comments by asserting that a shortage of teachers and a decrease in the quality of the public school system was to blame: "The problem is aggravated by not enough college graduates entering teaching even to replace departing teachers. Furthermore, the output of new high school teachers in important subject areas has declined sharply in 5 years. The decline in the science field excels all of the other fields." He concluded, "Critical shortage of high school science and mathematics teachers. . . . causes erosion of quality in our schools."[37]

In the fall of 1957, the popular magazine *U.S. News & World Report* published an article entitled "The 3 R's in Russia are Really Tough." Published on the very same day that Killian officially assumed the post of Science Advisor, this article was among the first to address and to report the ostensible realities of the Soviet education in the aftermath of *Sputnik*. The title referred to the "3 R's," the common abbreviation for the basics elements of the elementary school education—reading, 'riting (writing), and 'rithmetic (arithmetic). The piece presented the facts in a scholarly fashion, not alarmist but rather straightforward in its conclusions. It stated that Russian students tended to receive more hours of instruction in the mathematics and sciences during their 10-year secondary school career than American students received in their 12-year education program. Most importantly, it noted, "All Russian students graduating from the tenth grade in 1955 had completed five years of physics, four years of chemistry, six years of foreign language, and five years of mathematics above the level of arithmetic."[38] It was a system that turned out "nearly 225,000 physicists, engineers, and other professionals each year," the system

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[36]Roy D. Welch, Jr., "Science Progress," *School Science and Mathematics* 57 (1957): 524.
[37]*Ibid.*, 524.
[38]"The 3 R's in Russia are Really Tough," *U.S. News & World Report* 43 (1957): 137.

which "produced the scientists and engineers who built and launched Sputnik."[39]

One week prior to the publication of the *U.S. News & World Report* article, on November 7, 1957, President Eisenhower gave a national radio and television address to the American people. The purpose of the speech was to reaffirm America's commitment to both scientific advancement and to re-establishing its technical superiority. The appointment of James R. Killian, Jr., to the recently-created office of Presidential Science Advisor was intended to be an important first step toward this goal. Eisenhower stated that ODM-SAC, his "scientific friends," had informed him in the post-Sputnik meeting that "one of our greatest, and most glaring, deficiencies is the failure of us in this country to give high enough priority to scientific education and the place of science in our national life."

To correct these deficiencies, Eisenhower stated that he intended to ensure, "the very best thought and advice that the scientific community can supply, heretofore provided to me on an informal basis, is now fully organized and formalized so that no gap can occur. The purpose is to make it possible for me, personally, whenever there appears to be any unnecessary delay in our development system, to act promptly and decisively. To that end, I have created the office of Special Assistant to the President for Science and Technology. This man, who will be aided by a staff of scientists and a strong Advisory Group of outstanding experts reporting to him and to me, will have the active responsibility of helping me follow through on the program that I am partially outlining tonight and next week."[40] The Science Advisory Committee of the Office of Defense Mobilization, a temporary and informal body, would thus be elevated to a permanent

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[39]*Ibid.*, 141. It should be noted that the article makes no mention of Russia's own education deficiencies, such as the "overcrowding of Soviet schools, where double-session attendance is common and even three or four shifts are not unknown." See, "Total Education in Russia," *New York Times*, June 16, 1958, 22.

[40]Dwight D. Eisenhower, "Radio and Television Address to the American People on Science in National Security, November 7, 1957," The American Presidency Project, published online by Gerhard Peters and John T. Woolley, available at: http://www.presidency.ucsb.edu/ws/index.php?pid=9829#axzz1puNVKae0 (accessed March 14, 2012).

body and renamed the President's Science Advisory Committee (PSAC).

The next step was to formally announce the name of the man who would chair this committee. Eisenhower declared, "I am glad to be able to tell you that this position has been accepted by Dr. James R. Killian, President of the Massachusetts Institute of Technology. He is a man who enjoys my confidence, and the confidence of his colleagues in the scientific and engineering world, and in the government. . . . Dr. Killian will see to it that those projects which experts judge have the highest potential shall advance with the utmost possible speed." At the end of the address, he concluded, "there is much more to science than its function in strengthening our defense."[41] Indeed, science had another essential role to play in domestic affairs aside from defense and military technology—education. Education reform would prove to be one of the projects which Killian and PSAC "advanced with the utmost possible speed." The appointment of the president of one of the nation's most preeminent educational institutions was partially intended to mollify the alarmists and the critics of the American education system. It was also a symbolic gesture on the part of the Eisenhower administration which established and affirmed the role of science and scientists in the White House decision-making process.

As promised in the November 7 address, Eisenhower went on the air again a week later to further outline his scientific and educational goals. He had been invited to speak at Oklahoma's semi centennial celebration on November 13th and saw the commemoration as the appropriate venue to deliver a second speech advocating education reform and a renewed commitment to scientific progress. In a personal letter to California businessman John A. McCone, Eisenhower explained that he intended the November 13 speech to "present (at least as it stands at the present moment) some of the stark realities of the rate at which we are training

[41] *Ibid*.

scientists vis-a-vis the Russians."[42] In this nationally-broadcast speech, he did just that. Calmly, he admitted to the American audience, "The Soviet Union now has—in the combined category of scientists and engineers—a greater number than the United States. And it is producing graduates in these fields at a much faster rate. Recent studies of the educational standards of the Soviet Union show that this gain in quantity can no longer be considered offset by lack of quality. This trend is disturbing. Indeed, according to my scientific advisers, this is for the American people the most critical problem of all." Years earlier, Killian had warned of a technical manpower shortage. Eisenhower would conclude the November 13 address in Oklahoma by asserting that this shortage was a reality and a top concern for the administration. "My scientific advisers place this problem above all other immediate tasks of producing missiles, of developing new techniques in the Armed Services. We need scientists in the ten years ahead. They say we need them by thousands more than we are now presently planning to have."[43] The president's proclamation that education was and would continue to be a chief concern of PSAC, Killian, and the administration set the stage for curricular reform and further federal aid to educational institutions.

At this point, a discussion of PSAC's purpose and the role that the body was expected to play in the administration's decision-making process is appropriate. First and foremost, the job of the President's Science Advisory Committee was simply that—to *advise*. Eisenhower asked Killian to "make [himself] available as an advisor on scientific and technological matters to those

[42] McCone would become the Director of the CIA under Kennedy. "D.D. Eisenhower to John Alex McCone, November 12, 1957," in Galambos and Van Ee, eds, *The Papers of Dwight D. Eisenhower*, Vol. 18, 560.

[43] Dwight D. Eisenhower, "Radio and Television Address to the American People on 'Our Future Security,' November 7, 1957," The American Presidency Project, published online by Gerhard Peters and John T. Woolley, available at: http://www.presidency.ucsb.edu/ws/index.php?pid=10950&st=&st1=#axzz1pFfsCNJX (accessed March 8, 2012).

officers of government holding policy responsibilities."[44] PSAC had no budget, no operating responsibilities, and no role in implementing policy. Eisenhower had made it quite clear in his November 7 address that the committee's primary function was to make the scientific community's knowledge and expertise available to the president at all times. Unlike ODM-SAC, this new and improved advisory body was a permanent standing committee within the White House that reported directly to the Chief Executive. In an age when technological terrors such as thermonuclear war, improved missiles, and orbiting satellites threatened to annihilate entire civilizations, having a group of physicists, engineers, chemists, and biophysicists on hand to offer well informed advice made a good deal of strategic sense. The point to emphasize is that this committee was composed of scientists, not politicians, whose charge it was to advise the president and to offer solutions to contemporary problems. PSAC had virtually unfettered access to Eisenhower and his chief aides at all times and held the president's ear and confidence, making it, in effect, the nation's most powerful scientific think tank. But how and why did Eisenhower place so much faith and confidence in his science advisors, especially Killian? Why, for that matter, did he choose Killian to assume this post over a number of potentially more qualified candidates? Both questions deserve to be explored before an investigation of PSAC's role in education reform can commence.

To return to the previous question, why was Killian, a college president, chosen to chair PSAC over prominent scientists such as Edward Teller, "the father of the hydrogen bomb," or Werner von Braun, arguably the world's leading rocket scientist? Zuoyue Wang asserted that the selection of Killian indicated Eisenhower and his chief advisors' belief that Sputnik "represented

[44]James R. Killian, Jr., Oral History #4, February 1, 1970, The Eisenhower Library Oral History Collection, 105.

less a military and technological threat than one in science and education."[45] Killian had served as an acting member of ODM-SAC, played a crucial role as subcommittee chairman during the 1955 White House Conference on Education, and presided over MIT for nine years. Most importantly, he was so politically moderate that he was essentially apolitical.[46] Interestingly, he was also the only member of PSAC who did not have an advanced degree in a scientific field or any scientific research background. Killian had received his degree in engineering administration from MIT in 1926 and had proceeded up the "winding stair to the MIT presidency."[47] Wang describes Killian as "quiet" and "stately" and notes that he had the "reputation of a brilliant science administrator."[48] He speculates that "he knew both the scientific community and the government well enough to be an effective liaison between them. Conceivably, his nonscientist background might actually have made other White House staff feel more comfortable in working with him."[49] The American political journalist Theodore H. White described the MIT president as both "a genial South Carolinian" and "a brisk, incisive man with the manner and dispatch of a brilliant surgeon."[50]

In short, James R. Killian, Jr. was viewed by the administration and the public as a brilliant man with "a wealth of administrative and technological experience. . . . a methodical planner, but also as one who will slash through red tape to handle an emergency when the occasion demands."[51] A newspaper article entitled "Scientists Cheer Choice of Killian," released the day after the president's announcement, reported that the scientific community viewed the

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[45]Wang, *In Sputnik's Shadow*, 87.

[46]A notable exception to Killian's political moderatism came in the early 1950s, when he publicly defended MIT professors who were targeted by Senator Joseph McCarthy. For more information, see: Killian, Jr.,*The Education of a College President*, 150-157.

[47]For more information on Killian's ascent to the MIT presidency, see: Killian, Jr., "The Winding Stair to the MIT Presidency," in *The Education of a College President*, 1-21.

[48]Wang, *In Sputnik's Shadow*, 105.

[49]*Ibid.*, 78-9.

[50]Eric Pace, "James Killian, 83, Science Advisor, Dies," *New York Times*, January 31, 1988, 38.

[51]"Dr. Killian Has Experience as Research Boss," *Chicago Daily Tribune*, November 8, 1957, 11.

MIT president as "a man of sufficient stature to command the respect of the President, the Cabinet and Congress. It was hoped that he could convince Washington that the burning issue of the day was the country's intellectual competition with the Soviet Union."[52] A later article reviewed the symbolic effect of the Killian appointment, concluding that he and his team represented "the nation's scientific and technological effort to stay ahead of the Soviet Union."[53] On November 15, 1957, James R. Killian, Jr. was sworn in, signaling the arrival of science advice to executive decision-making. His duties began immediately. Within his first week in office, the first Presidential Science Advisor was bombarded by more than 5,000 letters containing suggestions on how to proceed in reassuring and reestablishing American scientific and technological superiority.[54]

Now that the post of Science Advisor had been filled, the next order of business was creating the committee over which the advisor would preside. This proved relatively simple. Most of the members of PSAC were acting members of ODM-SAC, a committee which had been established in 1951 during the Korean War. Roughly one-half of PSAC's members came from educational institutions—Killian, Robert Bacher, Hans A. Bethe, Detlev W. Bronk, George Kistiakowsky, Edward Purcell, Isidor Isaac Rabi, Howard P. Robertson, Jerome Wiesner, and Jerrold R. Zacharias. The other half were established researchers at scientific institutions. In addition, the majority of these individuals were politically inactive and moderate in their political sympathies. Hans Bethe later recalled, "As I remember it there was really a great deal of consensus within the committee. Surprisingly much."[55] PSAC was therefore largely united in its opinions, views, and goals. Since the membership of the body was largely composed of

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[52]Walter Sullivan, "Scientists Cheer Choice of Killian," *New York Times*, November 8, 1957, 12.

[53]John W. Finney, "Killian's Duties are Taking Shape: Aide of 2 Months Presents Views of Top Scientists in the White House," *New York Times*, January 13, 1958, 13.

[54]*Ibid.*, 13.

[55]Hans Bethe, Oral History, 4.

educators, scholars, and academics, one of the subjects upon which the committee agreed was the need for curricular reform and increased funding for academic institutions.

Having discussed the political and physical make-up of PSAC, the topic of Eisenhower's relationship with his science advisors must be explored. First, Eisenhower had an analytical mind and likely developed a deep respect for analytical, scientific minds during his career as a military officer.[56] He later reminisced that "some of his happiest times in the White House were those spent with PSAC."[57] White House Staff Secretary Andrew J. Goodpaster later noted, "The President said that he had a deep sense of obligation to this group" and went on to recall that Eisenhower "tended to put science advice into more and more subjects of national policy."[58] Why did Eisenhower turn to his science advisors for suggestions in "more and more subjects of national policy?" In his memoir *Waging Peace*, the president described Killian and the committee in glowing terms. He reflected that the appointment of Dr. Killian, whom he affectionately called "my wizard," "worked out wonderfully" and that the MIT president "helped to make certain that the government was supporting both basic and applied research. Without such distinguished help, any President in our time would be, to a certain extent, disabled."[59]

The middle of the way political viewpoint held by many of PSAC's members is another reason why Eisenhower sought the committee's advice in a wide array of subjects. He believed them to be objective and reliable advisors and, indeed, they were. Killian reminisced that Eisenhower "came to have a feeling that these advisers, by virtue of being scientists, were

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[56]In fact, Eisenhower's appreciation for analytical subjects and mathematics education began at an early age. One of the few school subjects he enjoyed was geometry and it was a field in which he excelled as a young student. For more information, see: Dwight D. Eisenhower, *At Ease: Stories I Tell to Friends* (Garden City, N.Y.: Doubleday, 1967), 100.

[57]D. Allan Bromley, "Science and Technology: From Eisenhower to Bush," *Presidential Studies Quarterly* 21 (1991): 244.

[58]Wang, *In Sputnik's Shadow*, 1.

[59]Eisenhower, *Waging Peace*, 226.

endowed with an objectivity in technical matters that he didn't find in other advisors."[60] He noted, "The effectiveness and influence of PSAC had resulted from its capacity to be objective and thorough. Repeatedly its recommendations prevailed, because its panels had done their homework thoroughly and their conclusions were not tainted with the influence of vested interests."[61] Eisenhower was therefore drawn to this advisory body for both personal and political reasons. Unsurprisingly, one of the arenas in which Eisenhower turned to his scientists for advice was education reform in the mathematics and sciences.

Hans Bethe once claimed that Eisenhower had the highest confidence in Killian.[62] On December 7, 1957, one month into his duties as Presidential Science Advisor, Killian received a letter from Eisenhower in which the Chief Executive conveyed his confidence, outlined what he expected from his science advisor, and confirmed the level of security clearance granted to the advisor. The president emphasized that Killian's role would be "to anticipate future trends or developments in the area of science and technology, particularly as they affect national security, and to suggest future actions in regard thereto." To accomplish these ends, Eisenhower authorized him "to be in attendance at meetings of the National Security Council, the Cabinet and the Operations Coordinating Board" and to "have full access to all plans, programs, and activities involving science and technology in the Government, including the Department of Defense, AEC, and the CIA."[63] Killian provides a full transcription of this letter in his memoirs and records the significance of its contents: "The authorization in this letter to attend National Security Council meetings and other classified meetings and to be present at cabinet meetings

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[60]Killian, *Sputnik, Scientists*, *and Eisenhower*, 228.

[61]James R. Killian, Jr., Oral History #7, February 23, 1970, The Eisenhower Library Oral History Collection, 105.

[62]Hans Bethe, Oral History, 22.

[63]D.D. Eisenhower to James R. Killian, Jr., December 7, 1957. A full transcription of the letter is provided by Killian in his book, see: Killian, Jr., *Scientists, Sputnik ,and Eisenhower*, 35-36.

was very important, because it opened to me the sessions of the highest policy-making bodies of the government."[64] Indeed, the Presidential Science Advisor had been given almost carte blanche. The virtually unfettered access to bodies such as the CIA, NSC, and the cabinet which Killian was given was politically and symbolically significant. Although such license was not of great consequence in molding Killian's and PSAC's views toward education reform, the high level of access to top-secret and confidential information granted to the science advisor reinforces the claim that Eisenhower placed enormous trust and confidence in his scientists. In addition, the letter reflects and symbolizes the movement of science advice into most levels and sub fields of government.

Sputnik had left in its wake a tense and paranoid national atmosphere. One of Killian's first and primary duties upon assuming office was to reassure the nation. He noted that, in his public addresses, he "sought to temper the hysterical response to *Sputnik*, to reassure all and sundry that we had not suffered 'another Pearl Harbor,' and to describe the assignment the president was giving to PSAC and me."[65] His first public speech was in January of 1958, at the annual dinner of the Women's National Press Club. He was the keynote speaker. In attendance were Speaker of the House Sam Rayburn, Senate Majority Leader Lyndon B. Johnson, and the minority leaders of the House and Senate, Congressman Joseph W. Martin and Senator William Knowland, respectively.[66] In this address, Killian reaffirmed that the United States had not fallen behind the Soviet Union. "The problem facing the country," he said, "is not America's leadership and technological strength as of today, but the maintenance of its leadership tomorrow." He continued by stating that the launching of Sputnik "has given many people the

[64]Killian, Jr., *Scientists, Sputnik, and Eisenhower*, 36.
[65]*Ibid.*, 38.
[66]Edward T. Folliard, "U.S. Leading in Science, Killian Says," *The Washington Post and Times Herald*, January 8, 1958, A1. See also, Killian, Jr., *Sputnik, Scientists, and Eisenhower*, 38-39.

idea that the Russians suddenly have complete technological superiority over us. This impression is wrong. . . . Sputnik has shown that the USSR is a very serious competitor in the technological field. She has not passed us yet, but she has a strong will to do so."[67]

Towards the end of the speech and in the presence of the most powerful and influential congressmen in America, the Science Advisor reasserted the need for education reform. Regarding science education, he stated, "Up until now, we have done little—save in our best schools where science is probably taught as well as anywhere in the world. We have been blocked by the argument that if we strengthen our science education we might run the risk of weakening something else. It is not that scientists should be educated at the expense of people who might be going into the humanities. Rather, it is that science courses have come to be taught more poorly in many schools than the humanities and need to be brought up to par."[68] In this speech, Killian reaffirmed the message that he had conveyed to his subcommittee a little over two years before at the White House Conference on Education. It was important to teach citizenship, social studies, and the humanities, but analytical subjects such as mathematics and science needed to receive an equal amount of educational emphasis. The primary theme of Killian's premier address, however, was not curricular reform. The principal purpose of this speaking engagement was to reassure and reaffirm to the American people and their elected officials that *Sputnik* had not marked the demise of U.S. technological and scientific prestige. Eisenhower later confided to the MIT president in a personal letter, "When millions, startled by sputniks, wanted to plunge headfirst and almost blindly into the space age, you assumed the complex responsibilities of trying to coordinate, for me. . . . programs [which] were not dictated or designed in an atmosphere of panic. No one did more than you, in those early days, to bring

[67]Folliard, "U.S. Leading in Science, Killian Says," A1.
[68]*Ibid.*, A7.

reason, fact and logic into our plans for space research and adventure."[69]

Killian's keynote address at the annual dinner of the Women's National Press Club was the first of several speeches that he made during his tenure as Science Advisor. Many of these addresses were subsequently published in both popular magazines and academic journals. In addition, the newspapers of the time highlighted the key themes expressed in these public speaking engagements. Following the speech to the Women's National Press Club, the focus of Killian's addresses shifted from emphasizing America's technological prowess to asserting the need for educational reform. In a speech given on March 3, 1958, at the annual awards banquet of the Seventeenth Annual Science Talent Search in Washington, D.C., the Science Advisor alluded to the oppressive Soviet system in encouraging the aspiring scientists to "mix with [their] professional work some of the ingredient for making gentle the life of our turbulent times, for cultivating civility in a period of harsh and brutal incivilities."[70]

Twenty days later, Killian appeared onstage alongside Admiral Hyman G. Rickover, one of the nation's most outspoken critics of American education, and Dr. Merle Tuve, Director of Terrestrial Magnetism Research at the Carnegie Institution. The occasion was the fiftieth anniversary celebration of the Saint Alban's School for Boys in Washington, D.C. The audience was composed primarily of high school principals and science and mathematics teachers from Washington, D.C. and the surrounding area. "The purpose of the meeting was to respond to President Eisenhower's challenge, made last November in Oklahoma City, that all school boards and parent-teacher's organizations scrutinize their curricula and standards to see whether they

[69]"D.D. Eisenhower to James R. Killian, Jr., July 16, 1959," in Galambos and Van Ee, eds, *The Papers of Dwight D. Eisenhower*, Vol. 20, 1579.

[70]James R. Killian, Jr., "The Qualities of a Scientist," *Science News Letter* 73 (1958): 170.

met the demands of the time."[71] The three men addressed the audience in succession, proposing and promoting ideas to increase the quality of American education in the mathematics and sciences.

Among the proposals made were the following: "Reward superior teachers with significantly larger salaries," "Give the high school teacher enough free time to become a scholar again," and "Push the talented student ahead as fast as he can go, rather than holding him back with the dolts."[72] The trio agreed that both gifted students and teachers needed to be rewarded and that the school system should require that, "higher standards, including increased emphasis on science, must be imposed upon high school students." Killian asserted, "Our overriding objective today. . . . must be to elevate standards of performance and enlarge the intellectual content of the secondary school program." Tuve argued, "The key to this whole program of more high quality students is more high quality teachers." Summoning his usual flair for the dramatic, Rickover called for a more rigorous standard of academic excellence, proclaiming, "We shall have to make a choice: educate our children better or downgrade our standard of living."[73] Since the Science Advisor was an active member of the administration, Eisenhower followed the reports of Killian's public appearances. He also went to PSAC meetings regularly for consultation and met with Killian individually on a regular basis.[74] It has been established that the president had great faith in his Science Advisor and that the two former college presidents saw eye to eye in most matters of domestic and science policy. One of the many subjects on which they strongly agreed was the pressing need for education reform in the mathematics and sciences.

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[71]James Reston, "3 Scientists Give Plan to Improve U.S. High Schools," *New York Times*, March 24, 1958, 1.

[72]*Ibid.*, 1.

[73] "Excellence in Education," *The Washington Post and Times Herald*, March 30, 1958, E4.

[74]Killian, Jr., *Sputnik, Scientists, and Eisenhower*, 193-4.

Roughly one month before Killian spoke at the awards banquet of the Seventeenth Annual Science Talent Search, Eisenhower began drafting a document which he intended to have circulated amongst the nation's legislators during the second session of the eighty-fifth congress. This manifesto was officially titled "Message from the President of the United States Transmitting Recommendations Relative to Our Educational System." It was referred to the House Committee on Education and Labor in late January and ordered to be printed.[75] Eisenhower opened the communiqué by reaffirming a message which he had been stating both privately and publicly for years—that the majority of the responsibility for improving individual schools should fall to the individual states.[76] He wrote, "For the increased support our educational system now requires, we must look primarily to citizens and parents acting in their own communities, school boards and city councils, teachers, principals, school superintendents, state boards of education and state legislatures, trustees and faculties of private institutions." However, Eisenhower realized that the urgency of the situation necessitated a certain degree of involvement on the part of the federal government. "Because of the national security interest in the quality and scope of our educational system in the years immediately ahead, however, the Federal Government must also undertake to play an emergency role."[77]

He then went on to echo the claim which Killian had been making for the better part of a decade, stating, "But if we are to maintain our position of leadership, we must see to it that

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[75]Dwight D. Eisenhower, "Recommendations Relative to Our Educational System," *Science Education* 42 (1958): 103.

[76]Eisenhower devoted an entire paragraph of his January 9, 1958, State of the Union Address to the issue of providing federal aid to academic institutions, stating, "Federal action can do only a part of the job. In both education and research, redoubled exertions… on the part of state and local governments, private industry, schools and colleges, private organizations and foundations, teachers, parents, and—perhaps most important of all—the student himself, with his bag of books and his homework." See, Dwight D. Eisenhower, "Annual Message to the Congress on the State of the Union, January 9, 1958," The American Presidency Project, published online by Gerhard Peters and John T. Woolley, available at: http://www.presidency.ucsb.edu/ws/index.php?pid=11162#axzz1pV3z88LG (accessed March 8, 2012).

[77]Eisenhower, "Recommendations Relative to Our Educational System," 103.

today's young people are prepared to contribute the maximum to our future progress. Because of the growing importance of science and technology, we must necessarily give special, but by no means exclusive, attention to education in science and engineering." He went on to praise the efforts of the National Science Foundation and its educational programs but insisted that much more could be done to foster science education and counter the technical manpower shortage.[78]

Eisenhower went on to recommend a fivefold increase in government appropriations for the National Science Foundation, emphasizing that the revitalization of science education should be a top concern of the organization. First, he recommended increased funding in support of institutions "for the supplementary training of science and mathematics teachers and a somewhat larger increase to support teacher fellowships. This will provide additional study opportunities to enable more science and mathematics teachers in our schools and colleges to improve their fundamental knowledge and, through improved teaching techniques, stimulate the interest and imagination of more students in these important subjects." Second, the president pointed out that many schools' classroom materials are "out of date or poorly conceived" and advocated an increase in funds to "stimulate the improvement of the content of science courses at all levels of our educational system."[79] A third increase targeted NSF programs which aroused, nurtured, and encouraged young minds to pursue scientific fields as a career. Eisenhower noted that, "The Foundation has already developed a series of programs directly focused on the problem of interesting individual students in science careers, and these programs should be expanded." Towards the end of this manifesto, Eisenhower noted that the planning and implementation of educational reform in the sciences would be the responsibility of scientists; general education reform in the humanities, social sciences, and languages would fall within the purview of the

[78] *Ibid.*, 2.
[79] *Ibid.*, 2.

Department of Health, Education, and Welfare.[80]

In this message to Congress, Dwight D. Eisenhower reaffirmed his commitment to education reform and reiterated his belief that much of the financial responsibility for this reform would fall to the individual schools boards within the individual states. He also confirmed the place of scientists in planning, encouraging, and promoting a reformation in science education. He closed the message by returning to his original point—that education reform was a national security issue that demanded immediate congressional action. "National security requires that prompt action be taken to improve and expand the teaching of science and mathematics. . . . The administration therefore recommends that the Congress authorize Federal grants to the States, on a matching basis, for this purpose. These funds would be used, in the discretion of the States and the local school systems, either to help employ additional qualified science and mathematics teachers, to help purchase laboratory equipment and other materials, to supplement salaries of qualified science and mathematics teachers, or for other related programs."[81] In a way, Eisenhower used the confusion and hysteria that accompanied the successful launch of the Soviet satellite *Sputnik* to his advantage. Many American educators had been hesitant to promote curricular reform in the mathematics and sciences during the White House Conference on Education in 1955. Between 1955 and October 4, 1957, the Congress had been equally hesitant to encourage a bill to promote education reform in these fields. *Sputnik* allowed Eisenhower to frame the issue of education reform as a national security matter, prodding Congress to revisit and reconsider legislation geared toward maintaining America's scientific preeminence.

In the coming months, the president and his scientists would face a daunting task. Maneuvering the education bill for which Eisenhower had called through a skeptical Congress

[80] *Ibid.*, 3.
[81] *Ibid.*, 4.

held by the Democratic Party would prove no easy task. The Chief Executive's hesitance to provide any more than the limited government funding already proposed to academic institutions within the individual states would also complicate matters greatly. Following the launch of *Sputnik*, Congress warmed to the idea of a bill to substantially aid education but felt that the federal government and its coffers could and should play a more active role. The legislative branch's greatest point of departure from the president's plan was its desire for a bill that would provide more federal grants for research. Drafting a bill upon which all parties would agree took considerable amounts of complex negotiations, a process in which James R. Killian, Jr., as Science Advisor, played a small but crucial role.[82] Killian recounted in his memoirs, "This relationship of confidence was a crucial factor in enhancing the influence of the committee and in gaining presidential support for its recommendations. It also resulted in Eisenhower's turning to his science advisers for advice on defense budget issues and on such diverse matters as the Defense Education Act."[83] Killian also elaborated on PSAC's modest but central advisory role during the negotiations surrounding the passage of the National Defense Education Act of 1958. He wrote:

> The president had consulted many people. . . . including his science advisors. Marion B. Folsom, secretary of the Department of Health, Education and Welfare, along with his deputy, Elliot Richardson, played key roles in developing an administration program for education, and both Folsom and the president invited me to share in the discussions leading to the development of the administration's proposals. . . . On several occasions the president invited me to join with his brother, Milton Eisenhower, then president of Johns Hopkins University, in meeting with him informally in the mansion to discuss the various educational proposals that were put before the president.[84]

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[82]For the purpose of this piece, only the role of the Science Advisor in the negotiating process will be explored. For the interested reader, scholar Barbara A. Clowse has produced a brilliant and painstakingly thorough investigation of the political debates and the congressional complexities surrounding the passage of the National Defense Education Act. See: Barbara A. Clowse, *Brain Power for the Cold War: The Sputnik Crisis and the National Defense Education Act of 1958* (Westport, CT: Greenwood, 1981), particularly pp. 94-100.

[83]Killian, Jr. *Sputnik, Scientists, and Eisenhower,* 219.

[84]*Ibid.*, 193-4.

The House Education and Labor Committee eventually drafted a bill co-authored by Representative Carl Elliot and Senator J. Lister Hill, both Democrats from Alabama. The document included a $10,000,000-plus increase in government funding for area vocational programs and research. It also included an item by which the federal government provided low-interest loans for college or graduate school students. Eisenhower communicated to the congressional committee that he would not support a bill that featured this $10,000,000 increase; in regards to a federal loan title, he remained noncommittal. The committee granted the administration this concession and dropped the $10,000,000 item completely.[85] Even after the vocational-education program had been erased from the final draft, Eisenhower remained reluctant to support the piece of legislation. He hesitated to endorse the loan title, believing the item to be another example of the federal government overstepping its bounds. He reflected, "I met with Secretary Folsom, Dr. Killian, and other advisors to consider strategy. I insisted that we stick to the main points of the administration bill, resisting in particular an increase in scholarships above ten thousand."[86]

White House aide Reginald Conley attended the executive sessions of the Committee of Education and Labor and confided to Elliot Richardson that the passage of the bill depended on Eisenhower's backing. He asserted, "In its present form the Committee Bill is so close to the Administration's proposal, except for inclusion of the loan title, that I don't see how the Administration could make any serious objection to it. However, its chances of passage are, in my view, practically non-existent short of vigorous, all-out, whole-hearted support from the

[85]Bess Furman, "Science Aid Plan Near Final Draft," *New York Times*, June 30, 1958, 17.
[86]Eisenhower, *Waging Peace*, 243.

Administration."[87] Folsom and Killian would prove instrumental in securing the Chief Executive's support for a loan title.

Killian described the small but critical role he played in convincing Eisenhower and members of Congress to support the draft of the National Defense Education Act produced by the House Committee on Education and Labor:

> One of the most controversial parts of the education message was the proposal for federal scholarships. A number of thoughtful members of Congress who were otherwise very much in support of the overall concept of the bill were dubious about federal scholarships, except at the graduate level. I remember attending some informal meetings of members of Congress, particularly at the invitation of Congressman [Peter] Frelinghuysen of New Jersey. In these meetings a proposal was generated to substitute federal loans for the proposed scholarships, and Congressman [Walter] Judd introduced an amendment to the bill providing for federal loans. Eisenhower at first was skeptical about loans. He recalled that Columbia University Medical School's loan fund had not been called upon very much by students, and he doubted whether young people and their parents would be willing to go into debt for their education. Secretary Folsom asked me to join him in discussing this amendment with the president, and at this meeting I was able to give Eisenhower a report on the great success of a loan fund started in 1930 at MIT and to express my conviction that a loan fund designed as a student aid fund and not as a commercial loan arrangement would be attractive to students. In the end, Eisenhower agreed to accept the Judd amendment and to give it his blessing.[88]

Killian described MIT's loan fund to Eisenhower "not as a financial operation, but as a real student aid program in which the interest rate was subordinated. A low interest rate was set, and it was used right up to the hilt by students, and in fact the payoffs were better than we ever forecasted. This was a factor in persuading Eisenhower to support a loan program."[89] Eisenhower realized that a bill which provided for federal loans was better than no education bill at all. He later recalled that Judd's provision making federal loans available at 3% was "a good

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[87] Memorandum from Reginald Conley to Elliot L. Richardson, June 27, 1958, Elliot L. Richardson Files, Records of the Department of HEW, Federal Records Center, Suitland, Maryland. Cited in: Crowse, *Brainpower for the Cold War*, 117.

[88] Judd represented Minnesota. Both he and Frelinghuysen were Republicans. Killian, Jr. *Sputnik, Scientists, and Eisenhower*, 196.

[89] James R. Killian, Jr., Oral History #10, Undated, The Eisenhower Library Oral History Collection, 304.

one" which "provided for repayment of each loan by the recipient within ten years of his leaving school. In essence its purpose was to make an education available to the able student while encouraging self-reliance."[90]

Killian had traveled back and forth between the White House, Congress, and the Department of HEW, attending meetings and providing advice on issues related to science education. The most important piece of advice he offered was to the President of the United States. As a college president and, more importantly, as the president of the nation's premier institution of science education in the country, his contribution to the discussion played an instrumental role in persuading Eisenhower to support a loan measure. According to the Science Advisor, the Massachusetts Institute of Technology had benefited from similar programs. As such, providing federal loans to stimulate higher science education was a pivotal first step to countering America's technical manpower shortage. In his memoirs, Killian plainly states that he had played "a modest part in shaping ideas and strategy in behalf of the National Defense Education Act."[91] This is a fair comment which brilliantly and accurately conveys to the historian the nature of the Science Advisor's role in the Eisenhower administration—to advise. Killian had a say in the decision-making process but hardly any say in the implementation process. After the president communicated to Congress his desire to approve the Judd amendment and the legislative act as it stood, events were quickly set into motion.

On July 3, 1958, House minority leader Joseph Martin predicted that this act to increase government aid to scientific institutions would be passed before the end of the congressional session. He was correct. In a 23 to 3 vote, the House Education and Labor Committee, after consulting with "Republican committee members, the Secretary of Health, Education, and

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[90]Eisenhower, *Waging Peace*, 243.
[91]Killian, Jr., *Sputnik, Scientists, and Eisenhower,* 196.

Welfare, and the science adviser to the President" hinted to reporters that the bill, as it stood, would likely be passed by the Legislative Branch and signed into law by the president. Newspapers of the time reported to the American public the short-term and long-term effects that the National Defense Education Act promised to produce. The *New York Times* reported, "Fiscal experts at the Health, Education, and Welfare Department figured that the four-year House measure to aid science education would cost $826,584,000 as finally approved. Its provisions include from 19,000 to 23,000 Federal scholarships for talented students, a student loan program, and a series of provisions to strengthen the teaching of mathematics, the sciences, and foreign languages."[92] The student loan program authorized the federal government to pay $47.5 million for fiscal 1959, $75 million for fiscal 1960, $82.5 million for fiscal 1961, and $90 million for fiscal 1962.[93]

It should be noted that Killian and PSAC's desire for a loan title was not driven purely by a selfless faith in science education's ability to win the Cold War; institutional and economic considerations also likely played a significant role. The National Defense Education Act called for increased federal funding for education in general and science education in particular. As such, the scientific educational institutions at which half of the PSAC committee members were employed would be among the largest beneficiaries. In the fall of 1956, while Killian was still president of MIT, tuition at the institution rose by more than 20%, from $900 $1,100.[94] The federal loans for which Killian and PSAC lobbied would encourage more students to pursue a degree at academic institutions by offsetting some of these costs.

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[92]Bess Furman, "Passage Forecast on Education Aid," *New York Times*, July 3, 1958, 3.

[93] "U.S. Congress. House. National Defense Education Act of 1958. P.l. 85-864. 72 Stat. 1580 (2 September 1958)," Federal Education Policy History, full text of the act is available online: http://federaleducationpolicy.wordpress.com/2011/06/03/national-defense-education-act-of-1958-2/ (accessed March 7, 2012).

[94] "MIT Raises Tuition," *New York Times*. May 21, 1955, 10.

The National Defense Education Act was enacted on September 2, 1958. Responsibility for implementing the provisions of the bill would be divided between the National Science Foundation and the Department of Health, Education, and Welfare. One month before the bill was enacted, on August 1, 1958, Arthur S. Flemming took over the HEW cabinet position after Marion Folsom resigned for health reasons. He "took over in time to carry the ball for the Sputnik-inspired education assistance law" and played the central role in overseeing the implementation of the act's provisions.[95] The act provided $1 billion over four years to HEW to provide need-based loans for higher-education students and to provide funding for the purchase of school laboratory equipment. The NSF received an influx of federal funding which nearly tripled its budget from a total appropriation of $50 million in fiscal 1958 to $136 million in fiscal 1959. These funds would be used to strengthen and extend the foundation's fellowship and institute programs.[96] Federal funding and expansion of the NSF's programs would continue in the decade following Eisenhower's retirement; by fiscal 1968, the foundation's allocated budget was $500 million.[97]

Five months prior to his resignation, James R. Killian, Jr. made his last major public address. On December 30, 1958, he was the keynote speaker at the 125th annual meeting of the American association for the Advancement of Science in Washington, D.C. He used the speech as a platform from which to extol the Eisenhower administration's "record of progress" in the fields of science funding and education. He hailed the National Defense Education Act as one of

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[95]Bernice Flemming, *Arthur Flemming, Crusader at Large: A Memoir* (Washington, DC: Caring Publishing, 1991), 194. For more information on the appointment of Flemming and his role in implementing the NDEA, see: Arthur S. Flemming, Oral History, June 2-3, 1988. The Eisenhower Library Oral History Collection, available at: http://www.eisenhower.archives.gov/research/oral_histories/oral_history_transcripts/Flemming_Arthur_504.pdf, 43-46.

[96]Rudolph, *Scientists in the Classroom*, 109-110.

[97]Jennifer B. McCormick, Homer A. Neal, and Tobin L. Smith, *Beyond Sputnik: U.S. Science Policy in the Twenty-first Century* (Ann Arbor, MI: University of Michigan Press, 2008), 3.

the "year's greatest accomplishments," pointing to the piece of legislation's role in expanding the programs of the NSF. He stated correctly that the tripling of the foundation's budget had helped to "increase its support of basic research and expand its programs for science-teacher training and other efforts contributing to the quality of science education."[98] In the years following his retirement, Killian would claim that the loan program of the NDEA had "changed the whole psychology about borrowing" and "was a watershed act on the part of Congress. They found a way to deal with the church-state problem, and for the first time to bring the federal government into support of education on a large scale. This was its great significance. The urgency of doing something about strengthening education and science and so on was a great help in accomplishing that."[99] Killian concluded his December 30th address by cautioning Americans to remain committed to educational excellence and not to lower their standards of teaching. "A greater desire to learn and an increased respect for learning—for intellectual excellence—may now in the long run be essential for national survival."[100] These were powerful and prophetic words.

On May 28, 1959, Killian sent the president an official letter announcing his intention to resign the post of Science Advisor. In this personal message, he informed his boss that he was deeply grateful to have had the opportunity to work under his "inspiring leadership." He went on to convey his confidence that "the programs developed during this recent period will stand as a milestone in the progress of American science."[101] In his memoir, Killian explained that his decision to resign from the position stemmed from a desire to escape the Washington political

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[98]James R. Killian, Jr., "Science and Public Policy," *Science* 129 (1959): 129.

[99] James R. Killian, Jr., Oral History #10, Undated, The Eisenhower Library Oral History Collection, 305-6.

[100]Killian, Jr., "Science and Public Policy," 134.

[101]James R. Killian, Jr. to Dwight D. Eisenhower, May 28, 1959. A full transcription of the letter is provided in: "Killian Letter and Reply," *New York Times*, May 29, 1959, 2. See also, John W. Finney, "Killian Resigns as Science Aide," *New York Times*, May 29, 1959, 1.

arena. He reiterated that he had no desire to remain in a government post and had no long-term political ambitions; he also stated that he "didn't want [his] public service to become habit-forming."[102] Eisenhower responded to Killian's letter immediately, informing the Science Advisor that he accepted his resignation. He thanked Killian for his dedication to the position and pointed out that PSAC's efforts had "already produced results that should have lasting value to the nation."[103] The Ukrainian-born Harvard chemist George B. Kistiakowsky would replace Killian as Science Advisor and chairman of PSAC. Kistiakowsky would later claim that his relationship with the president was just as amicable as the relationship between Killian and Eisenhower had been.[104]

Eisenhower's claim that PSAC's work had "already produced results that should have lasting value to the nation" proved especially true in the realm of education. The National Defense Education Act of 1958 was the first general education aid measure to be enacted since the Morrill Land Grant College Act of 1862, the bill which allowed for the creation of state-operated colleges.[105] The act allowed more students to pursue college at both the undergraduate and graduate levels via federal loans. These loans improved science education by allowing schoolteachers to pursue further education in the field, thus increasing the quality of teaching. It also helped stimulate American public school science programs by providing financial aid for the purchase of classroom materials. Schools could obtain the newer equipment necessary for implementing new and improved curriculums at cheaper rates through NDEA grants; oftentimes, schools paid 5% of the costs, the government the other 95%. These grants helped cover the new

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[102]Killian, Jr., *Sputnik, Scientists, and Eisenhower*, 206.

[103]Dwight D. Eisenhower to James R. Killian, Jr., May 29, 1958. A full transcription of the letter is provided in: "Killian Letter and Reply," *New York Times*, May 29, 1959, 2.

[104] George B. Kistiakowsky, Oral History, November 17, 1976, Eisenhower Library Oral History Collection, available at: http://www.eisenhower.archives.gov/research/oral_histories/oral_history_transcripts/Kistiakowsky_George.pdf, 20.

[105]Loren B. Pope, "Education in Review: Congress Nearing Action on Measures for Federal Aid to Education," *New York Times*, August 3, 1958, E9.

science and mathematics textbooks which schoolchildren in most facilities desperately needed.[106] PSAC member Hans Bethe claimed that the *Sputnik* launch and the NDEA which it spawned had significantly aided American secondary education, using a personal reminiscence as an example. "My wife paid a lot of attention to the Ithaca, New York schools. The Ithaca schools improved tremendously after Sputnik, which was just the time our daughter entered the critical years, I think, eighth grade or so. And so she got a very good education which she never would have gotten without Sputnik."[107] The NDEA had marked a major turning point in the history of American education and was inarguably one of the Eisenhower administration's greatest accomplishments. It was also a triumph for Killian and PSAC which reaffirmed the peripheral but important role of science advice in executive policy making.

Nineteen years after traveling to Washington, D.C., to present the bedridden Dwight D. Eisenhower with the Atoms for Peace Award, James Rhyne Killian, Jr. passed away at his home in Cambridge at the age of eighty-three.[108] During his tenure as Science Advisor, Killian had played a small but crucial advisory role in many of the Eisenhower Administration's policies. He reminisced, "My role as presidential science advisor in the months of pandemonium following *Sputnik* was a heady, iridescent experience for a college president, but it was also one of happy fulfillment. I was at the center of memorable events."[109] Regarding education reform, Killian was indeed in the middle of "memorable events." While president of the Massachusetts Institute of Technology in the mid-1950s, he emerged a champion of curricular reform in the mathematics and sciences. As a subcommittee chairman at the White House Conference on Education, he continued to push for reform, albeit to little effect. The launch of *Sputnik* in October of 1957 and

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[106]Lloyd H. Barrow, Jim Concannon, and Cathy Wissehr, "Looking Back at Sputnik and Its Impact on Science Education," *School Science and Mathematics* 111 (2011): 373.

[107]Hans Bethe, Oral History, 24.

[108]Eric Pace, "James Killian, 83, Science Advisor, Dies," *New York Times*, January 31, 1988, 38.

[109]Killian, *Sputnik, Scientists, and Eisenhower*, 205.

the climate of anxiety it generated propelled the MIT president to the office of Science Advisor. From this post, Killian was well-positioned to reassure the nation that the United States had not fallen behind the Soviet Union while continuing to advocate for increased aid to teachers and students.

Over time, the president and his "wizard" formed a bond of mutual trust and understanding forged in the semi-hysterical aftermath of a post-Sputnik world. The confidence Eisenhower placed in Killian was amplified by the latter's well-earned reputation for good judgment and political moderation.[110] During the politically-charged negotiations over the National Defense Education Act, Killian would play a modest but noteworthy role in convincing the president to not only accept but also wholeheartedly endorse a federal loan title; these federal loans would benefit numerous students at MIT and other institutions of higher learning. Other NDEA programs would provide money to secondary education institutions, research facilities, and the National Science Foundation, all of which would proceed to benefit students and educators at all levels. In the end, one should remember that James R. Killian, Jr. and PSAC had no role in implementing public policy under Eisenhower. The advice of Killian and his committee did, however, prove instrumental in developing many of the administration's

[110]Sadly, it appears that amiable relations between the president and his science advisors reached its zenith during the Eisenhower years. Following Eisenhower's retirement, the rapport between the White House and its scientists experienced a steady decline. "President Johnson did not trust scientists much, and President Nixon trusted them even less. The situation came to a head in the early 1970s, when several former members of PSAC and one current member testified against the Nixon Administration's positions on antiballistic missile plans and the supersonic transport, even though they had participated in confidential discussions on these topics. Not surprisingly, Nixon… wiped out both PSAC and the position of science advisor." The position was later revived under President Gerald Ford and the post still exists today, in altered form, within the Barack Obama administration. See, Bromley, "Science and Technology: From Eisenhower to Bush," 245. For information on science advice in the Obama White House, see: "Office of Science and Technology Policy," The White House, http://www.whitehouse.gov/administration/eop/ostp (accessed April 1, 2012).

domestic policy initiatives, one of the most consequential and longest-lasting of which was education reform.

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APPENDIX

Original President's Science Advisory Committee (PSAC), 1957*

Name	Field of Expertise	Institution
James R. Killian, Jr.	Engineering/Collegiate Administration	Massachusetts Institute of Technology (MIT)
Robert Bacher	Physics	California Tech
William O. Baker	Chemistry	Bell Labs
John Bardeen	Physics	University of Illinois
Lloyd V. Berkner	Physics	Associated Universities Inc.
Hans A. Bethe	Physics	Cornell University
Detlev W. Bronk	Physiology/Biophysics	Rockefeller Institute
James Fisk	Physics	Bell Labs
Donald F. Hornig	Chemistry	Princeton University
George B. Kistiakowsky	Chemistry	Harvard University
Edwin H. Land	Electrical engineering	Polaroid Corporation
Wolfgang Panofsky	Physics	Stanford University
Emanuel Piore	Physics	IBM
Edward Purcell	Physics	Harvard University
Isidor Isaac Rabi	Physics	Columbia University
H.P. Robertson	Physics	California Tech
Glenn T. Seaborg	Chemistry	University of California, Berkeley
Jerome Wiesner	Electrical engineering	MIT
Herbert F. York	Physics	Lawrence Livermore Laboratory
Jerrold R. Zacharias	Physics	MIT

* Biographical information of PSAC located in: Wang, *In Sputnik's Shadow*.