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Vannevar Bush, Pioneering Engineer, Dies at 84

Dr. Vannevar Bush, one of the outstanding scientists and engineers of the 20th century who organized and led American science and technology during World War II, died at 11:50pm Friday, June 28, at his home at 304 Marsh St., Belmont, Mass. He was 84.

Dr. Bush, who had been in failing health since December 1972, suffered a cerebral vascular accident on Monday, June 3. Primary cause of death was pneumonia.

Dr. Bush was a former professor, vice president and dean of engineering at MIT where in the 1920s and 1930s he developed analytical systems that led to the modern electronic computer. He was president of the Carnegie Institution in Washington, D.C., from 1939 to 1955 and while there served as science advisor to President Franklin D. Roosevelt, organizing US science and technology on behalf of the nation's war effort. He was chairman of the Corporation of MIT from 1957 to 1959 and honorary chairman from 1959 to 1966.

Services will be private and a memorial service at MIT is planned for this fall.

Survivors include two sons, Richard Davis Bush, MD of Belmont, and John Hathaway Bush of Weston and Paris, a sister, Edith L. Bush of Provincetown, and six grandchildren. Dr. Bush's wife, Mrs. Phoebe Davis Bush, died in 1969.

Educator, engineer and inventor, Dr. Vannevar Bush will be long remembered as a statesman of science who played a key role in winning World War II by organizing and directing a technological research program of unprecedented scope.

Well before Pearl Harbor Dr. Bush became the leader in developing a new national research policy. He mobilized a force of 25,000 to undertake such momentous tasks as discovering how to utilize atomic energy.

At the end of the war, his ideas and influence helped determine the character and vast growth of scientific research in decades that followed. He responded to President Roosevelt's request for a comprehensive report on postwar scientific research policy. Published in 1945 under the title *Science the Endless Frontier*, it contained the recommendations of committees, which Dr. Bush had organized to make studies, with respect to health, education, unemployment and other areas in which science would play a part. Dr. Bush wrote:

"Science by itself, provides no panacea for individual, social and economic ills. It can be effective in the national welfare only as a member of a team, whether the conditions be peace or war. But without scientific progress no amount of achievement in other directions can insure our health, prosperity and security as a nation in the modern world....

"Basic scientific research is scientific capital. Moreover, we cannot any longer depend upon Europe as a major source of this scientific capital."

The report was a stimulus for growth in science and technology with an impact on virtually every aspect of American life. The National Science Foundation was established as a major source of Federal support for research. The Office of Naval Research was formed to move far beyond the limits of traditional military research. When the Department of Defense was organized Dr. Bush became chairman of its Research and Development Board, which took the place of the Joint Research and Development Board of the Army and Navy.

Through most of his career Dr. Bush was closely identified with the Massachusetts Institute of Technology—as a student, professor, dean, vice president and chairman of the Corporation. His spirit of optimistic creativity, which touched the lives of many, was perhaps best summed up in the foreword to his book, *Pieces of the Action*, published in 1970:

"He who struggles with joy in his heart struggles the more keenly because of that joy. Gloom dulls, and blunts the attack. We are not the first to face problems, and as we face them we can hold our heads high."

Grandson of sea captains—one a whaling captain, the other a coastwise shipping captain—Dr. Bush came from a Cape Cod family and he had a salty, energetic, forthright, Yankee manner. He owned a farm in New Hampshire at one time but he was especially happy when he could be at his summer place in South Dennis on the Cape.

Dr. Bush was born on March 11, 1890, in Everett, Mass., where his father was a Universalist clergyman, and he grew up and went to high school in Chelsea, on Boston Harbor. He received BS and MS degrees from Tufts College in 1913, worked briefly doing testing for General Electric Company and inspecting for the US Navy, and then

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Pieces of the Action
Foreword

For the title of this book, I have drawn on the wealth of the vocabulary of the youth of our times. Theirs is a pungent stock of words, and action marks most of them. In my time, it has been my good fortune to have a piece of the action here and there in varied circumstances. It has been a pleasant experience for me to review some of the more rugged of these, and some of the more serene.

Do birds sing for the joy of singing? I believe they do. The complexity of their songs is far greater than is needed for recognition or for marking of reserved areas. I have become acquainted with a catbird who obviously derives pleasure as he tries out little phrases on his own. Moreover, I believe that evolution produced birdsongs, and the joy that goes with them, because of the survival value they bestow.

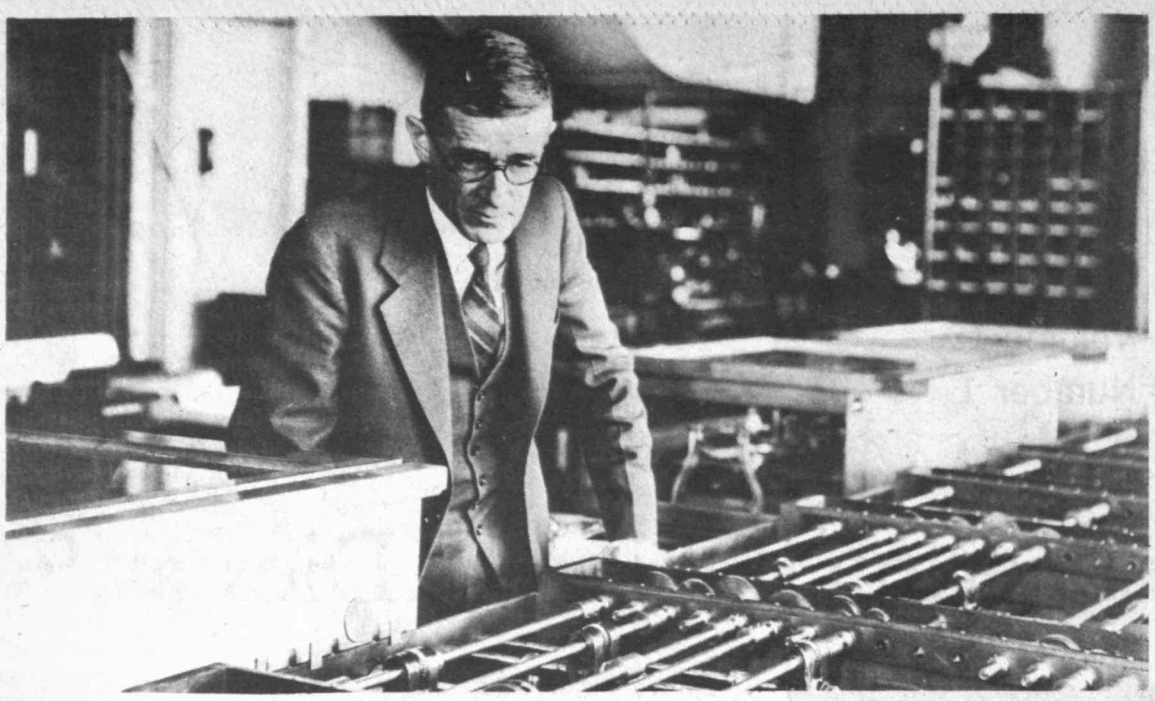
He who struggles with joy in his heart struggles the more keenly because of that joy. Gloom dulls, and blunts the attack. We are not the first to face problems, and as we face them we can hold our heads high. In such spirit was this book written.

Belmont, Massachusetts
January 31, 1970

Vannevar Bush

He was a great teacher, a highly creative scientist and engineer, a brilliant leader of our scientific program during World War II and humanist who enriched the lives of all who came in contact with him. He was one of the great figures in the history of MIT and the nation.

—Dr. James R. Killian, Jr.



Dr. Bush with the differential analyzer, a machine that he completed in 1931. In his work on electric power transmission systems, Dr. Bush acutely felt the need for a machine that could perform analytical tasks too formidable for mathematicians alone. The differential analyzer was one of a series of Bush machines, which were the precursors of modern analogue computers.

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returned to Tufts as an instructor in mathematics.

With money for only one year's study, Bush entered MIT and earned a doctorate in electrical engineering in that single year. In 1916, the D.Eng. was awarded to him jointly by MIT and Harvard under an arrangement then in force.

Dr. Bush returned to Tufts as an assistant professor of electrical engineering and after the entry of the United States into World War I he was called to New London, Conn., for antisubmarine research. He developed a magnetic device for detecting submarines but because of the Navy's lack of proper coordination and management it was never effectively used—providing a lesson that he remembered when he established policies for World War II research.

In 1919, Dr. Bush returned to MIT as associate professor of power transmission. He soon became a dynamic force in the Department of Electrical Engineering, as a teacher and researcher.

Meanwhile he was also an industrial consultant and was associated with Laurence K. Marshall, who had been his roommate at Tufts, in ventures which led to the founding of Raytheon Company, now the largest employer in New England, and of Metals and Controls Corporation, now a manufacturer of nuclear fuels.

In his studies at MIT of power lines, Dr. Bush found that traditional mathematical methods were inadequate for the analysis of increasingly complex systems. In 1925 he set several graduate students to work designing an analog machine called the Product Integraph to grapple with such problems. It was the first in a series of machines which were precursors to modern computers.

Another version of the machine, with a greater capacity, was completed by Dr. Bush and Harold L. Hazen (later a dean) in 1927. It was described by a writer at the time as "virtually a man-made 'mind,' " which "transcends human reasoning in its ability to write the answer to mathematical problems too complex for the brain to solve."

A still more elaborate machine, known as a Differential Analyzer, was completed by Dr. Bush in 1931 and was so successful that it served as a prototype for machines built elsewhere in Europe and the United States. This led to the construction of a 100-ton giant known as the Rockefeller Differential Analyzer, which had 2,000 electronic tubes, 200 miles of wire and 150 motors. It was not fully operational until 1942 and was used 24 hours a day during World War II in making analyses for radar, fire control and other military technology.

Although Dr. Bush maintained a continuing interest in the proto-computer, he had become an administrator in 1932 when he was appointed vice president of MIT and first dean of the newly organized School of Engineering. The period was one in which, under President Karl T. Compton, MIT was at the forefront of rapidly developing sciences and technology. Dr. Bush was a leader in modernizing the curriculum and advancing research.

In 1939, Dr. Bush became president of the Carnegie Institution in Washington, D.C., one of the outstanding American scientific research centers. At the same time he was elected life member of the MIT Corporation and he continued his strong relationship with the Cambridge institution.

Dr. Bush also became chairman of the National Advisory Committee for Aeronautics, the top agency in its field. In 1939 he began meeting with a small group to discuss what might be done to prepare for a massive technological program which they thought would be essential if the US entered the war (as they thought it surely would). They had concluded that the nation was "pathetically unprepared from the standpoint of new weapons."

In addition to Dr. Bush, the group included Dr. Compton of MIT; Dr. James B. Conant, president of Harvard University; Frank B. Jewett, president of the National Academy of Sciences and president of Bell Telephone Laboratories, and Richard C. Tolman, dean of the graduate school at California Institute of Technology.

"Of this group," wrote Irvin Stewart in *Organizing Scientific Research*, "Bush was the one who carried the major part of the responsibility of impressing the need for action upon President Roosevelt and his advisers and of persuading the heads of the military forces of the need for a more effective mobilization of science for a program of improvement of the weapons of warfare."

In early 1940, Dr. Bush went to President Roosevelt with a plan formulated by the group for the establishment of the National Defense Research Committee. The President approved and appointed Dr. Bush chairman of the NDRC. Dr. Compton accepted the responsibility for radar research; Dr. Conant took charge of chemistry and explosives; Dr. Jewett had communications and Dr. Tolman, armor and ordnance. The committee also included representatives of the Army and Navy and Conway P. Coe, commissioner of patents. Each member recruited specialists to embark on research projects which fell under his direction.

Research activity became so extensive by 1941 that the Office of Scientific Research and Development was established, with Dr. Bush as director. Under the OSRD was the NDRC, of which Dr. Conant became chairman, and the Committee on Medical Research, which was to deal with wartime problems in medicine. Dr. Bush also served as chairman of the Joint New Weapons Committee of the Joint Chiefs of Staff.

In 1941, after preliminary studies indicated the feasibility of developing an atomic bomb, Dr. Bush secured the President's approval to proceed and gave Dr. Conant the responsibility for the program. When the project was ready for large-scale construction, it was turned over to the Corps of Engineers, which established the Manhattan Engineering District as a secret agency which would carry the enormous enterprise to completion. A Military Policy Committee, to function as a kind of board of directors, was formed, with Dr. Bush as chairman and Dr. Conant as his deputy.

Among Dr. Bush's tasks was that of briefing Congressional leaders from time to time on progress toward the atomic bomb in order to secure the huge appropriations needed for the program. He won their confidence and there were no political or legislative obstacles. Following the death of President Roosevelt, it was Dr. Bush who gave the first detailed information about the bomb to President Truman. Dr. Bush, Dr. Conant and Dr. Compton were members of the Interim Committee which, after careful deliberation, recommended to the President that the bomb be used.

Of that recommendation, Dr. Bush wrote in *Pieces of the Action*: "I knew that Japan would succumb within a matter of months even if the bomb were not used. But I also knew that an invasion of Japan was already being mounted, that it involved several hundred thousands of estimated casualties, and that once rolling, it could not be stopped in its tracks. I also felt sure that use of the bomb, far less terrible in my mind than the fire raids of Tokyo, if it brought a quick end to the war, would save more Japanese lives than it snuffed out.

"But there was another aspect to this heavy subject. By that time I knew that civilization faced an utterly new era, and I felt that it might as well face it squarely. I knew that nerve gases, delivered in a dozen different ways, could be as terrible as an A-bomb. And I had no illusions about the potential power of biological warfare. When science became really applied to warfare, which occurred only during World War II, it presented humanity with two alternatives. Either it could refrain, formally or informally, from use of weapons of mass destruction—not only the bomb but also gases and bacteria and viruses—or it could thrust itself back into the dark ages. Over twenty years have passed, and the world has understood and has thus far refrained. If for no other reason I would justify the use of the bomb at Hiroshima and Nagasaki because it was the only way in which the dilemma could be presented with adequate impact on world consciousness."

The bomb ended the war but no technology contributed more to winning it than radar and related developments from another OSRD establishment, the Radiation Laboratory at MIT. Centimenter radar and LORAN were crucial in the battle against German submarines.

In *Pieces of the Action*, Dr. Bush observed: "There were a lot of antisubmarine weapons that finally came into use, among them MAD, magnetic airborne detection of a submerged submarine, which made my World War I attempt look amateurish indeed. The greatest of all was centimeter radar. Developed at MIT, this was a form of radar using very short wavelengths and hence giving greater detail. It rendered an aircraft a powerful enemy of the U-boat. It was no minor accomplishment; the Germans never produced it, nor could they counter its us."

Altogether, OSRD developed some 200 new weapons. Proximity fuses, gun stabilization for tanks, rockets for use against tanks, the DUKW and the Weasel were among the innovations. The military services were sometimes resistant to new weapons and one of Dr. Bush's major jobs was to engineer acceptance, sometimes through diplomacy and sometimes by invoking high-level influence.

In his book *My Several Lives*, Dr. Conant paid tribute to Dr. Bush by telling of a memorandum which the director of OSRD wrote to his close associates in 1944. Dr. Bush could be gruff; he wrote in the memo:

"In the heat of trying to work out a matter I made a remark which injured deeply one of the men of this outfit for whom we all have enormous regard. Fortunately, he brought it up a few days later, I realized what I had done, and I made amends as far as I could. But it caused me to wonder.

"The stress at the present time is enormous, and I think that the entire organization is on edge. The suspense caused by the invasion is intense to us who know some of the elements...

"Yet we have an extraordinary record. I wonder if there ever was an organization, made up as ours is of individualists, that had a better record of freedom from serious strife. The same group that started are still with us. We have had internal disagreements, of course, but I cannot remember a single one that did not finally end amicably, and I cannot remember an instance where any valuable individual in our organization has been permanently injured. Our external relations with other agencies and organizations have sometimes been lurid, but they have been kept as internal affairs and we have never been part of the

Vannevar Bush was among the greatest scientists of our era. His own work in the 1920s and 1930s with electrical power networks and the analog devices simulating their behavior made him a pioneer in the development of modern computers. Moreover, he was among the first to recognize the total impcat of science and technology on mankind and the consequent importance of sound scientific advice in the highest councils of government. He implemented his conviction by his own personal service to the nation during the Second World War. Perhaps less well known were his enormous contributions to scientific and engineering education. He was a man of the widest ranging intellect and practical curiosity whose precise and probing style of thought and work served as a model and an inspiration for young scientists and engineers for more than half a century. He avoided the easy way and taught by his own example that real achievement is the product of thorough preparation, careful procedure and diligent labor combined with the willingness to cultivate bold visions. His humane and sensitive way with associates—especially his students—together with the strength of his intellect brought forth generations of scientists and engineers whose achievements have changed the world.

—Dr. Jerome B. Wiesner

Dr. Bush with (left to right) the late Alfred P. Sloan, General James McCormack, then vice president of MIT, and John J. Wilson, secretary of the Corporation, marching in the Centennial Convocation procession in 1961.

Dr. Vannevar Bush was among a group of eminent scientists to whom former President Harry S. Truman expressed the nation's thanks for their work in directing the country's scientific manpower and research facilities during World War II. In this photograph made at the White House in 1947, Dr. Bush is standing, third from left. Others in the group were, seated, left to right, James B. Conant, president of Harvard and chairman of the National Defence Research Committee; President Truman; and Alfred N. Richards, a vice-president of the University of Pennsylvania and chairman of the Committee on Medical Research. Standing were Karl T. Compton, president of MIT and member of the National Defense Research Committee; Lewis H. Weed, director of the Johns Hopkins Medical School and vice chairman of the Committee on Medical Research; Dr. Bush, who was then president of the Carnegie Institution of Washington and director of the Office of Scientific Research and Development; Frank B. Jewett, an MIT alumnus of the Class of 1903 and president, National Academy of Sciences; Jerome C. Hunsaker, an MIT alumnus, head of the MIT departments of mechanical and aeronautical engineering and chairman of the National Advisory Committee for Aeronautics; Roger Adams, of the National Defense Research Committee; A. Baird Hastings, of Harvard, member of the medical research committee, and Alphonse R. Dochez, of Columbia University, member of the medical research committee.

The Builders

by Vannevar Bush

The process by which the boundaries of knolwedge are advanced, and the structure of organized science is built, is a complex process indeed. It corresponds fairly well with the exploitation of a difficult quarry for its building materials and the fitting of these into an edifice; but there are very significant differences. First, the material itself is exceedingly varied, hidden and overlaid with relatively worthless rubble, and the process of uncovering new facts and relationships has some of the attributes of prospecting and exploration rather than of mining or quarrying. Second, the whole effort is highly unorganized. There are no direct orders from architect or quarrymaster. Individuals and small bands proceed about their businesses unimpeded and uncontrolled, digging where they will, working over their material, and tucking it into place in the edifice.

Finally, the edifice itself has a remarkable property, for its form is predestined by the laws of logic and the nature of human reasoning. It is almost as though it had once existed, and its building blocks had then been scattered, hidden, and buried, each with its unique form retained so that it would fit only in its own peculiar position, and with the concomitant limitation that the blocks cannot be found or recognized until the building of the structure has progressed to the point where their position and form reveals itself to the discerning eye of the talented worker in the quarry. Parts of the edifice are being used while construction proceeds, by reason of the applications of science, but other parts are merely admired for their beauty and symmetry, and their possible utility is not in question.

In these circumstances it is not at all strange that the workers sometimes proceed in erratic ways. There are those who are quite content, given a few tools, to dig away unearthing odd blocks, piling them up in the view of fellow workers, and apparently not caring whether they fit anywhere or not. Unfortunately there are also those who watch carefully until some industrious group digs out a particularly ornamental block, whereupon they fit it in place with much gusto and bow to the crowd. Some groups do not dig at all, but spend all their time arguing as to the exact arrangement of a cornice or an abutment. Some spend all their days trying to pull down a block or two that a rival has put in place. Some, indeed, neither dig or argue, but go along with the crowd, scratch here and there, and enjoy the scenery. Some sit by and give advice, and some just sit.

On the other hand there are those men of rare vision, who can grasp well in advance just the block that is needed for rapid advance on a section of the edifice to be possible, who can tell by some subtle sense where it will be found, and who have an uncanny skill in cleaning away dross and bringing it surely into the light. These are the master workmen. For each of them there can well be many of lesser stature who chip and delve, industriously, but with little grasp of what it is all about, and who nevertheless make the great steps possible.

There are those who can give the structure meaning, who can trace its evolution from early times, and describe the glories that are to be, in ways that inspire those who work and those who enjoy. They bring the inspiration that all is not mere building of monotonous walls, and that there is architecture even though the architect is not seen to guide and order.

There are those who labor to make the utility of the structure real, to cause it to give shelter to the multitude, that they may be better protected, and that they may derive health and well-being because of its presence.

And the edifice is not built by the quarrymen and the masons alone. There are those who bring them food during their labors, and cooling drink when the days are warm, who sing to them, and place flowers on the little walls that have grown with the years.

There are also the old men, whose days of vigorous building are done, whose eyes are too dim to see the deatils of the arch or the needed form of its keystone; but who have built a wall here and there, and lived long in the edifice, who have learned to love it and who have even grasped a suggestion of its ultimate meaning; and who sit in the shade and encourage the young men.

—from *Science Is Not Enough*

In the passing of Vannevar Bush, the nation has lost a distinguished public servant, who became a legend in his own time and a revered spokesman for the scientific community, Educator, electrical engineer and inventor, Dr. Bush will long be remembered as a statesman of science who played a key role in World War II by organizing and directing a technological research program of unprecedented scope. After the war, his ideas and influence helped determine the character and vast growth of scientific research for decades that followed. We at MIT have lost one of the Institute's greatest leaders, a beloved alumnus and colleague.

—Howard W. Johnson

Washington strife as viewed by the public. I think it is a record to be proud of.

"I write this memorandum because the incident, that I do not need to go into detail, rests heavily on my mind. I urge that all of us watch the little incidents and frictions that are bound to arise, seek out the man who badly needs respite before he cracks and see that he gets it, and in general attempt to hold the line and come through the present intense period in harmony. I will certainly attempt to do my part in this if any of you will tell me where you think I could head in to advantage."

Dr. Conant commented: "The memorandum tells more about why Bush was a great mobilizer of scientists, a great chairman of NDRC, than any words of mine. The reader who understands anything about the ways of men will agree with me when I say the United States was indeed lucky that such an extraordinary man had President Roosevelt's ear in that crucial month, June, 1940.

The dollar volume for NDRC-OSRD operations in 1940-41 was $6 million; for 1944-45, it was $166 million. The total for the was was $536 million, plus about $2 billion for the atomic bomb.

Dr. Bush turned his attention again to the Carnegie Institution after the war. He retired as its president in 1955 and returned to the Boston area to live, establishing a home in Belmont. He became chairman of the MIT Corporation in 1957 and honorary chairman in 1959, serving in the latter capacity until 1971. He had been a member of the board of Merck and Co. since 1949 and after George Merck died succeeded him as chairman of the board in 1957, taking an active part in the management of the pharmaceutical company.

Dr. Bush was one of the organizers and executive chairman of the Graphic Arts Research Foundation, which developed Photon, a new and now widely used device for setting type photographically and with the aid of a computer.

A justifying typewriter was one among a number of Dr. Bush's inventions. While still at MIT he invented a high speed library search machine called the rapid selector which was taken over by the Navy for cryptoanalysis. While a lieutenant commander in the Naval Reserve in the 1920s he developed ideas for the control of antiaircraft guns which were eventually applied by Sperry Gyroscope Company.

Dr. Bush obtained his first patent, in 1912 when he was still in college, for a machine mounted on two bicycle wheels which could be used in surveying land. Since then he has been granted dozens of patents and has built many unpatented devices, ranging from a birdfeeder which discriminated against pigeons and bluejays to hydrofoil boats. He invented new kinds of vacuum tubes and electrical circuitry.

After his retirement, Dr. Bush installed an elaborate machine shop in his basement at Belmont and worked extensively on hydraulic pumps and motors, free piston engines, gas engines and steam engines. He developed medical devices such as a silicone rubber value for the heart and also a gold valve for hydrocephalus, a congenital brain lesion.

Dr. Bush once testified before a Congressional committee that he had never received any money for patents. Many of them were assigned to the government or institutions. Others contributed to commercial developments which were profitable for him, however.

Royalties from his books were generally assigned by Dr. Bush to MIT. With the profits from one of them, he established a fund to be used annually by the head of the student government in any way he chose. *Endless Horizons* and *Modern Arms and Free Men* were two of his popular books. He also published two texts, *Principles of Electrical Engineering* (with William H. Timbie) and *Operational Circuit Analysis*.

In honor of Dr. Bush, the Department of Electrical Engineering named its social and assembly room the Vannevar Bush Room. The Center for Materials Science and Engineering, a large research building, was dedicated as the Vannevar Bush Building in 1965.

Dr. Bush has received many awards and honorary degrees. President Harry Truman gave him the Medal for Merit, President Lyndon Johnson the National Medal of Science and President Richard M. Nixon the Atomic Pioneer Award of the Atomic Energy Commission. He was made Knight Commander of the civilian division of the Most Excellent Order of the British Empire and an officer of the French Legion of Honor.

Other awards include the Louis Levy Medal of Franklin Institute; the Lamme Medal of the American Institute of Electrical Engineers; the Research Corporation Award of Columbia University; the Ballou Medal and Distinguished Service Award of Tufts College; the Edison Medal of the American Institute of Electrical Engineers; the Holley Medal of the American Society of Mechanical Engineers; the John Scott Award of the Philadelphia City Trust; the Gold Medal of the National Institute of Social Sciences; the Roosevelt Association's Distinguished Service Award; the Marcellus Hartley Public Welfare Medal and the John J. Carty Medal for the Advancement of Science of the National Academy of Sciences; the Hoover Medal and the John Fritz Medal of the AIEE, ASCE, AIMME and ASME; the medal of the Industrial Research Institute; the Award of Merit of

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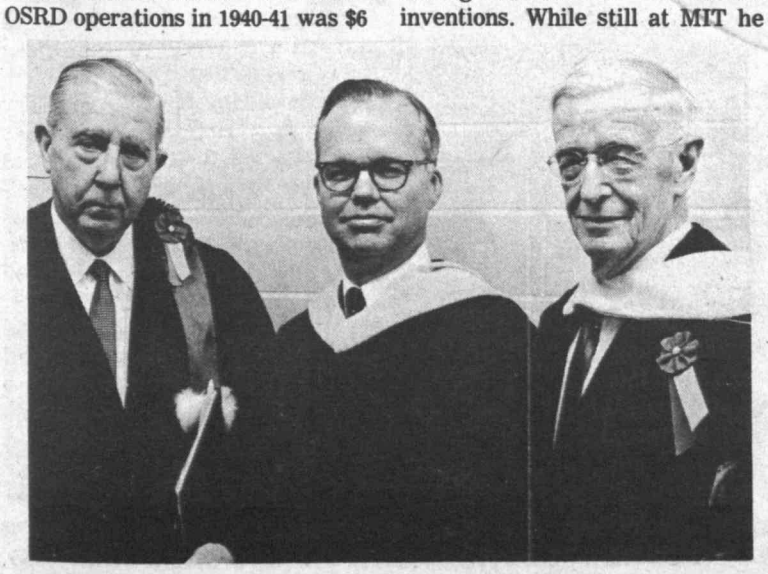


Dr. James R. Killian, Jr., left, Howard W. Johnson, then President of MIT, and Dr. Bush at 1967 Commencement.

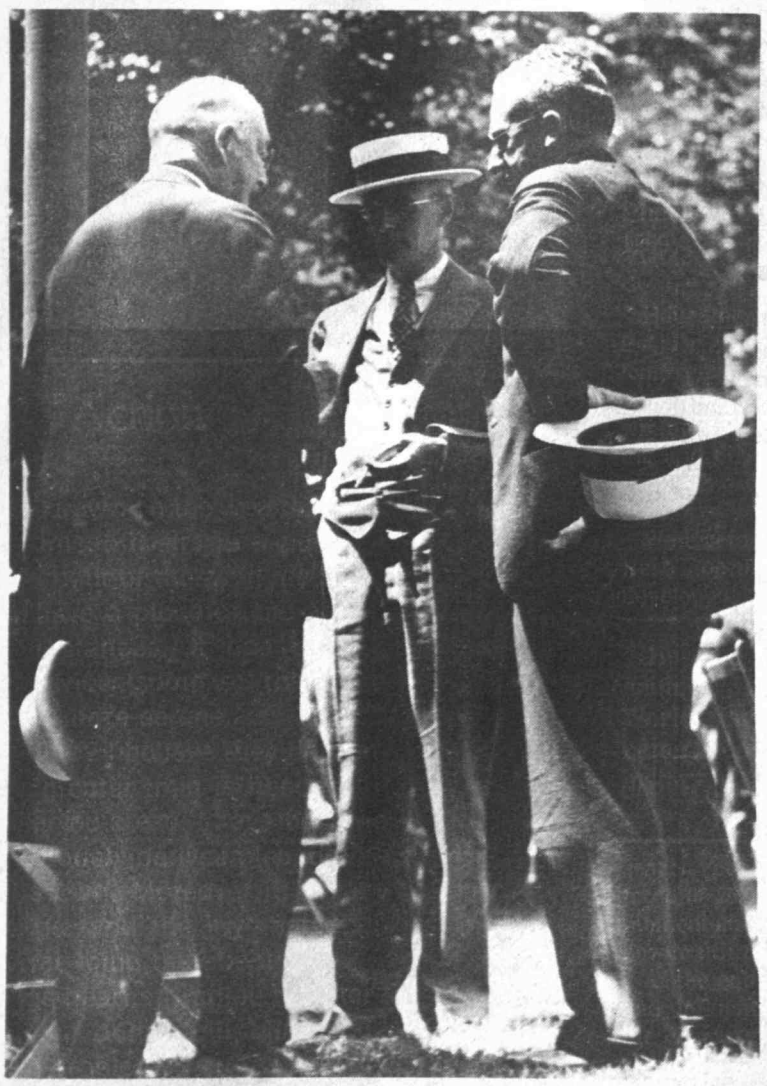
Dr. Bush during a television interview in 1958.

In every age a few men stand out above all others, and Vannevar Bush was most certainly one of these. Vigorous in mind and spirit, direct and incisive in approach, he strove constantly to transform an abundance of creative thought into tangible reality. Throughout a long and distinguished career he compiled a vast record of achievement. We shall remember him always as a pioneer in the field of computation and control, as a superb organizer of technological research, as a brilliant and colorful colleague at MIT. But we shall remember him most especially—and I believe we shall be forever in his debt—for his farsighted leadership in bringing clearly to public attention the fundamental importance of science and technology for the future well-being of this country, which he served so long and so well.

—Dr. Julius A. Stratton

Photos Offer Glimpse of Bush Career

Dr. Bush and the late Professor Samuel Caldwell during a 1949 demonstration of an electric typewriter, an experimental model of a photo composing machine.



Edwin S. Webster, '88, left, Dr. Bush, and Horace S. Ford in conversation at Alumni Day 1936.

Van Bush Did Not Enjoy Farewells

Dr. Vannevar Bush did not very much enjoy sentimental farewells, but he did enjoy a joke. In his book, Pieces of the Action, *Dr. Bush gave this account of how he avoided too much ceremony on the occasion of his retirement after 16 years as president of Carnegie Institution in Washington, D.C.:*

"When I retired as head of the Carnegie Institution of Washington in 1955, I made several resolves. One was that I would not allow my portrait to be added to the gallery of former presidents, for I was gun-shy of formal portraits. Second, I would not allow the final meeting I attended to be lachrymose. Also I resolved to get out of town so that I could not possibly get in the hair of my young successor, Caryl P. Haskins. And, finally, I resolved to use my new freedom to barge into something else equally interesting.

"The first matter was readily taken care of. When some of the trustees pressed me for a formal portrait, I told them I would sit for it provided the Chairman of the Board would paint it. Now the Chairman was Elihu Root, Jr., and he was an amateur painter of no mean accomplishment, a far better one, in my lay and inexpert opinion, than Churchill or Eisenhower, or in fact any other amateur whose work had come before me. So that is exactly what we did. He painted me with a pipe in my teeth, which assured that the result would not go into the formal gallery; it is hung in a side room, and I like it. After all, this was probably the only time that the retiring president has been painted by the Chairman of the Board.

"The second matter involved a little more care. There was to be a final meeting of staff and trustees, with a short lecture and reception, in Elihu Root Hall at the Institution. There was a distinct danger that some staff member would rise and make a speech about the dear president who was departing and evidently on his last legs. Paul A. Scherer was my executive officer, and we fixed up a preventive. We installed a stereo system in the hall, placing it so no one would note its presence. It was a good one; when recorded words came over it the audience could tell exactly where the speaker was located on the stage in front of them, except of course that he was not there. At the proper moment I got up to announce the reception, and a brass band went across the stage behind me and completely drowned me out. When the band left, Paul tried to make the announcement, but a locomotive ran out behind him, blew off steam, and clanged its bell. Then we played some good music over the system. At the end of this I rose once more, at the left of the stage, and started again to announce. I was interrupted by a strong voice from the right of the stage: 'What, no more music?' It was my own voice, which a student once described as 'raucous' and which could not be mistaken. So I proceeded to have an argument with myself across the stage for a while, after which we adjourned. There was no weeping at that farewell party."

Biography

(Continued from page 3)

the American Institute of Consulting Engineers; the William Proctor Prize of the Scientific Research Society of America; the New England Award of the Engineering Societies of New England; the Great Living American Award of the United States Chamber of Commerce, and the Charles F. Kettering Award for Meritorious Work in Patent, Trademark and Copywright Research and Education, and the Founders' Medal of the National Academy of Engineering.

Honorary degrees were awarded by Tufts College, Brown University, Colby College, Middlebury College, Johns Hopkins University, the University of Pennsylvania, Yale University, Polytechnic Institute of Brooklyn, Stevens Institute of Technology, Williams College, Rutgers College, Washington University, Harvard University, Trinity College, the University of Buffalo, West Virginia University, Columbia University, Princeton University, the Carnegie Institute of Technology, Boston University, Cambridge University, Worcester Polytechnic Institute, Rockefeller University and Dartmouth College.

Dr. Bush was made an honorary member of Franklin Institute, the AIEE, the Society of Naval Architects and Marine Engineers, the ASME, and the American Society for Engineering Education, and a fellow of AIEE, an honorary fellow of the American College of Surgeons and a fellow of the American Physical Society.

In addition to services as a life member of the MIT Corporation, Dr. Bush has been a trustee of Tufts, Johns Hopkins, the Carnegie Institution and the Carnegie Corporation and a regent of Smithsonian Institution. He served as a director of American Telephone and Telegraph Company and trustee of the George Putnam Fund of Boston.

Memberships include Phi Beta Kappa, Eta Kappa Nu, Tau Beta Pi, Alpha Tau Omega, Sigma Xi, the American Philosophical Society, the American Academy of Arts and Sciences, the National Academy of Sciences and St. Botolph Club of Boston.

Dr. Bush speaking at 1966 Commencement Luncheon, Mrs. Killian is seated at right.

President Johnson and Professor Jerome Wiesner (at far left) are shown above at the White House with the five 1963 recipients of National Medals of Science. Those honored were (l to r) Institute Professor Emeritus Norbert Wiener of MIT, John R. Pierce of the Bell Telephone Laboratories, Vannevar Bush, '16 of MIT, Cornelius B. van Niel of Stanford University, and Luis W. Alvarez of the Lawrence Radiation Laboratory at Livermore, Cal.