
Guarding the Public

I know of no safe repository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their discretion, the remedy is not to take it from them, but to inform their discretion.

—Thomas Jefferson

“The greatest single cause of environmental contamination of this planet is radioactivity from test explosions of nuclear weapons in the atmosphere,” Commoner wrote in 1964.¹ Because of that, he boldly claimed that “the Atomic Energy Commission made me an environmentalist.”² The severity of the threat posed by radioactivity from nuclear tests also prompted Commoner to assert that the 1963 Nuclear Test Ban Treaty was “the first victorious battle in the campaign to save the environment—and its human inhabitants—from the blind assaults of modern technology.”³ Commoner was particularly optimistic about the symbolic relevance of the Test Ban Treaty and the growing effectiveness of the science information movement. The struggle over nuclear testing had been the politico-scientists’ first major effort to engage the public with a universal scientific problem. “Seen in its true, environmental context,” he claimed, “the power of nuclear technology is subject less to the control of the technologist than to the governance of the public will.”⁴ Not only was the Test Ban Treaty a significant political and environmental victory, it also constituted an impressive example of democracy’s potency as a tool for social change.

Commoner had every right to be particularly proud of this key victory, as his development of a public information forum—first under the auspices of the AAAS, then with his Committee for Nuclear Information, and ultimately with the Scientists’ Institute for Public Information—was arguably one of the most significant features of the campaign against nuclear testing.

Working in close collaboration with the anthropologist Margaret Mead—and inspired by the public advocacy of Nobel laureates such as Albert Schweitzer, P. M. S. Blackett, and Linus Pauling—he developed the science information movement while he served as the chair of the AAAS Committee for Science in the Promotion of Human Welfare. After outlining the program for public information, Commoner encouraged the growth of several grassroots information groups that provided information to the public to enable them to participate more actively in critical questions of science and its applications. The Greater St. Louis Citizens' Committee for Nuclear Information was among the most prominent and significant of these groups. Its scientists, led by Commoner, argued that the determination of what constituted acceptable risks was an inherently moral and public—rather than scientific—issue; in a free and democratic society, citizens should be appropriately informed in order to make these decisions. What “appropriately informed” meant was naturally open to debate, but Commoner insisted that public debate was imperative. He openly conceded that the nuclear test program had been an enormous success in solving exceedingly difficult problems in physics and engineering, but that Americans were not successful in solving “the resultant worldwide contamination from fallout.”⁵ If nuclear technology promised (or threatened) so much, surely a greater public understanding and endorsement of its inherent risks was necessary for the continuation of weapons testing. To Commoner, the absence of any such discussion constituted a very serious “crisis of democracy.”⁶

This second chapter considers the social significance of the post-World War II science information movement, but also situates it and the controversy over control of nuclear power as one of the defining events of the modern environmental movement. Whereas the previous chapter examined how secrecy threatened to restrict scientific progress, this chapter outlines how that secrecy resulted in the accumulation of radioactive fallout in the food chain in a manner that galvanized the politico-scientists into action. The Washington University-based scientists and citizens who founded the Committee for Nuclear Information based their call for public information in part on the importance of the democratic process, but also in recognition of the environmental consequences that might be incurred if nuclear testing were to continue. As one of their main catalysts, Commoner warned ominously: “The first lesson to be learned from our experience with fallout is that given the enormous power and scope of modern

physical science, and intense social pressure for its application, we are likely to put massive technological processes into operation before we understand their eventual biological consequences.”⁷ That lesson demonstrated the significance of the Committee for Nuclear Information’s collaboration with public opposition to aboveground nuclear testing and constitutes a vitally important parable in our contemporary environmental understanding. Moreover, we can witness in the debate over nuclear weapons testing a practical example of scientists agonizing over their social responsibility. Whether scientists were supposed to be recognized authorities and specialists at the front of the triumphant march toward progress, or whether they should rein in the technological juggernaut when it seemed too risky, appeared to constitute a significant schism within the scientific community. No other technology provoked such a heated debate during the 1950s, nor did any other technology present such high stakes.

Just as important, Scott Kirsch notes that “the history of ‘radiation safety’ . . . [has] been largely a reactionary one, characterized by changing standards developed over time in response to new scientific knowledge of environmental health risks.”⁸ Reactionary history and the changing contexts of the awareness of environmental hazards are indicative of what Bruno Latour has called the “historicity” of scientific knowledge: “History not only passes but transforms.”⁹ As knowledge increases, our understanding of the past is altered. As a result, Kirsch observes in his work on the discovery of iodine-131 in nuclear fallout: “After 1962, ingested I-131 had posed the most serious radioactivity hazard to infants and children living downwind from nuclear testing *throughout* the previous decade.”¹⁰ Commoner’s role in that history was to provide a voice of dissent and to engage in the active dissemination of scientific information as it was acquired. We might also take from this story a deeper understanding of the social confusion surrounding modernization. According to Ulrich Beck, “The more modern a society becomes, the more unintended consequences it produces, and as these become known and acknowledged, they call the foundations of industrial modernization into question.”¹¹ To a degree, this phenomenon was responsible for the growing malaise of modernity, and as the unanticipated hazards of nuclear fallout became clear, they offered a lurid and ubiquitous introduction to a postwar world rife with sociopolitical tension and conflict and steeped in new poisons. Keeping the historicity of scientific knowledge in mind, however, the following account

does not mean to highlight Commoner's prescience on the hazards of nuclear fallout, but rather to observe the success of his apparatus in action and to note the potential value of taking a more precautionary approach to new technologies.

With a flash in the desert, human history entered the atomic age. At 5:25:49 A.M. on 16 July 1945, at the Trinity test site at Los Alamos, New Mexico, American scientists detonated the first atomic bomb. The pre-dawn sky was torn apart by a blinding burst of light. The mood within the test bunker was mixed. The test had been a success, but only after detonation did the observers recognize the full effect or power of the weapon upon which they had labored for several years. Quoting the *Bhagavad Gita* as he watched the mushroom cloud rise from ground zero, the Manhattan Project director, J. Robert Oppenheimer, lamented, "I am become death, the Shatterer of Worlds." Shaking Oppenheimer's hand in congratulation, test director Kenneth Bainbridge dryly stated, "Now we are all sons of bitches." General James Farrell later expressed concern "that we puny things were blasphemous to tamper with the forces heretofore reserved to the Almighty." Within a month, World War II would be over, as Americans would drop two atomic bombs on Japan, and the United States would try to reorganize its scientific and military complexes to restore prosperity after almost two decades of depression and war while simultaneously preparing for the next enemy on the horizon.¹²

Suggestions concerning what to do with the atomic program had been delivered in the 1946 Atomic Energy Act. While the Act had ensured that the Atomic Energy Commission (AEC) would function under civilian control, it also had compromised, recognizing military progress as its primary objective. Military need was perceived to have grown drastically in September 1949, as Americans discovered that the Soviet Union had developed and tested an atomic bomb. Prompted by a new Cold War arms race, the AEC was caught in a position where secrecy and uninhibited progress were both thought to be critical to national security. In militaristic terms, it was essential that the United States maintain its nuclear dominance, but to tap into that potential, the AEC needed to be able to develop nuclear technology without inhibiting regulatory impediments. Because the AEC was required to both develop and regulate nuclear power, it often felt handcuffed when it came to developing nuclear energy technology. As Com-

missioner Willard Libby stated, expressing the frustrations of many members of the AEC: “Our great hazard is that this great benefit to mankind will be killed aborning by unnecessary regulation. There is not any doubt about the practicability of isotopes and atomic power in my mind. The question is whether we can get it there in our lifetime.”¹³

If its destructive capacities had horrified its creators, the atomic bomb’s lingering side effect—fallout—would become a source of domestic tension during the Cold War. As nuclear testing began in Nevada and in the Pacific, the Atomic Energy Commission insisted that the dangers of radioactivity to Americans living downwind from the tests were minimal, and that accumulations of fallout within the body could never reach hazardous levels. In reassuring language, the AEC tried to quell concerns over the testing of hydrogen bombs in Nevada in 1952, stating that “these explosives created no immediate or long-range hazard to human health outside the proving ground.”¹⁴ But throughout the 1950s, while the AEC’s specialists dismissed any danger related to radioactive fallout, a burgeoning movement within the scientific community argued otherwise. Determined to turn the science and politics of the Cold War arms race into public issues, scientists across the country demonstrated to the public that humans were consuming alarming amounts of strontium-90 and iodine-131, particularly dangerous sources of radioactivity that were chemically similar to calcium. One of the primary reasons for caution was the discovery that strontium-90 fell to earth much sooner than had been expected. Strontium-90 is a radioactive by-product of the fission of uranium and plutonium in nuclear weapons testing. Its half-life—the time it took for half of its atoms to disintegrate—was twenty-nine years. AEC scientists had confidently expected that it would remain in the stratosphere at least that long. However, on 26 April 1953, physicists experimenting with radioactivity at the Rensselaer Polytechnic Institute in Troy, New York, noticed a sudden surge in their “background” radiation counts. The surge, associated with a deluge of rain, was determined to be radioactive debris—fallout—from nuclear tests in Nevada thirty-six hours earlier that had blown across the country and been brought to earth by heavy rain. The hazards of nuclear weapons testing had become extremely palpable. Strontium-90 was a known hazard, but no one had ever fully investigated its danger, because it was not supposed to pose a threat from the stratosphere. Uncertainty and rapidly conducted experiments resulted

in substantial differences of opinion among scientists which only exacerbated the debate, as scientists and citizens waited to learn about each new finding. That it had come down at all suggested that atomic science was again proving to be fallible and anything but omniscient.¹⁵

Because strontium-90 was a chemical relative of calcium, it followed a similar course through the biological food chain. Entering the human body through milk and calcium-rich vegetables, most strontium-90 passed right through the body, but trace amounts collected in bones and bone marrow and gave off radiation internally, threatening to cause bone cancer, cancer of soft tissue near bone, and leukemia. As radioactive fallout entered the soil, it accompanied calcium through the food chain—from soil, to plants, to animals—and into human bodies. Human—especially children’s—bones were being fortified not only with calcium but also with a radioactive isotope, exponentially increasing one’s susceptibility to cancer. Further, given its long half-life, significant quantities of strontium-90 could accumulate in human bones over a long period of time. Because of its capacity to contaminate food supplies upon which all Americans were dependent, the dangers of radioactive fallout presented a relatively universal risk.¹⁶

During the 1956 presidential campaign, the Democratic candidate and former governor of Illinois, Adlai Stevenson, introduced nuclear fallout as a campaign issue. In April 1956, Stevenson raised the suggestion that the United States “take the lead in halting further test explosions” in an address to the American Society of Newspaper Editors, an argument he raised again in Los Angeles as the Democratic nominee for president in a speech to the American Legion convention in September.¹⁷ By the end of the month, Stevenson had raised weapons testing again at a speech in Minneapolis, stating that nuclear disarmament should be “the first order of business in the world today.” Also in Minneapolis, Stevenson raised “the danger of poisoning of the atmosphere” as another reason for putting an end to atomic weapons testing.¹⁸ It was the first time that fallout had been used as a political issue in a presidential campaign, and the first time that such public attention had been given to fallout as a potential health hazard. Stevenson had asked Dr. Evarts Graham, a lung surgeon at Washington University, to gather information on the dangers of fallout. Graham turned to his colleagues in science, including Commoner, to help compile the information Stevenson requested. Stevenson lost the election to the in-

cumbent, Dwight D. Eisenhower, but public interest in putting a halt to atomic weapons tests was growing and scientists were just beginning to learn how effective they could be as disseminators of public information.¹⁹

The scientists' conclusions radically altered the official U.S. position on atomic fallout and led to the 1963 Nuclear Atmospheric Test Ban Treaty. More important, the Atomic Energy Commission's politics of secrecy and misinformation raised serious questions about the governance of nuclear technology and risk assessment. Even as late as 1963, no standards or limits had been laid out for acceptable doses of fallout radiation, and the government had been slow in developing any countermeasures to protect the public. Significantly, no government agency had kept the public informed of radiation's possible health hazards. Rather, the AEC had done its utmost to deny any danger. In October 1956, for example, President Eisenhower reassured Americans that "the continuance of the present rate of H-bomb testing, by the most sober and responsible scientific judgment . . . does not imperil the health of humanity."²⁰ Eisenhower's reassurance echoed the government literature that circulated. Pamphlets published by the AEC supported Eisenhower's statement that the various radioactive components presented very little risk to Americans. Accompanying the AEC's literature, a group of scientists who supported nuclear technology further publicized the necessity of bomb tests and inquiries into atomic energy.²¹

Edward Teller was among the most outspoken of these scientists and the foremost champion of nuclear technology's potential. As a part of the Manhattan Project, he had attended the first test at Los Alamos in 1945, but his enthusiastic reaction was in stark contrast with the more somber tone set by Oppenheimer and others in the bunker. "I was looking, contrary to regulations, straight at the bomb," Teller recalled. "I put on welding glasses, suntan lotion, and gloves. I looked the beast in the eye, and I was impressed."²² After the war, Teller remained at Los Alamos, and became widely considered the "Father of the H-Bomb" after the detonation of the world's first thermonuclear bomb on 1 November 1952. In *The Legacy of Hiroshima*, Teller dismissed any inherent dangers of nuclear fallout. "Fallout from . . . testing is dangerous," he boldly stated, "only in the imagination."²³ Recent accounts have portrayed Teller as one of the great villains of twentieth-century American history because he very consciously contributed to the proliferation of nuclear fallout, but Teller simply saw himself as another politico-scientist, admittedly from the opposite side of

the tracks than Commoner. A Hungarian refugee from Nazi Europe, Teller saw nuclear power as ultimately making a single world government inevitable; for Teller, such a world government needed to hinge on the democratic ideals of the West. The continuation of atomic research and testing was the only way to ensure that the West would be able to resist the post-war Communist threat. He actively used his position to promote the American nuclear program, less for his own immediate benefit—Teller was less interested in personal gain or in saving face when data on the health risks mounted against his position—than for national security. Given the tensions of the Cold War, he was convinced that a strong nuclear program was essential for Western survival and—ultimately—victory over Soviet Communism. For Teller, national security was a more immediate priority than public health, which he held was at less risk than many naysayers warned. His position in favor of testing made him a favorite scientist within military circles, who also supported continued testing and military expenditures.²⁴

This tension between Cold War security and public information serves as one of the cornerstones of the dynamics that colored Cold War politics in the United States. The Communist threat demanded that greater emphasis be put on secrecy and civil defense, but the perceived cost to many was an inhibition of American freedoms, particularly of democracy and the freedom of expression. For many scientists and citizens, curtailing American democracy to preserve it seemed a perverse abuse of Americanism, and many confronted the Cold War administrations of the early and mid-1950s. J. Robert Oppenheimer, the former director of the Manhattan Project, had publicly fallen from grace after expressing concerns about policy directions pertaining to the development of nuclear technology. Attacked by 1950s cold warriors, Oppenheimer ironically fell victim because of his deference to social responsibility over federal service and national security. It appeared that the political mechanisms that had bestowed so much public attention and power on the scientific community could just as easily take them away.²⁵

I discussed the E. U. Condon case in the previous chapter. Commoner was instrumental in getting Condon to join the Washington University faculty in 1956, and they became collaborators in promoting dissemination of nuclear information to the citizens of St. Louis. Commoner also came into close contact with the famed biochemist Linus Pauling. Pauling was

an outspoken politico-scientist roughly a generation older than Commoner. In January 1952, the State Department had refused to issue Pauling a new passport. Pauling—who would be the unprecedented recipient of two Nobel Prizes, for chemistry in 1954 and for peace in 1963—was a strong and vocal critic of U.S. nuclear policy. In 1957, he organized a petition to the United Nations signed by scientists opposed to nuclear weapons; it ultimately collected 11,021 signatures from all over the world. Demanding a halt to weapons testing and advocating disarmament, the Pauling petition claimed that the danger to human health was one of its primary concerns. “Each nuclear bomb spreads an added burden of radioactive elements over every part of the world,” it stated. “Each added amount of radiation causes damage to the health of human beings all over the world and causes damage to the pool of human germ plasm such as to lead to an increase in the number of seriously defective children that will be born in future generations.”²⁶

Similar in tone to Commoner’s AAAS rhetoric about the role of the scientist, the petition also noted the scientists’ authority in understanding the dangers that nuclear weapons presented. The petition was written in Commoner’s office at Washington University in St. Louis, and the forms were printed in a St. Louis union shop and bore the union label. When Pauling was again called before the House Committee on Un-American Activities (HUAC), he refused to name anyone in the organization of this successful campaign. In this particular incident, Commoner might have been fortunate to escape the anticommunist sentiments of the period. HUAC did not pursue the St. Louis union label, which would have inevitably led back to Commoner’s participation. But his close connection with both Condon and Pauling taught Commoner valuable lessons about how one might voice dissent without suffering political marginalization during an era of intolerance. His subsequent activism would be informed by—and in reaction to—the political climate that gave rise to Pauling’s and Condon’s cases.²⁷

After the dissolution of the Interim Committee on the Social Aspects of Science, the AAAS board of directors created the Committee on Science in the Promotion of Human Welfare. In January 1959, AAAS Secretary Dael Wolfle wrote to Commoner, inviting him to be a member of the committee. “The Committee on Science in the Promotion of Human Welfare is in a

fairly direct sense a descendant of the Committee on the Social Aspects of Science,” he wrote. The AAAS was still concerned about questions dealing with the relationship between science and society, and the new committee was charged with assessing “the Association’s present activities in terms of their effectiveness in fulfilling the Association’s constitutional responsibility ‘to improve the effectiveness of science in the promotion of human welfare.’”²⁸ Margaret Mead was also appointed to the committee, and she and Commoner formed an important working relationship that led to the realization of an effective science information movement.

After a few months of inactivity within the newly formed committee, Commoner was asked to take over as chair. Still sensitive about divisions within the AAAS concerning whether the Association should become more involved in politics, he was cautious about how best to move the committee beyond the obstacles faced by the Committee on the Social Aspects of Science. The AAAS remained a large and diverse organization, and one prone to conservatism. As Commoner confided to Mead upon accepting the chair of the new committee, “I think that there is still a serious problem of demonstrating that a committee such as ours can be of real value to the AAAS.”²⁹ What was needed was a method of presenting scientific positions on social issues without antagonizing other scientists. Dividing scientists over political issues ultimately resulted in confusing the public as they received differing information from different camps. Further, trying to ensure that he avoided upsetting the AAAS board of directors and the membership in general, Commoner opted for defending the notion of scientific integrity. He regarded the integrity of science as “the system of discourse and procedures which science employs to discover and discuss the properties of the natural world.”³⁰ As defenders of scientific truth, Commoner felt the committee could deflect most criticism by taking the moral high road, but this resulted in a repositioning of scientists and their social responsibility. Whereas Commoner and other politico-scientists had advocated rousing and stimulating public concern over issues relating to science and society, the new Commoner Committee moved away from direct political activism to serve as a more objective outlet for scientific information.

The cornerstone of Commoner’s subsequent activism took on this premise: effective social activism needed to be unfettered and informed. The scientist’s role, then, was to provide accessible information pertaining to difficult scientific questions to the public so that they could make informed

decisions. At the height of the science information movement, Commoner reflected that “the scientist as the custodian of [scientific] knowledge has a profound duty to impart as much of it as he can to his fellow citizens. But in doing so he must guard against false pretensions, and avoid claiming for science that which belongs to the conscience.”³¹

Commoner saw three parts to the politico-scientist platform. First and foremost, he insisted that scientists should not divorce themselves from social issues raised by their work. Given the prevalence of technology and the relative ubiquity of science and science policy in the postwar environment, scientists had a moral responsibility to participate in the social ramifications of their findings. While public policy decisions were not inherently scientific decisions, many of them were fundamentally reliant on a very important scientific factual basis. Scientists had a duty to help the public understand the complexities of the decisions that faced them as they related to science. Commoner called this “involuntary responsibility,” the scientist’s obligation to inform the public. Whereas university scientists had obligations to teaching and research—involuntary responsibilities—this kind of social engagement, to Commoner, constituted a third obligation.³² A related second point involved the dissemination of scientific information. Commoner and Mead recognized a need for public information; scientists should no longer confine their efforts to advising political officials. Their social duty was to the public, not to the policy makers. The public needed to be more directly and completely informed by scientists about the technical aspects of social issues. As much as remaining responsible for their research and its applications, scientists were primarily responsible not to their funding agencies or employers, but to the American public and the world. Finally, scientists were not prophets. This last point was critical. While it was imperative that scientists provide information to the public, scientists should not take advantage of this role to dictate how nonscientists should interpret the moral or political elements of the scientific findings. Scientists were experts in interpreting the objective aspects of scientific findings; they were not experts in shaping policy decisions. In this respect, scientists should present data and information about the relative benefits and costs of a particular new technology—providing them equally to politicians and to citizens, for them to weigh the risk.

As Commoner understood it, the postwar technological revolution had created as many social puzzles as scientific ones. Scientists were well

positioned to understand the causes of these problems, but their solutions—because they were social—demanded more public participation. But for that public participation to be productive and effective, citizens needed to understand the problem, to be able to weigh the pros and cons of differing positions, and to make informed decisions. Given the technical nature of the scientific causes of the social problems, scientists needed to find a way to filter through the technical language and translate it into lay terms. Commoner saw that two elements were essential to an effective methodology: clear information and a nonpartisan position. Combined, these two pillars could resurrect a faltering democratic system in relation to science and its application to society. On an issue as provocative as nuclear testing that combined both national security interests and public health concerns, clear, objective information could help the public to determine whether the health risk involved in preserving national security was acceptable or not. Objectivity, therefore, came to play a critical role in the political discourse of the science information movement. The intent and purpose of the information movement was to encourage the adoption of a particular position, but that activism was obscured by the mantle of objectivity, which produced a far more subtle and convincing line of rhetoric.

If there is a seminal document in the creation of the science information movement, it was “The Fallout Problem,” which was Commoner’s salvaging of the Committee on the Social Aspects of Science’s attempt to establish a position on nuclear weapons testing for the AAAS. At the December 1957 AAAS meeting in Indianapolis, Commoner tested his nonpartisan approach to the dissemination of accessible information. He would publish the paper in *Science* in May 1958. In “The Fallout Problem,” Commoner gave an overview of the long-range effects of worldwide fallout from nuclear weapons testing and outlined the relationship between scientific knowledge and public policy. “That governments find advantage in conducting test nuclear explosions may as well be taken here as a fact of political life. It is not our purpose at this time to debate the validity of this need.” Rather, Commoner claimed, his job was to consider the possible health hazards of fallout. He proceeded to describe the science of fallout, defining terms and explaining what fallout was. Commoner then discussed why scientists disagreed—because there had been so little time to analyze the consequences of the new technology’s intrusion into na-

ture—and the source of public confusion—that the public relied on expert opinion, and experts were divided. Nowhere in “The Fallout Problem” did Commoner take any position on the fallout question. Rather, he concluded by turning the question over to the informed citizenry. With the proper information, they should act by following their consciences. “There is a full circle of relationships which connects science and society,” he stated. “The advance of science has thrust grave social issues upon us. And, in turn, social morality will determine whether the enormous natural forces that we now control will be used for destruction—or reserved for the creative purposes that alone give meaning to the pursuit of knowledge.”³³ Without taking a distinct position, Commoner challenged the public to “do the right thing.”

Commoner’s activism was never quite so objective, of course, but he did emphasize that the precautionary principle should be the driving force behind policy decisions, and in order for that to happen, the public needed to be more intimately involved. The first step, therefore, was making sure that the public was more aware of the stakes. “The power of science over our lives is now so complex,” he warned at a Washington University lecture in 1960, “that we will do ourselves harm—blindly, unknowingly and sometimes disastrously.”³⁴ In effect, politico-scientists needed a citizen constituency in order to help raise their concerns about the misguided nature of American technological enthusiasm. As Commoner noted later, this alliance of socially engaged scientists and informed citizens constituted “the one invention of our technological age which can conserve the environment and preserve life on earth.”³⁵

Moreover, in an era of anticommunist restrictions on the freedom of expression, Commoner’s more passive rhetoric made a lot of sense, but with the hazardous implications of fallout so tangible, it must have been difficult to accept a more ambiguous political stance. After all, the public—even if it was confused—was looking to scientists to offer guidance through the proverbial minefield, and rather than guiding, Commoner was offering only a map with a list of possible destinations. Commoner defended this position against criticisms that it was a kind of political regression from “activist” politics by insisting that “the most vital missing element in our present political life is not so much leadership for ‘good policies,’” but rather “that all of us, government and citizens alike, be given the means to know the facts, that we may bring before our personal and

collective conscience the real depth of the troubles of our time.”³⁶ Rather than trying to be the loudest advocate, Commoner offered a sense of order and calm in a storm of voices and contradictory opinions. What he was banking on for success was the populist appeal of public empowerment and the deference accorded to objective expertise.

Commoner continued to chair the Committee on Science in the Promotion of Human Welfare until 1964. Under his watch, the committee found a niche in defending the integrity of science and promoting the importance of public information, while the principles of “The Fallout Problem” served as a practical directive for all the subsequent work done by the Commoner Committee. But even as Commoner headed this new AAAS endeavor, he was shifting much of his energy toward a more grassroots variety of activism in opposition to nuclear weapons testing. After experiencing considerable frustration in trying to print the AAAS public statement taking a position against the testing of nuclear weapons, Commoner began gravitating toward more grassroots-oriented activism by cofounding the Committee for Nuclear Information. In April 1958, a group of concerned scientists and local women reformers founded the Committee for Nuclear Information to combat what they perceived to be a thin veil of government misinformation. They determined that the committee’s primary directive should be to collect, evaluate, and make available to the public information concerning atmospheric nuclear testing. Washington University was a breeding ground for this kind of intellectual opposition. The university’s chancellor, Arthur Holly Compton, an eminent physicist but no friend of Commoner’s radicalism, contributed to the growth of activism in St. Louis by recruiting prominent chemists and physicists who had worked on the Manhattan Project. In so doing, Compton improved the prestige of the science faculty at Washington University, but he also unwittingly recruited scientists who knew firsthand (as Oppenheimer put it) and were more naturally inclined to share Commoner’s belief that scientists should also be socially concerned citizens.³⁷

Through its magazine and speakers’ bureau, the Committee for Nuclear Information helped to pioneer the science information movement. Calling the Committee for Nuclear Information “the pioneer citizens’ group in the field of nuclear education,” the group’s mission statement claimed that it did “not stand for or against particular policies. It presents the known

facts for people to use in deciding where *they* stand on the moral and political questions of the nuclear age.”³⁸ A 1962 brochure reiterated that the committee took “no position on political or military issues except the position that a free people must be an informed people.”³⁹

After some debate, the group’s founders affirmed Commoner’s recommendation that the group maintain a nonpartisan stance in the information they publicized, including possible endorsement of a nuclear test ban. But the committee’s stated dedication to political neutrality and scientific objectivity was a point of some controversy among its founding members. For example, the physicist John Fowler, a Quaker, had a difficult time accepting the “information position.” Quakers took positions, Fowler argued, and nuclear fallout was too serious a problem to risk nonpartisan politics. Commoner sympathized, and sought a compromise with Fowler. If Fowler would acknowledge that he was presenting neutral information as a scientist, he could share his position at the end as a citizen and voter, so long as emphasis was placed on the information and not his personal opinion. After some debate, the original committee members adopted a nonpartisan platform with the understanding that they would evaluate their progress under this rubric after a year.⁴⁰

The rhetoric of impartiality ultimately served the committee well, and it was approved after its yearlong test. Their nonpartisan position proved to be an astute tactic that bolstered their public and political credibility as objective scientists. In order to realize their bigger goal of inciting a broader citizen participation and political mobilization through increasing concerns about radiation’s potential harm, the Committee for Nuclear Information maintained a conscious tension between the importance of public information and their underlying political message. The decision to abstain from making any partisan statements was prompted in part by the notion that scientists were objective experts and should therefore adhere to a level of impartiality.⁴¹ Their primary duty was to convey scientific facts to help the public make decisions on controversial social issues. But a second, and perhaps more critical, explanation for the Committee for Nuclear Information’s nonpartisan approach stemmed from the political climate of the Cold War. As the Cold War carved out global political divisions, the scientific community became equally split. While many scientists appreciated the significance of national security, others continued to promote the importance of public health and intellectual freedom.

Moreover, intellectual freedom, by implication, also meant international cooperation and communication. The spirit of scientific sharing, however, conflicted with the overriding political tone of the American government during the Cold War. Prominent American scientists proposing to share scientific findings with their Soviet counterparts became easy targets for Senator Joseph McCarthy's tribunals. In such a polarized political arena, it was obviously difficult to demonstrate dissent without appearing to have Communist sympathies. The Committee for Nuclear Information avoided this pitfall by advocating a purer democracy and insisting they were impartial experts providing information and not political positions. By promoting the importance of an informed public, committee members positioned themselves as defenders of democracy, making it difficult to attack them without appearing to challenge the American affinity with democratic ideals. Further, their impartial position avoided most charges of radicalism.

Nevertheless, abstaining from taking political positions did not mean that the Committee for Nuclear Information avoided conflict. On the contrary, the committee charged that established governmental agencies were misleading the public and not doing their jobs properly. A regular target was the Atomic Energy Commission. In July 1957, the Joint Congressional Committee on Atomic Energy had observed that "information on fallout has evidently not reached the public in adequate or understandable ways."⁴² Hoping to capitalize on this gulf between government and public, the Committee for Nuclear Information also faced several obstacles, most significantly and ironically the general public tendency to "leave it to the experts." How to effectively communicate nuclear information to a public that showed little interest in becoming involved in the debate proved to be a difficult process. But by situating the committee as an objective grassroots organization, Commoner and the other leaders hoped to forge a link to the public.

The Committee for Nuclear Information mounted a serious challenge to the Atomic Energy Commission and to the role that specialists had taken in informing the public about the potential hazards of nuclear fallout. Commoner and others worried that a nation seemingly engaged in a permanent Cold War might stress "national security" at the expense of a working democracy. Indeed, they interpreted the classification of information as just that sort of breach. Keeping scientific information from scien-

tists constituted a breakdown in scientific progress, but keeping it from the public it was supposed to serve was even more problematic as it constituted a collapse in the structure of a functioning democracy. To counteract government secrecy, Commoner and others adopted a rhetoric that publicly promoted democratic principles, distributing accessible scientific information to the public in order to assist them in making moral judgments about radiation risks. Commoner in particular believed that a citizenry informed of the risks inherent in nuclear testing would share his concerns about radiation fallout and would object to the shortsighted machinations of its government so enthralled with the Cold War. In essence, he interpreted the public information movement as a movement for public empowerment and as a means of improving the lines of communication between the citizenry and their elected officials. Publicly distributed independent information became a powerful political tool.

Compared with Commoner's AAAS efforts in informing the public, the Committee for Nuclear Information, whose budget was a tiny fraction of the bigger organization's, was a far more successful enterprise. A lot of this had to do with the energy of its members and their dedication to their efforts, and just as much had to do with the creativity with which they engaged in getting information to the public. Through a series of outreach programs and well-advertised projects, the Committee for Nuclear Information (CNI) succeeded in establishing itself as a credible source for scientific information about nuclear technology. Between October 1958 and May 1959, CNI speakers addressed seventy-five organizations, including church, parent, student, and business groups. The biologist Florence Moog's fictional account of St. Louis one year after a nuclear war, for example, received considerable attention. Basing her account on hearings by the Joint Congressional Committee on Atomic Energy regarding the effects of nuclear war, Moog quantitatively speculated on what might happen to St. Louis in the event of a nuclear war. "Nuclear War in St. Louis: One Year Later" was very popular; more than a dozen publications worldwide reprinted the article, which was all the more poignant because it drew on the most recent scientific evidence to create a piece of science fiction. In December 1959, Dynamic Films approached CNI for film rights, but the movie was never made. As the CNI grew, the BBC, the *National Observer*, and *Audubon* magazine used it as a valuable resource for making sense of

complicated nuclear issues, which they in turn passed on to their audiences. Moreover, committee members made regular appearances on local TV and radio programs, and other news services outside of St. Louis made regular use of *Nuclear Information*, the committee's monthly bulletin. While membership numbers remained modest, the committee's message enjoyed widespread attention.⁴³

Members of the CNI were convinced that government information on nuclear testing and technology was either based on inaccurate data or, even more problematically, driven by sociopolitical—nonscientific—factors, and they were not wrong. Teller, in particular, was the subject of criticism from scientists on the CNI. Committee letters charged that Teller's work "failed to conform to the standards of validity which are customary in scientific work." In response, Teller accused committee scientists of "quibbling" over "small and irrelevant details."⁴⁴ But in insisting that dangers of fallout existed only in the imagination, Teller was twisting statistics on strontium-90 consumption to his own interests. He was correct in suggesting that the average level of strontium-90 was quite low. What his conclusion did not suggest, however, was that he had combined data from children and adults, which deflated the high levels of strontium-90 in children. Not only were children's bodies smaller, children also consumed more calcium—and therefore more strontium-90—than adults.⁴⁵

Willard F. Libby was another AEC scientist who seemed to deliberately obfuscate questions of nuclear fallout. In June 1957, at the hearings of the Special Subcommittee on Radiation, Libby was challenged for statements he had made a couple of months earlier regarding the uniformity of fallout. In 1953, AEC publications suggested that fallout would be evenly distributed over the globe, implying that no area would suffer an excessive amount. By averaging the amount of fallout over the entire globe, the AEC anticipated a relatively low total of human exposure to fallout. By 1957, however, meteorologists were beginning to determine that fallout was concentrated in a band in the North Temperate Zone. Because the majority of the world's population lived in the North Temperate Zone, the total human exposure to fallout was clearly much greater than the AEC had predicted.⁴⁶ Libby dismissed the controversy by downplaying disagreements among scientists regarding how much fallout was indeed safe. He further defended nuclear testing against attacks by geneticists. Geneticists had become increasingly concerned that fallout from nuclear

testing was posing mutative hazards to subsequent generations, but Libby casually insisted that “testing constitutes a small risk—very small compared to ordinary risks which can be tolerated.”⁴⁷ In his open letter to Schweitzer regarding his appeal in the *Saturday Review*, Libby had admitted that fallout represented some risk, but was negligible, and that risk was an integral part of modern life. Risk was inherent in “our pleasures, our comforts, and our material progress,” he argued.⁴⁸ That fallout raised the rate of leukemia by only 0.5 percent, as he suggested, seemed innocuous enough. In the same issue of the *Saturday Review*, the California Institute of Technology geochemist Harrison Brown conceded that Libby’s increase seemed small, but pointed out that “when we say that 10,000 *individuals* are killed each year . . . the number suddenly seems very large.”⁴⁹ This was a central aspect of the science information movement. The fraction 0.5 percent meant very little to the public, but 10,000 people was easier to comprehend. With accessible information, the public could form their own moral judgments about what constituted acceptable and unacceptable risks.

To concerned scientists, another troubling element of Libby’s testimony and public writing was the comparison of risks. For Libby, the health risks from fallout were smaller than those taken by Americans every day when they boarded an airplane or drove a car, but what Libby failed to address was that some risks were voluntary and some were not. Eugene Rabinowitch, the editor of the *Bulletin of the Atomic Scientists*, objected to Libby’s flippant comparison of risk from fallout to risks that people took voluntarily, stating that fallout was the product of “deliberate government action,” and posed a ubiquitous threat to Americans and humans the world over.⁵⁰ Nobody had a choice to avoid the risk of fallout, while one could freely decide not to fly or drive or cross the street. Involuntary risk suggested a breakdown in the democratic process, if citizens could not express choice as to whether or not to accept a particular risk, nor receive the information necessary to make a choice in the matter. Libby’s professional career was not beyond Commoner’s scorn either. After Libby left the Atomic Energy Commission, he took a position in the Chemistry Department at the University of California, Los Angeles. In a letter to *Look* magazine editor Roland Berg, Commoner noted Libby’s move to California instead of a return to his former position in Chicago. “Do you suppose,” Commoner mused in a rather gratuitous swipe intended, perhaps,

to inspire some comment in a future editorial, “that he chose to settle down in that part of the country which has the lowest fallout level?”⁵¹

For almost a decade, through persistent questioning of official findings, independent scientists had pushed the Atomic Energy Commission into a series of often embarrassing reversals. As radioactivity fell on America’s fields, the possibilities that cattle were consuming strontium-90 raised alarms from independent scientists. On this score, government officials insisted that the risk of ingesting strontium-90 in addition to calcium was insignificant. Indeed, as late as 1953 the Atomic Energy Commission had asserted that strontium-90 constituted a minimal hazard that was limited to human “ingestion of bone splinters which might be intermingled with muscle tissue during butchering and cutting of meat.”⁵² By 1954, independent biologists had reminded the Atomic Energy Commission that most people received far more calcium—and with it, strontium-90—from milk, not splinters of bone in their hamburgers. By 1956, the Atomic Energy Commission had conceded that milk was the most significant source of strontium-90 in human food.⁵³

To further emphasize strontium-90’s danger, the committee engaged in one of their most innovative and highly successful campaigns, the Baby Tooth Survey, to determine whether children in St. Louis were being exposed to more strontium-90 by virtue of the nuclear weapons tests in Nevada. Because children, and especially infants, needed more milk than adults, it stood to reason that they were more likely to accumulate more strontium-90. Also, smaller bodies were at greater risk, a fact that roused both the concerns and the emotions of parents across the country. The analysis of baby teeth to measure the buildup of strontium-90, which began in December 1958, was inspired by the biochemist Herman M. Kalckar’s August 1958 article in *Nature*, titled “An International Milk Teeth Radiation Census,” which proposed a scientific study of baby teeth as a means of determining the extent to which fallout was being absorbed into human bodies. So far, Kalckar noted, only “erratic data existed, based on autopsy of bone samples derived mainly from adults.” A radiation census of the type he recommended could “contribute important information concerning the amount and kind of radiation received by the most sensitive section of any population, namely, the children.” “If a continued general trend toward a rise in radioactivity in children’s teeth were attained,” Kalckar posited, “it might well have important bearings on national and

international policy.” Recognizing the political sensitivity of the testing question, Kalckar insisted that “the results [of the study] should be conveyed to the public without interpretations which might give rise to either complacency or fear, but rather in a spirit that would encourage sober, continued, active concern.”⁵⁴ Shortly after the article’s publication, the Committee for Nuclear Information’s vice president, the pediatrician Alfred S. Schwartz, proposed that the committee collect deciduous teeth for strontium-90 analysis after 1958 studies conducted by the United States Public Health Service found that levels of strontium-90 in St. Louis milk were surprisingly high, the highest of the ten cities they surveyed.⁵⁵

In a press statement submitted for release on 21 December 1958, the Committee for Nuclear Information announced its plans to “collect 50,000 baby teeth a year to provide an important record of the absorption of radioactive strontium-90 by children.” Echoing Kalckar’s claim that a baby tooth survey would provide a unique and critical resource, the committee stated that “the importance of an immediate collection of deciduous, or baby, teeth lies in the fact that teeth now being shed by children represent an irreplaceable source of scientific information about the absorption of strontium-90 in the human body.” Because strontium-90 had begun to fall to earth and contaminate food roughly ten years previously, “deciduous teeth now being shed were formed from the minerals present in food eaten by mothers and infants during . . . the first few years of the fallout era and therefore represent invaluable baseline information with which analyses of later teeth and bones can be compared.”⁵⁶

The Baby Tooth Survey was the first of its kind and was designed to produce the most comprehensive body of knowledge of strontium-90 absorption in children. Previous studies had been based on the analysis of bone samples, and a 1957 Columbia University study had indicated that one-year-old children possessed the highest levels. But those bone samples came from dead children, so the sample was naturally rather limited.⁵⁷ The Committee for Nuclear Information hoped that their study would offer more conclusive evidence as to whether strontium-90 was accumulating in children’s bones and whether that posed a serious health hazard. Deciduous baby teeth offered a ready and accessible resource for determining levels of strontium-90 absorption. By applying the findings of strontium-90 in baby teeth, the committee expected to be able to determine the relative absorption in bone. Before proceeding, the committee elicited enthusiastic

endorsements from both the Washington University and the St. Louis University schools of dentistry, both of which became instrumental in forming the scientific advisory group that guided the program. Initial grants from the American Cancer Society, the Leukemia Guild of Missouri and Illinois, and the United States Public Health Service helped to launch the Baby Tooth Survey.⁵⁸ Dr. Louise Zibold Reiss, an internist, volunteered full-time as the Baby Tooth Survey's director for the following three years. Predominantly organized and run by the Committee for Nuclear Information's women volunteers, the survey began locally in St. Louis, testing donated baby teeth for absorption of strontium-90. In order to obtain the necessary information on environmental factors that would contribute to the uptake of strontium-90, questionnaires were sent out to be returned with the teeth. The forms included questions concerning the child's date of birth, the date the tooth was lost, the mother's residence during pregnancy, the child's residence for the first year after birth, the duration of breast-feeding, the duration of formula-feeding, the kind of milk used in the formula, and other milk used during the first year. After the tooth and background information were received, children would be sent a button that read "I gave my tooth to science," an Operation Tooth Club membership card, and a new tooth form.

While the Baby Tooth Survey subcommittee sent out questionnaire forms and solicited support from the community, the Committee for Nuclear Information's publication, *Information*, worked to allay public panic regarding fallout hazards, while also effectively ensuring that the topic did not leave its newfound place of prominence. In February 1959, *Information* was devoted exclusively to "Milk and the Strontium-90 Problem," a statement published at the request of the St. Louis Dairy Council. In its statement, the Committee for Nuclear Information emphasized the gravity of the issue, but also insisted emphatically that milk was an essential part of a child's diet and that "nothing can be gained by reducing milk intake." The committee explained that "cutting down milk consumption would probably have no effect on strontium-90 absorption. The amount of strontium-90 absorbed by the body seems to depend on the ratio of strontium-90 to calcium in the diet, and not so much on the total amount of strontium-90 taken in."⁵⁹ In March, the committee focused on "Strontium-90 and Common Foods," addressing the relative lack of information on food products other than milk. The article commented on a three-year survey of wheat

samples from Minnesota and the Dakotas. By October 1959, the committee's bulletin, now titled *Nuclear Information*, addressed food safety for children. In "Mothers Ask—What Should We Feed Our Kids?" the freelance writer Doris Deakin transcribed a discussion conducted by the St. Louis pediatrician-turned-housewife Miriam Pennoyer and a number of her neighbors, in which Pennoyer explained the connection between strontium-90 and milk, the connection between strontium-90 and bone cancer and leukemia, and general questions about radiation and radiation safety. One of the questions raised in "Mothers Ask" had to do with the disproportionately high levels of strontium-90 in St. Louis milk. While the science of the global distribution of nuclear fallout was still very much in its infancy in 1959, Pennoyer suggested, "We're finding that there are hot spots. The middlewest is one. We don't know why this is so. Maybe it's because of where we are, in relation to the bomb testing sites. Maybe it has something to do with the minerals in our soil. Or both. We're not sure."⁶⁰

In its candor—both in answering questions and in not knowing all the answers—the Committee for Nuclear Information effectively positioned itself as a reputable voice in the fallout debate and an organization with an unflinching social conscience. Commoner's gamble that the committee could preserve its political neutrality had paid off. As William K. Wyant, Jr., noted in *The Nation*, in an article devoted to the success of the committee: "Ordinarily, a group that called itself the Greater St. Louis Citizens Committee for Nuclear Information would not be expected to last for any great period of time. Mortality among earnest and well-meaning organizations has been . . . great." What had helped the committee beat the odds, Wyant argued, was its decision not to take a political stand. "The view prevailed that what really was needed was information," he continued. "It was felt that too many people—the politicians, the military and the oracles speaking *ex cathedra* from the Atomic Energy Commission—were taking decisive attitudes on the basis of indecisive information, or none."⁶¹ The committee's work in general, therefore, offered a public service, but also insisted upon broader public participation.

The very nature of the tooth campaign necessitated active public participation, and the committee could not be sure what kind of response it would receive. The response was considerable. By the spring of 1960, the survey had received 17,000 teeth. In late April 1960, Mayor Raymond Tucker of St. Louis declared Tooth Survey Week to initiate the committee's

spring tooth drive. Support from the mayor, the St. Louis Dental Society, and the St. Louis Pharmaceutical Association provided plenty of publicity for the campaign; 10,000 teeth were collected in the following month alone.⁶² Reiss tirelessly sought the cooperation of all the schools and school superintendents in the St. Louis district, and in October 1960, 250,000 questionnaire forms were published and distributed to children in the lower grades throughout the city.⁶³ Tens of thousands of small packages poured into the St. Louis post office and found their way to the Committee for Nuclear Information's offices, some addressed only to "The Tooth Fairy, St. Louis."⁶⁴ Some teeth, such as Gene Smith's of Decatur, Georgia, found their way to the mayor's office. The eleven-year-old wrote: "I always put my tooth under my pillow for a dime but had rather the scientists use this one."⁶⁵ Assuring the boy that he would forward his tooth to the committee, Mayor Tucker added: "I am enclosing a dime so that you will not suffer any financial loss by turning this tooth over to the scientists rather than putting it under your pillow."⁶⁶

The comments from mothers sending teeth to the survey demonstrated that the Committee for Nuclear Information had struck a chord with the public. That nuclear fallout posed a particular threat to society's most innocent members—not to mention its future—compounded the problems of involuntary risk, and raised more public concern about the potential cost of the arms race in general. Some letters accompanying teeth expressed the love and anxiety parents felt for their children who might be at risk. Mrs. Doris Gould's letter claimed that "in my rare moments of leisure I take out those baby teeth and what memories they recall."⁶⁷ Mrs. Robert J. Masten reminded the committee that the teeth with which they had been entrusted constituted a "precious commodity," no doubt much in the spirit of Gould's nostalgia.⁶⁸ And while the study focused on St. Louis, teeth came in from all over the country. Mrs. Norman Steele of Wellesley, Massachusetts, was anxious to learn of the results. "The teeth which I have belonged to my son who died of cancer of the bone (osteogenic sarcoma) at the age of eleven a year ago," she wrote.⁶⁹

Other notes were from children to the Tooth Fairy: "Dear Fairy, I would like to have a dime," wrote Jill in a small child's handwriting. "But do not take my tooth I am going to send it to siense [*sic*]."⁷⁰ Michael Pachulski of Grand Rapids, Michigan, sent a wad of Kleenex with a baby tooth in it. "If you can use it," he wrote, "I will be very happy." He continued: "I'm going

to spread the word to all my friends.”⁷¹ Patty Hamley wrote to apologize that she would not be able to send any more teeth. “My reason is that the tooth I sent you was my last baby tooth,” she wrote. “I will let my brother use the card you sent me. I will be proud to wear the pin, and will tell children about it.”⁷² A Mrs. Jenks enclosed one “I gave my tooth to science” button, “which has been through the washing machine. This has caused one broken heart and floods of tears at our house and I wonder if you could replace it.”⁷³ Many of the children’s letters expressed some parental concerns, such as Robert Roe’s. “I drink about a quart of milk a day,” the nine-year-old wrote in his letter.⁷⁴ Parents fortifying their children’s bones with calcium must have been stunned and terrified to learn that they might actually be poisoning them instead. By the time of the Test Ban Treaty of 1963, the Baby Tooth Survey had collected data on 132,000 teeth; by 1966, it had collected more than 200,000.

In November 1961, Reiss published the Baby Tooth Survey’s preliminary findings in *Science*; she presented strontium-90 absorption levels in St. Louis between 1951 and 1954, but concentrated on the viability of tooth collection and analysis as a legitimate means of analyzing strontium-90 accumulation in children. “The results reported show that deciduous teeth can be usefully employed as a means of monitoring strontium-90 in man,” she wrote in her introduction.⁷⁵ By that time, 67,500 teeth had been cataloged and 1,335 teeth were used in the initial study. Reiss noted that 10 percent of the teeth received came from beyond the study area and another 15 percent came from children who were born elsewhere. Other teeth had developed outside the time parameters of the first study. Because tooth calcification begins after the twelfth week of pregnancy and is completed during the first year after birth, the Baby Tooth Survey was exceptionally particular about the teeth used in its analyses.

The study confirmed the committee’s suspicions and fears that strontium-90 was increasingly present in children’s bones. As the committee had predicted, the amount of strontium-90 began increasing after 1952, the year the first hydrogen bomb was detonated. Whereas levels of strontium-90 found in teeth from 1951 and 1952 contained roughly 0.2 micromicrocuries per gram, that number had doubled by the end of 1953 and tripled and even quadrupled in 1954. Interestingly, teeth from babies who had been fed formula typically contained higher levels of strontium-90 than teeth from babies who had been breast-fed. As Pennoyer had suggested in

her October 1959 conversation with neighbors, mothers served as filters that reduced the amount of strontium-90 absorbed by their children.⁷⁶ The committee's published data showed that the baby teeth examined demonstrated a 300 percent increase in strontium-90 from 1951 to 1955, the result of increased nuclear testing. By even the most sober interpretations, more aboveground nuclear weapons testing meant greater exposure to radioactive fallout.

The Baby Tooth Survey continued until 1968, but from a public information standpoint, the call for baby teeth was an instant and inspired success. As Reiss commented in *Nuclear Information* in November 1961, "The Baby Tooth Survey has apparently lost its own milk teeth, and has become a growing institution with a bite!"⁷⁷ More effective than any advertising campaign, the Baby Tooth Survey served two purposes. First, it brought attention to the hazards of nuclear fallout to which the nation's children were particularly susceptible, and second, it required public participation by involving the public in the initial phase of the study and ensuring widespread interest in the committee's results. The overwhelming response to the requests for teeth, and the growing number of similar surveys around the country, suggested that Americans were becoming less willing to accept risk out of hand. The popular concern that developed over the potential health hazards inherent in aboveground nuclear testing—especially to children—marked one of the first stages of modern environmentalism in the United States. Americans wanted to learn more about the risks to which they and their loved ones were being exposed. The debate even came into play more prominently in the mainstream media. The widespread news coverage of the Baby Tooth Study occasionally confused the project's facts and details, but more often than not, national reports referred to strontium-90 as a "poison" from radioactive fallout that "attacks the marrow of the bone."⁷⁸ Though the committee continued to refrain from using such inflammatory language, concerns about radioactive fallout were becoming more widespread. Whereas Adlai Stevenson had barely caused a ripple among American voters in 1956 when he proposed a test ban, a more public debate over the costs and benefits of nuclear testing was front and center within a half-decade.

In no small measure because of increasing public awareness, Congress ordered a series of hearings on the potential hazards of nuclear fallout

throughout the late 1950s and early 1960s. The May 1959 hearings, titled “Fallout from Nuclear Weapons Tests,” became another opportunity for the Committee for Nuclear Information to make public their Baby Tooth Survey and the relevance of the politics of information to the public. Commoner was particularly intent on having his views included. Though he was not physically present at the hearings, Commoner submitted two previously published essays for the public record. The first, “The Hazard of Fallout—Nuclear Bomb Test Policy Should Be Decided by All,” which originally appeared in the Washington University student magazine, *Student Life*, evaluated the growing dangers of fallout and strontium-90 and the existing scientific debate over the results, before concluding that decisions on fallout should rest with the public rather than with specialists. “[The scientific] discussion of the fallout hazard has . . . brought the issue before the public,” Commoner wrote.

Until a few years ago, the public had no way of knowing that the little information about fallout then allowed to reach the public press was uncertain, incomplete, or sometimes in error. . . . But it is fortunate that the issue has now reached the public generally. There is no scientific basis for judging the relative worth of the political gains which result from nuclear tests—and the human lives which they cost.⁷⁹

Commoner’s second submission was “The Fallout Problem,” which had been published in *Science* a year earlier. Again, Commoner concluded by emphasizing the importance of an informed citizenry and the scientist’s role in achieving it. Scientists, Commoner argued, were well positioned to explain to the public what consequences might result from a given policy. As informed citizens, he continued, scientists had the right and the obligation—shared by all informed citizens—to express an ethical opinion on the wisdom of continuing that policy. “But there is . . . no scientific way to balance the possibility that a thousand people will die from leukemia against the political advantages of developing more efficient retaliatory weapons.”⁸⁰ Reiterating his conclusions from “The Hazard of Fallout,” Commoner insisted that scientists were not equipped with any special competence with which to resolve moral judgments. These publications, enhanced by their nonpartisan appearance, were very much in keeping with his professed dedication to the information process, but Commoner also demonstrated the subtleties of his political activism. By pitting human lives against an apocalyptic government policy, he was influencing the way people thought about nuclear testing. In principle, if not

entirely in practice, Commoner's perspective helped to frame the public debate.

Other findings presented during the hearings substantiated Commoner's concerns. Congress learned that "acceptable" levels of strontium-90 did not take into consideration the cumulative impact of the various other isotopes that were harmful. Indeed, government scientists conveniently neglected to consider the cumulative effects of other isotopes such as strontium-89, cesium-137, barium-140, and iodine-131, all present in a nuclear reaction and likely as harmful to humans as strontium-90. In 1959, at the spring subcommittee hearings, an Oak Ridge National Laboratory physicist, Karl Z. Morgan, advocated the drastic reduction of acceptable levels of strontium-90 in the human body. He argued that the allowable levels of strontium-90 should be cut in half to take into account the hazards of what amounted to a radiation cocktail.⁸¹

As scientists and the public reached a general level of acceptance that strontium-90 was indeed harmful, the Committee for Nuclear Information turned its attention to iodine-131, which also concentrated in milk. Though its half-life was only eight days, compared with strontium-90's twenty-nine years, iodine-131 accumulated in the more susceptible thyroid gland, rather than in bone. The small size of a child's thyroid moved the emphasis of the fallout debate from strontium-90 to iodine-131. Again the Atomic Energy Commission downplayed the threat, and again the Committee for Nuclear Information produced data that demonstrated flaws in the Atomic Energy Commission's position. In this instance, the Atomic Energy Commission argued that levels of radiation did not exceed established guidelines for external exposure. The Committee for Nuclear Information concurred, but "*only if the fallout which gives rise to this radioactivity does not enter the food chain.*"⁸² In language that anticipated the ecological rhetoric of the environmental movement, one committee scientist criticized the Atomic Energy Commission for continuing to restrict "its concerns to 'persons.' Such a restriction exhibits a startling lack of appreciation of the basic ecological fact that 'persons' cannot exist alone. All living things are interdependent."⁸³ Adopting the rhetoric of ecology, the Committee for Nuclear Information challenged the Atomic Energy Commission to think more holistically. Fallout could enter the food chain and accumulate in human bodies in higher concentrations than occur from initial atmospheric exposure. The Atomic Energy Commission, therefore,

was measuring only one type of exposure, ignoring the often more pertinent accumulations that resulted from secondary exposures.

In August 1963, at the Joint Committee for Atomic Energy hearings, the Committee for Nuclear Information presented the results from their recent studies that suggested that residents living downwind from the Nevada test site in Nevada, Utah, and Idaho had been exposed to fallout “so intense as to represent a medically unacceptable hazard to children.”⁸⁴ At the same hearings, Gordon M. Dunning, deputy director of the Atomic Energy Commission’s Division of Operational Safety, presented a direct rebuttal to the committee findings, arguing that committee “computations of probable iodine-131 exposure . . . ‘are either statistically unreliable or cannot be supported by sound experimental measurements.’”⁸⁵ In the November 1963 issue of *Nuclear Information*, the committee published its own reply, which listed fourteen errors in Dunning’s testimony and characterized the Atomic Energy Commission as “careless of the public welfare” and “less than candid.”⁸⁶ At an impasse, in a letter to the Atomic Energy Commission, the Committee for Nuclear Information insisted that “either you or we are dead wrong.”⁸⁷

The impact of the Committee for Nuclear Information’s campaigns was far-reaching. Politicians commented on the numerous letters received from housewives and mothers who wanted the Test Ban Treaty approved, and substantiated their positions with scientific explanations of how it would reduce the medical hazards from fallout.⁸⁸ Clearly, the public information message was being received loud and clear, and Commoner’s faith in the public desire and ability to understand scientific information was well justified. It was further compounded by the signing of the Test Ban Treaty and by President Lyndon Johnson’s address in October 1964, a year after it had been signed. In stark contrast to Eisenhower’s dismissal of the hazards of fallout eight years earlier, Johnson stated that the Nuclear Test Ban Treaty has halted the steady, menacing increase of radioactive fallout. The deadly products of atomic explosions were poisoning our soil and our food and the milk our children drank and the air we all breathe. Radioactive deposits were being formed in increasing quantity in the teeth and bones of young Americans. Radioactive poisons were beginning to threaten the safety of people throughout the world. They were a growing menace to the health of every unborn child.⁸⁹

Johnson’s somber tone represented a drastic shift in the official response to nuclear fallout, but also a stark contrast to his presidential opponent Barry

Goldwater, who had advocated using nuclear weapons in Vietnam.⁹⁰ Johnson's reference to children's teeth and bones made a direct link to the work of the Committee for Nuclear Information and their Baby Tooth Survey.

Rather than marking a successful conclusion to the question of atmospheric nuclear weapons testing, the Nuclear Test Ban Treaty might be properly regarded as laying the groundwork for environmentalism and a much larger and more diverse means of galvanizing public activism. Margaret Mead would call this scientific endeavor to alert citizens to particular issues and furnish them with the appropriate information with which to evaluate the relative benefits and hazards of modern technology "a new social invention."⁹¹ In 1963, Commoner and other committee members were among the catalysts for the creation of the Scientists' Institute for Public Information. Commoner determined the new institute's agenda by arguing that "scientists today are the first to live with the knowledge that our work, our ideas, and our daily activities impinge with a frightening immediacy on national politics, on international conflicts, on the planet's fate as a human habitation."⁹² For Commoner, this new organization needed to establish "an *independent* and *active*" information movement similar, on a national scale, to the Committee for Nuclear Information's smaller operation.⁹³ Scientists, Commoner argued, represented the front line against ecological hazards, and the job of the Scientists' Institute for Public Information was to equip the populace with the knowledge necessary to combat those hazards.

The Nuclear Test Ban Treaty might also represent a palpable admission that the Cold War priority on national security over public health was inherently flawed and ironically counterintuitive. Over the course of a decade, activists had persuaded the public that the fallout hazard constituted too great a risk, and the American testing policy experienced a complete reversal. The subsequent ban of DDT and some of the other chemicals that were part of the post-World War II technological revolution further compounded this recognition. As Commoner reflected in *Science and Survival*, it became clear that "the government agencies responsible for the development of nuclear weapons embarked on this massive program before they understood the full biological effects of what they proposed to do. Great amounts of fallout were disseminated throughout the world before it became known that the resultant risks

were so great as to require that nuclear testing be halted. The enactment of the Test Ban Treaty in 1963 is, in part, a confession of this failure of modern science and technology.”⁹⁴

As the debate naturally shifted from whether or not fallout represented a health risk to the extent of that risk, it exposed serious flaws in nuclear technology’s potential, which hindered the progress of the atomic energy industry as well. Splitting atoms to boil water, Commoner maintained, was like “using a cannon to kill a fly.”⁹⁵ The innovations that characterized the post-World War II technological revolution had solved very difficult physics and engineering questions, and had put at human disposal powers greater than any previously imagined. The danger, however, was that the biological consequences of these new powers had not been evaluated, and because of the potency of their innovations, more than ever scientists needed to be absolutely sure about what they were creating and how those creations worked. As in Commoner’s analogy of the risk inherent in the development of the steam engine compared with that of a nuclear power plant, modern science and technology were simply too powerful to justify a trial-and-error approach.⁹⁶ Given the potential for disaster, Commoner preferred to err safely on the side of caution.

The notion that decisions on balancing benefits against social and environmental cost should be made by every citizen and not left to experts—in any environmental problem—became Commoner’s overriding principle. When he stated in *The Closing Circle* that “the Nuclear Test Ban Treaty should be regarded . . . as the first victorious battle in the campaign to save the environment—and its human inhabitants—from the blind assaults of modern technology,” he was referring not only to the result of the campaign but also to the process that realized that victory.⁹⁷ Democratic principles had endured as fundamental to American society, and the science information movement had taken advantage of that rhetoric. Moreover, when Commoner insinuated in the early draft of the Committee for Nuclear Information’s founding statement that the country was experiencing a “crisis of democracy,” he was pointing to the symbolic nature of what the withholding of nuclear information signified.

The political climate of the Cold War imposed priorities on public citizens in an undemocratic manner that excluded them from the decision-making process. Bruno Latour has observed that “when controversies flare up, the literature becomes more technical,” a situation characterized by a

shift from politics to expert opinion and a growing uncertainty among experts.⁹⁸ The science information movement's historical significance, then, is its deliberate confrontation with that tendency. That fallout posed an involuntary risk to many Americans suggests that the avenues along which Americans might participate in determining what constituted acceptable risks were closed to all but a very few. Without the necessary information, Commoner intoned, "citizens cannot with reason give their consent to any public policy."⁹⁹ What democracy currently exists on the nuclear issue can be directly attributed to the extent to which critics weakened government control over information. Without the dissent that followed, the quest for technological progress would have perpetuated public health risks and public exclusion from information and subsequent decision-making.

3

The New Jeremiad

If you can see the light at the end of the tunnel you are looking the wrong way.

—Barry Commoner

Due in no small measure to opposition to nuclear weapons testing from groups such as the St. Louis Committee for Nuclear Information, the 1960s became the Age of Ecology. In the early 1960s, synthetic pesticides quickly joined radioactive fallout as poisons known to be ubiquitous in the environment. By the end of the decade, the Santa Barbara oil spill and flames bursting from the Cuyahoga River in Cleveland spurred further public recognition of the postwar environmental decline and culminated in the first Earth Day, during which more than 20 million Americans took to the streets in protest and celebration. To many Americans it had become abundantly clear that the postwar landscape had been subjected to unparalleled environmental threats and that they were raising their families in a dangerous environment. As Adam Rome notes, “The insights of ecology gave countless citizens a new appreciation of the risks of transforming nature.”¹

If Commoner’s activism against aboveground nuclear weapons testing contributed to the establishment of a link between the scientific community and a burgeoning environmental awareness, the 1960s helped to foster connections between those two institutions and the peace movement. The Vietnam War and the environmental crisis were both products of a dangerous technological logic. As Rome wrote, “In Vietnam, Americans destroyed towns to ‘save’ them; at home, Americans degraded the environment to make ‘progress.’”² Another element of the public concern over nuclear weapons dealt quite practically with the dangers of nuclear war. While fallout constituted a legitimate domestic threat, the prospect of