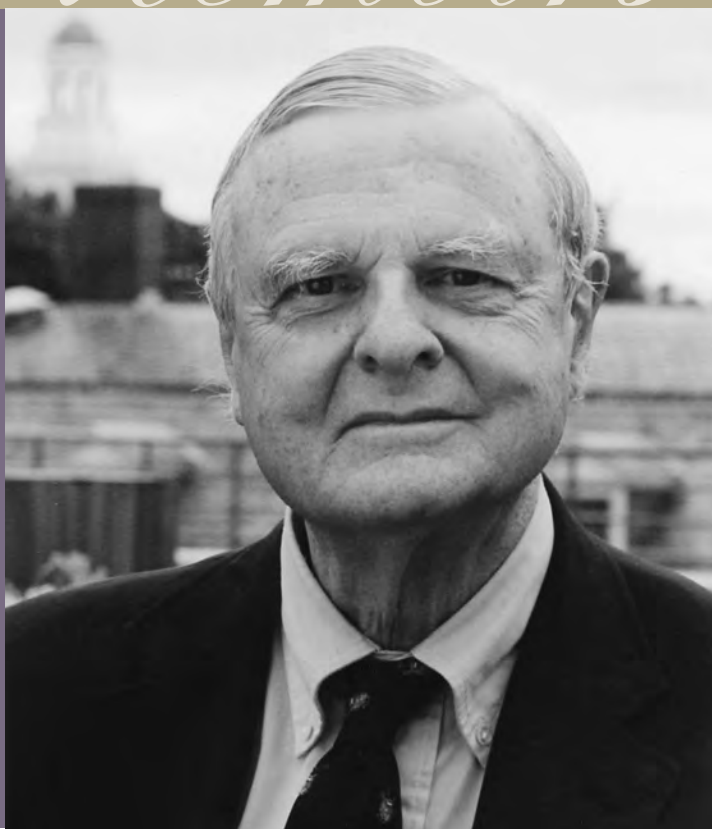
Harvey Brooks

1915–2004

BIOGRAPHICAL *Memoirs*



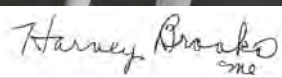
A Biographical Memoir by
Lewis M. Branscomb

NATIONAL ACADEMY OF SCIENCES

HARVEY **BROOKS**

August 5, 1915–May 28, 2004

Elected to the NAS, 1962



By Lewis Branscomb[1]

In the post-World War II period, Harvey Brooks[2] was the intellectual leader of the field of science and public policy and its most sought-after practitioner. He served Harvard University as a tenured faculty member for more than 50 years, first as Gordon McKay Professor of Applied Physics, subsequently as dean of the Division of Engineering and Applied Sciences (1957–1975), and then as Benjamin Peirce Professor of Technology and Public Policy at Harvard's Kennedy School of Government.

Chief Architect of his Field

Benjamin Franklin would have been proud of Harvey Brooks—a man who, more than most, truly appreciated "useful knowledge" and the values and institutional structures necessary to apply basic science to social needs. Harvey's accomplishments are widely recognized. He was elected to the National Academy of Sciences (1962), the National Academy of Engineering (1968), and as a senior member of the Institute of Medicine (1973). As will be recounted in this article, (to distinguish it from his own 2001 memoir) he was especially active through projects at the three academies and their National Research Council, where he served on no less than 16 study committees over 35 years. He also testified before Congressional committees at least 15 recorded times.

Elected to the American Philosophical Society in 1961, Harvey presented three papers over his 43 years of membership that tracked the evolution of his career in science and public policy: a prospective on solid state physics (1963), a reflection on "expertise and politics" (1975), and an analysis of the complexities of energy policy (1980). He was a

1. Emeritus professor of public policy and corporate management, Harvard University; emeritus director of the Program of Science, Technology, and Public Policy, John F. Kennedy School of Government, Harvard University, and adjunct professor in the School of International Relations and Pacific Studies, University of California, San Diego.
2. This memoir is drawn substantially from the author's memoir of Harvey Brooks published by the American Philosophical Society, of which Brooks was a member, and which permits that material to be used by the National Academy of Sciences.

member (from 1966) and president (1971–1976) of the American Academy of Arts and Sciences, for which he served on the U.S. Committee for the International Institute for Applied Systems Analysis in Laxenburg, Austria. Harvey was appointed by President John F. Kennedy to the National Science Board in 1962 and served on a number of other boards, both corporate (Raytheon Corp.) and academic (Boards of Overseers of the Franklin Pierce Law Center and the Tufts University College of Engineering).

He was the recipient of honorary doctor of science degrees from six universities, among them Harvard and Yale. He also was awarded the 1993 Philip Hauge Abelson Prize of the American Association for the Advancement of Science and the 1957 Ernest Orlando Lawrence Award of the U.S. Atomic Energy Commission.

Harvey was an extraordinary person, deeply interested not only in the beauty of science and its power to enrich our lives but also in the sociopolitical context of science. He sought to understand the human as well as the more intellectual dimensions of a rational society and to make democratic decision-making better informed. In addition to many papers in three scientific disciplines as well as in science policy, he authored in 1968 *The Government of Science* (a synthesis of what he viewed as his most important public policy work) and founded the international *Journal of the Physics and Chemistry of Solids*, for which he remained editor-in-chief until the mid-1970s. Hundreds of notebooks, printed in Harvey's hand and now safely archived in 282 boxes in Harvard's Widener Library, record the ideas that flowed from the myriad conferences, advisory committees, and other bridges between science and policy on which he served.[i] Three years before his death in 2004, Harvey summarized the highlights of his life's work:[ii]

> *As I look back over this sketch, I note the progression of my career from submarine warfare to nuclear power to technology assessment to environmental policy analysis to the humanization of work. This progression was fueled both by my own intellectual curiosity and by the sociopolitical preoccupations of a particular period of history, but it is difficult to say in retrospect which type of motivation predominated at any one time. Most frequently, new societal needs opened new windows of intellectual exploration, which were not apparent or obvious at the outset. Thus the struggle between the Bernal philosophy and the Polanyi philosophy of research[iii] formed a continuing, underlying leitmotif that never found any permanent resolution in my own intellectual agenda. Rather, one could say the tension between scholarly autonomy and societal responsiveness was itself the agenda.*

As John Holdren observed in his "Tribute to Harvey Brooks," Harvey:

> *was fascinated from the earliest stages of his career with interactions across boundaries: the interaction of fundamental with applied science, the interaction of science with technology, and the interactions across the still more complex and fractious boundary of science and technology with the public-policy process. This fascination with boundaries shaped a professional life in which Harvey, in turn, reshaped the understanding of all of us about the intersections of science and technology with each other and with society. For at least the last 40 years of his life, he was the best known, best read, and most respected scholar in the world in the field of science and technology policy—the acknowledged chief architect and dean of the discipline.*[iv]

Early experiences

Harvey's boyhood schooling in Cleveland, Ohio, already forecast a brilliant career. He later described himself as "bookish" at that time. Indeed, he recalled indulging in Arthur Eddington, Bertrand Russell, Alfred North Whitehead, and Albert Einstein as a young student. When he was 12, Harvey became fascinated with theoretical physics, and "from that time on thought I would be a physicist." At Yale (his father's and grandfather's alma mater) he majored in mathematics, with a heavy dose of physics, including a graduate course in theoretical physics. A Henry Fellowship took him to Cambridge University in 1937–1939. Coming to Harvard when the war in Europe was looming, he completed his Ph.D. under J. H. Van Vleck in 1940 and was elected a Junior Fellow in the Harvard Society of Fellows.

The Society of Fellows experience must also have accustomed Harvey to ignoring the traditional boundaries between disciplines. With the onset of Pearl Harbor, he took leave from the Society and devoted the war years to highly classified research on anti-submarine warfare at the Harvard Underwater Sound Laboratory (HUSL). His leadership role in the development of Fido, an acoustic homing torpedo, already foretold his commitment to applying his sophisticated scientific education to technological goals when the occasion demanded. As Harvey put it, "I had found during the war that I enjoyed development work, especially the opportunity for long-range strategic thinking about development based on applications of new fundamental science."[v] At HUSL he also met his wife Helen. They married on October 20, 1945, and raised a family of four children, Alice Bourgoin, Katharine Brooks, Kingsley Brooks, and Rosalind Stowe.

At the end of WWII, Harvey joined General Electric's Knolls Atomic Power Laboratory, funded by the Atomic Energy Commission; there he became head of the theoretical physics group and devoted his energies to the development of liquid-metal-cooled nuclear electric-power reactors. This project eventually became the prototype power plant for the *Sea Wolf*, a nuclear submarine famous for traversing the North Pole under the ice.

A career aimed at settling policy conflicts

In 1950, after a decade of science-based engineering, Harvey returned to Harvard as Gordon McKay Professor of Applied Physics, intending to do research in solid-state physics and applied mathematics. But the Atomic Energy Commission diverted him by asking Harvey to join the Advisory Commission on Reactor Safeguards (ACRS), which proved to be a turning point in his career—the beginning of his deep concern for settling policy conflicts that turned both on technological and social values. He became particularly interested in the strengths and limitations of alternative institutional arrangements for mediating strongly held differences of views.

In an early ACRS assignment, Harvey chaired "endless adversarial hearings" over the siting near Detroit of a new nuclear electric power plant. Witnesses for the company included scientists such as Hans Bethe; opponents were led by Ralph Nader, then a young lawyer working for the United Auto Workers (UAW) union. This experience led Harvey to ponder whether it made sense to separate the regulatory role of the ACRS from the promotional role of the AEC. The obvious conflict of interest eventually led to the creation of the free-standing Nuclear Regulatory Commission, but he was not entirely convinced that separation had been a wise move. From a later perspective, he thought that the ACRS had done a better job than the NRC and that the severance of regulation from promotion "created an adversarial relationship between industry and government, which plagued the nuclear industry from its beginning, and, in my opinion, was largely responsible for the demise, or near-demise, of the nuclear industry," even though the industry's own failings were partly to blame.[vi]

Also around the time Harvey arrived back at Harvard from GE, given his wartime experience with HUSL he was asked by the National Academy of Sciences (NAS) to join its Committee on Undersea Warfare; he accepted and subsequently became chairman.

In 1957, in response to alarm over the Soviet launch of the first Earth satellite, President Eisenhower transferred the Science Advisory Committee (established by President Truman in 1951) from the Department of Defense's Office of Defense Mobilization to the Executive Office, where it was renamed the President's Science Advisory Committee (PSAC). In 1958, Harvey was appointed to PSAC, serving into 1964 under President Kennedy and briefly under President Johnson. He remained a senior consultant to PSAC until President Nixon abolished it in 1973. In its first years, PSAC was largely concerned with advising the president on the technological merits of military and space programs. Over time it addressed a wider array of issues.

During the first decade of the Cold War, the members of PSAC and other expert advisers at NAS did not question the need for American superiority in defense and space. Accordingly, Harvey and other PSAC member were content to accept the president's goals and confine their advice to the best technological means for achieving them. But as domestic matters, such as environmental issues, increasingly involved science, the conflation of science and social, economic, and political values had to be addressed.

During the Kennedy administration, the president's science advisor Jerome Wiesner asked Harvey to chair a study of government-agency support for science. To that point, PSAC had primarily been concerned with public policy issues making use of scientific applications. But Harvey made an oft-quoted distinction between "science for policy" and "policy for science."[vii] He pointed out that presidents were almost always concerned with the former, while the scientific community was keenly concerned about the latter—government's commitment to the support of science. The presumption that PSAC might be conflicted over these two interdependent issues was a subject Harvey recognized and often addressed.

Meanwhile, Harvey succeeded George Kistiakowsky, who had been President Eisenhower's second science adviser, as chairman of the NAS Committee on Science and Public Policy (COSPUP),[viii] which began a series of disciplinary studies outlining the state of each field and opportunities for the future. With the aid of Herb Simon, COSPUP and the Social Sciences Research Council also undertook a joint study of the social sciences. "I really did get my nose rubbed in the social sciences," Brooks later recalled.[ix]

In 1963 the NAS entered into a contract with the House Committee on Science and Astronautics, under which a series of important studies of the concept of technology assessment would be performed. Led for the Academy by Harvey, this Congress-Academy collaboration culminated nine years later in the creation of the Office of Technology Assessment (OTA), an independent bipartisan agency of the Congress. The first of its reports were "Basic Research and National Goals" (1966) and "Applied Science and Technical Progress" (1967). In these contexts, the interdependence of science for policy and policy for science were apparent.

Throughout the three and half decades from 1950 to his retirement in 1986, Harvey was substantially responsible for the maturation of the field of science and technology policy studies in the United States, and to a great extent among the democracies abroad.

In 1969 the NAS published "Technology Processes of Assessment and Choice," written by a group chaired by Harvey. This report evaluated in depth the need for an assessment capability to support policy makers and the conditions required for it to be successful. The OTA was finally de-funded by the 104th Congress in 1995. Although many other scholars were very involved in both the creation and successful operations of OTA for its quarter-century of life, Harvey was truly its intellectual father.

Throughout the three and half decades from 1950 to his retirement in 1986, Harvey was substantially responsible for the maturation of the field of science and technology policy studies in the United States, and to a great extent among the democracies abroad. Much of his influence came from his academic position at Harvard. In 1958, during Harvey's PSAC service, Don Price, then head of Littauer School of Public Administration, invited him to join its Harvard Science and Public Policy Seminar. The Littauer School in 1972 evolved into the John F. Kennedy School of Government, and the seminar evolved as well. For his part, Harvey served the Kennedy School as Benjamin Peirce Professor of Technology and Public Policy and director of the Program on Science and Public policy until his retirement.

Diverse projects over the years

The decade of the 1960s was a highly productive time for Harvey in terms of the contributions he made to science and technology policy. Unlike other scholars, who typically addressed such studies in a theoretical style, publishing in academic journals, the great

majority of Harvey's work sprung from his practical interest in addressing real policy problems. Thus he was leading policy studies commissioned by committees of Congress, for example, or performed by the National Academy of Sciences. Many of these studies were published in accessible places; some were not. Fortunately, the MIT Press had the inspired idea of asking Harvey to prepare collections of "essays and speeches" in the area of science and public policy. The resulting volume, published by the Press in 1968, comprises 11 thoughtfully constructed chapters that drew on Harvey's science policy thinking, as expressed in his publications, between 1960 and 1968. Although this work, titled *The Government of Science*, is out of print, it is an invaluable volume for students of science and public policy, and it addresses the extraordinary scope of Harvey's thoughts and achievements.[x]

Harvey Brooks, approximately 1967.
(Photo by Paul Koby.)

In 1968 Harvard was the beneficiary of a $10-million gift from the IBM Corp., the result of Tom Watson, Jr.'s concern about widespread public fears that computers, then entering the market, would displace manual work and create unemployment. The Harvard Business School launched a study to determine how realistic this concern was, and the economists in the project soon concluded that computers' increases in productivity should stimulate economic growth and create at least as many jobs as they displaced. Harvey took over leadership of the project and redirected it to a broader study of how the social sciences should deal with technology. By 1972 the Harvard program was closed, but

substantial numbers of grants were made to other universities, which led to the start of many academic programs for the study of the relationship between technological change and socioeconomic change. With the remaining funds, Harvard created the Benjamin Peirce chair in the Kennedy School of Government, which Harvey occupied through the remainder of his career.

In the period from 1976 to 1979, Harvey was heavily engaged in the most difficult policy-oriented study of his career. Known as CONAES—the acronym for Committee on Nuclear and Alternative Energy Systems—Harvey and his cochair Ed Ginzton and their panel put out a 700-page report, which Brooks described as "perhaps the most complicated and costly study ever conducted by the NAS." He credits John Holdren with observing that it was during this period that Harvey's hair turned white. The CONAES project would have been difficult enough, given the polarized political positions of the nuclear power advocates and the greens, but the Three Mile Island accident occurred just as the study was being completed. In addition, estimates of future oil prices were changing after the embargo earlier in the decade, and there was no consensus on how to handle nuclear reactor waste. The effort needed to gain consensus on the final report is evidenced by a count of panel members' personally added comments—79 of them, by my count mostly by Harvey Brooks or John Holdren and sometimes together with other authors.

Despite many criticisms of this mammoth study, in retrospect its conclusions were much the same as would be drawn today. Few would quarrel with the two main conclusions of CONAES: (1) "All in all, conservation deserves the highest immediate priority in energy planning;" and (2) "The research and development necessary to bring truly sustainable energy sources—nuclear fission, solar energy, geothermal energy in places, and perhaps fusion—into place for the long term must receive continued attention." The greatest shortcoming of CONAES was its lack of focus on global climate change, which would have surely increased the report's sense of urgency to reduce dependence on fossil fuels. However, it can be seen to have had enormous immediate impact, because it allayed the sense of panic induced by the oil embargo of 1973 by concentrating on opportunities to make much more efficient use of conventional sources of energy and to develop alternatives. Benefits such as the mandates for increasing automobile gasoline mileage, the incentives for weatherizing homes and cogeneration, and the subsidies for research into alternate sources all flowed from the findings of this report.

Throughout the period of his commitment to energy policy, Harvey was seriously engaged in a program on Technology, Public Policy, and Human Development, a program that had been initiated by Michel Maccoby in 1970 under the IBM-funded grant to Harvard. The program came to include a daring field experiment—to test how imaginative collaboration between management and labor could improve the quality of working life—which was initiated by Harman International Industries in collaboration with the UAW. The plant they chose was in Bolivar, Tennessee, giving the project its name, the Bolivar Project, which was expanded under Harvey's leadership when in 1977 Sydney Harman made a major grant to Harvard for this purpose. This program, led by Harvey, demonstrated the wisdom of "flexible, participative approaches based on explicitly articulated and shared principles." It also demonstrated Harvey's versatility and reach, far beyond theoretical physics to social sciences, management, and law.

Harvey Brooks, mid 1970's.

In the following years, Harvey became ever more deeply engaged in giving advice to the U.S. government, and indeed to other governments and international institutions. For example, he provided consultation to the Organization for Economic Cooperation and Development, chaired the German Marshall Fund, and worked with and helped rescue the International Institute for Applied Systems Analysis. Harvey officially retired from his Harvard chair in 1986, but emeritus status slowed neither his productivity nor his intellectual contributions to public policy. In 1993 he cochaired, with John Foster, the National Academy of Engineering's Committee

on Technology Policy Options in a Global Economy, which released the report *Mastering a New Role: Shaping Technology Policy for National Economic Performance*.

Harvey Brooks's intellectual contributions

In 1998, I had the privilege of orchestrating an occasion in Harvey's honor at which Sidney Harman announced that at his request the Sidney Harman chair at Harvard's J.F.K. School of Government would be renamed for Harvey Brooks. It is quite appropriate that William Clark now occupies this chair, called the Harvey Brooks Professor of International Science, Public Policy, and Human Development. No other title for the chair could more appropriately describe the scope of Harvey's life work.

Harvey was known for his critical thinking and intellectual generosity. John Holdren best described these two qualities from which his colleagues and students so greatly benefited:

> *For all of his erudition and experience, though, Harvey was absolutely without arrogance or affectation. He invested tremendous effort in improving the thinking and writing of his students and colleagues—who were often tempted to publish the densely reasoned commentaries he produced on their drafts and to throw the drafts away. Harvey cared about science, about policy, about teaching, and about the intersection of these in making the world a better place; he never cared about who got the credit.*[xi]

Harvey reflected, in his 2001 memoir, on the central issue to which he "returned again and again:…the importance of finding the right balance between expert and lay input into decision making." In a commentary on a Clinton-Gore report (titled *Science in the National Interest*), Harvey wrote:

> *If one thinks of the process of using science for social purposes as one of optimally matching scientific opportunity with social need—as it were, solutions in search of problems (opportunity) with problems in search of solutions (need—then the total evaluation process must embody both aspects in an appropriate mix, whether successively or simultaneously. Experts are generally best qualified to assess opportunity, while…broadly representative laymen in dialogue with appropriate experts may be qualified to assess need as well as the best balance between opportunity and need.*[xii]

Putting this point another way in his 2001 memoir, Harvey wrote:

> *A recurring concern of mine, still unresolved, is how to give due weight, simultaneously, to two different visions of the scientific enterprise: an endeavor that must remain autonomous and an endeavor that must be driven by societal needs.*

Despite that concern, Harvey Brooks' lifetime contribution both to science and society was a remarkable example of how such a balance could be struck.

NOTES

i Harvard University Archives, Harvey Brooks documents 1930s–1980s, Call no: HUGP 128.

ii Brooks 2001 (in Selected Bibliography).

iii Freeman, C. 1993. *The economics of hope: Essays on technical change, economic growth, and the environment.* London/New York: Pinter.

iv Holdren, J. 2004. *Belfer Center Newsletter*, Belfer Center nt 26:29–48.

v Brooks 2001.

vi Brooks 2001.

vii With customary modesty, Harvey gave credit to W. O. Baker of Bell Telephone Laboratories for first making this distinction.

viii COSPUP was later modified to COSEPUP with the addition of Engineering to its name, also making the acronym more pronounceable.

ix Brooks 2001.

x Library of Congress catalog card no. 68-22824.

xi Holdren, J., *loc. cit.*

xii Brooks, H. 1994. Evolution of the U.S. science policy debate from the endless frontier to the endless resource, unpublished. See Brooks, H. 1996. The evolution of U.S. science policy. In *Technology, R&D, and the economy,* edited by L. R. Bruce and C. E. Barfield. pp 14–49. Washington, DC: Brookings Institution.

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