KEN FULTON AND MARCIA MCNUTT

Remembering Frank Press 1924–2020

Frank Press, portrait by Jon Friedman, 1995

Progress in the authoritative use of scientific evidence to guide wise government policy is a story of people, ideas, and institutions. As an example, Frank Press launched *Issues in Science and Technology* as a vehicle to provide a forum in which a community of experts could share their experiences, opinions, and proposals for advancing science in the public interest under the banner of a trusted, nonpartisan science policy institution. It is therefore most fitting that we highlight here Press's many contributions to science policy through his ideas and the institutions he built.

Press was born on December 4, 1924, and grew up in New York City, the son of Russian Jewish immigrants. He recalled being a poorly performing student in the public school system until sixth grade, when a pair of glasses allowed him to read the blackboard. Early on, he developed an interest in science from reading periodicals such as *Popular Science* and *Popular Mechanics*, but it was a high school geology teacher who ignited his interest in the geosciences. While conducting an assigned magnetic survey of Van Cortland Park in the Bronx, he realized that with geophysics he could apply his aptitude for physics to explore the unknown.

Press completed a physics major at City College of New York in 1944 in just two and a half years, studying year-round as was common during the war years. Having been rejected from the military for poor eyesight, he completed his PhD at Columbia University five years later, under the supervision of renowned geophysicist and oceanographer Maurice "Doc" Ewing. Press's decision to pursue research in the blooming discipline of seismology could not have been more prescient from both a scientific and a public policy perspective. Although the scientific revolution in plate tectonics was still more than a decade away, seismology was already proving to be one of the most promising tools for exploring the nature of continents and seabeds, and it would soon provide the necessary assurances to help rein in the nuclear arms race.

After completing his dissertation, Press was appointed to the Columbia faculty, where he cofounded the Lamont Geological Observatory (now the Lamont-Doherty Earth Observatory) and developed a new-generation seismometer for recording long-period earthquake waves, the Press-Ewing seismograph. Six years later, in 1955, Press was recruited away by the California Institute of Technology to join its Seismological Laboratory. Press's foray into low-frequency seismology had made him a wunderkind in the geosciences, and Caltech was eager to expand its seismological prowess into this part of the seismic spectrum. In 1957, he was appointed director of the Seismo Lab. The next year he was elected to the National Academy of Sciences, at the tender age of 34.

That year he also traveled to Geneva as part of the US team negotiating the proposed Nuclear Test Ban Treaty. By this time, the dangers of continued escalation of nuclear weapons capabilities were apparent, as were the risks from testing ever-more-powerful bombs. The nuclear nations seemed ready to agree to a treaty that banned further nuclear weapons testing, but only if they could be convinced that verification was possible and that all other nations would also abide by the terms of the treaty. Press helped design the basic architecture of a worldwide network of standard seismometers that could detect underground nuclear blasts that violated the treaty. The construction of the network and signing of the treaty not only made the world safer from nuclear holocaust but also proved an enduring contribution to seismic information on the internal structure of the planet and the nature of earthquake hazards.

By the mid-1950s, the first mainframe computers had become commercially available, and Press positioned the Seismo Lab on the front line by converting analogue seismic recordings to digital records for numerical processing. When the magnitude 9.4 earthquake struck Chile on 22 May, 1960, the largest earthquake ever recorded, Press and Caltech seismologists were able to extract the long-period excitation of Earth's free oscillations for the very first time, thus deriving new information about the structure of Earth's interior.

Five years later, in 1965, the Massachusetts Institute of Technology asked Press to lead its Department of Geology and Geophysics (now the Department of Earth, Atmospheric, and Planetary Sciences). With support from the philanthropists Cecil and Ida Green, Press transformed a middling, traditional department into one that is consistently ranked one of the top in the nation.

Eleven years after Press arrived at MIT, President Jimmy Carter asked him to become his presidential science advisor and director of the Office of Science and Technology Policy. Carter's choice was based on addressing the issues of the day—energy, nuclear arms control, resources, environment, and the Soviet Union—which fit well with Press's background. Carter became the fourth president that Press served, having been appointed to a six-year term on the National Science Board by Richard Nixon and a three-year term on the President's Science Advisory Committee under John Kennedy and Lyndon Johnson.

Leading the president's science team, Press championed funding for basic research and the use of scientific evidence in government policy, which he continued to do after he was elected as president of the National Academy of Sciences (NAS), a position he assumed in 1981 and held until 1993. Press was very familiar with the Academy: in addition to having been a longtime member, he had served on committees of the National Research Council (NRC), its operating arm, and on the NAS Council. The Academy had been providing advice to the government since it was chartered by Congress in 1863, but it was Press more than any other leader who built and maintained its reputation as a nonpartisan scientific adviser to government. Writing in *Science* at the start of his term, he said that science policy should be made "quietly, without fanfare, without public pronouncements of successes, with the noises of bureaucratic battle muted."

Many of Press's accomplishments at the Academy reflected his preference for discreet negotiations rather than public stands, which proved especially effective during the Reagan presidency. That was a difficult time for science funding because of cuts to the domestic discretionary budget and high rates of inflation, and Press encouraged his colleagues to seek more cost-effective means of accomplishing their science objectives. He also established a positive relationship with George A. "Jay" Keyworth, Reagan's science advisor, who eventually fought to restore science budgets from his position within the White House. When Press pushed back against some policies of the Reagan administration, he did so with science, not posturing. Reports from the NAS and NRC, sometimes supported by the Academy's own funds, were successful in countering efforts to teach creationism in schools as an alternative to evolution, in confronting the AIDS

epidemic in the absence of government action, and in setting policies to address acid rain. Other policy issues addressed during Press's presidency, often under difficult conditions that required back-channel communications and diplomatic skill, included export control restrictions, and international security and arms control.

Press had championed exchange with China in the Carter White House, and during his NAS presidency the Academy's Committee on Scholarly Communication with the People's Republic of China oversaw visits to China by senior US scientists. Press's diplomatic skills were valuable in dealing with the aftermath of the 1989 massacre in Tiananmen Square, as well as with similar human rights issues in scientific exchanges with the Soviet Union.

Press significantly reduced the NRC's bureaucratic layers and streamlined the process for approving and conducting its advisory work. Although not all staff—or members—were happy with these changes, Press was firm but fair in carrying them out. Press improved the Academy's relationships with the National Academy of Engineering (NAE), with which the NAS operated the NRC, and with the Institute of Medicine (IOM), which produced its own studies while adhering to the NRC's processes. And he used diplomacy and persuasion to forestall an effort to establish a separate national academy of agriculture by strengthening representation of those disciplines in the NAS membership.

Press recognized both the importance of including the industrial sector in policy deliberations and the dangers inherent in accepting financial support from parties seen to have an interest in their outcome. He addressed the former by establishing the Government-University-Industry Research Roundtable in 1984, and the latter by combining all funding from industry into a single pool from which support could be drawn without reference to its original source.

In addition to including industry in the Academy's work, Press knew that the organization needed allies outside its usual constituency. He formalized and greatly expanded communication with Congress, and he created a news office that publicized NRC reports. Press, with IOM president Samuel Thier, established the President's Circle, composed of individuals from nongovernment sectors that could benefit from the Academy's reports but were often unaware of them. Press's launching of *Issues in Science and Technology* in 1983 provided a forum for discussions of science policy and further expanded the audience for them.

Increasingly, the Academy undertook studies in areas that the government could not, or would not, support. Together with NAS treasurer Elkan Blout, Press worked to increase the Academy's endowment, more than doubling its value during Press's first term as president, and thus greatly increasing the amount of discretionary funding available for important studies that might otherwise not be undertaken.

Although the Academy was founded by a group of members from East Coast institutions, by the time Press took office almost a quarter of its membership resided west of the Mississippi. With a gift from the chemist, inventor, and philanthropist Arnold Beckman, Press and NAE president Robert White created the Beckman Center in Irvine, California, to make it easier for committee members living in the west to participate in Academy studies. The Beckman Center also became the site of one of Press's most enduring scientific legacies: the Frontiers of Science symposia (now with major support from the Kavli Foundation), which bring together the brightest young researchers from across scientific disciplines to learn about advances in fields other than their own and to build lasting networks of colleagues. The format of these symposia has endured virtually unchanged since 1989, and the program has been expanded to bi- and tri-lateral symposia with partner academies in other countries. A chapter in a forthcoming history of NAS will provide more detail about Press's enormous contributions (and we are grateful to the authors for allowing us to see a prepublication version).

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After completing his second and final term as president of the NAS, Press, along with some other veterans of Washington science policy circles, founded the Washington Advisory Group, which provided strategic, management, and leadership advice to governments, universities, research foundations, and companies. A major client was the King Abdullah University of Science and Technology in Saudi Arabia, which benefitted from the quality and stature of advice it received.

Press received too many awards to list here, including more than two dozen honorary degrees, as well as the National Medal of Science in 1994 for his "contributions to the understanding of the deepest interior of the earth and the mitigation of natural disasters, and his service in academia, as a government official, and at the National Academy of Sciences." A mountain in Antarctica is designated Mount Press in recognition of his early—and correct—scientific inference that the South Pole ice, unlike the North Pole, is underlain by a continent, not ocean.

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