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2 RALPH H. LUTTS

Chemical Fallout: *Silent Spring*, Radioactive Fallout, and the Environmental Movement

♡ The landmark book *Silent Spring* played a vitally important role in stimulating the contemporary environmental movement. Never before or since has a book been so successful in alerting the public to a major environmental pollutant, rooting the alert in a deeply ecological perception of the issues, and promoting major public, private, and governmental initiatives to correct the problem. It was exceptional in its ability to combine a grim warning about pesticide poisoning with a text that celebrated the living world. *Silent Spring* has been compared in its social impact to *Uncle Tom's Cabin* (United States, *Interagency Coordination* 220–21); John Kenneth Galbraith described it as one of the most important books of Western literature (“Immortal Nominations” 13); and Robert Downs listed it as one of the “books that changed America” (260–61).¹

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Rachel Carson's case against the indiscriminate use of pesticides prevailed in the face of powerful, well-financed opposition by the agricultural and chemical industries. Despite this opposition, she prompted national action to regulate pesticides by mobilizing a concerned public. The book established a broad constituency for addressing the problem—broader, perhaps, than that enjoyed by any previous environmental issue. Never before had so diverse a body of people—from bird-watchers, to wildlife managers and public-health professionals, to suburban home owners—been joined together to deal with a common national and international environmental threat. Her success in the face of what might have been overwhelming opposition suggests there was something significantly different between the response to *Silent Spring* in 1962 and the pesticide-control efforts of the first half of the century.

The issue of pesticide pollution was not new. Since the introduction of Paris green around 1867, highly toxic compounds of lead and arsenic were widely used in agriculture despite the significant health hazards they presented. As one example, seventy-five million pounds of lead arsenate were applied within the United States in 1944; eight million pounds were even used in the 1961–62 crop year when DDT was preeminent. In the early decades of their use, these toxic chemicals could sometimes be found as visible coatings on farm produce in retail markets. Over the years, stories of acute poisonings and warnings of the dangers of chronic toxicity appeared in the press. Everyone was warned to scrub or peel fruits and vegetables before they were eaten. Many public-health officials attempted to institute strong regulations and strict residue tolerances, but the general public, medical profession, and agriculture industry showed only limited concern (Whorton 178; Whitaker 378; United States, *Environmental Hazards* 13). This relative indifference to the hazards of pesticides in the first half of the century stands in stark contrast to the vocal outcry following the publication of *Silent Spring*.²

Why is it that the book's publication in 1962 had such a major impact upon the public? The answer to this question might reveal a great deal about the origins of contemporary environmental concerns, but no one has examined it systematically. A number of answers have been suggested, focusing most often upon Carson's extraordinary skill and reputation as a writer, the general circumstances surrounding the rise of pesticide use and misuse, the publisher's marketing strategy, and the chemical industry's response. Many authors have also noted the growing public awareness of a variety of environmental problems, including water and air pollution. One of the major events to bring the hazards of pesticides to public attention was the "cranberry scare" of 1959 when people were warned against eating this traditional fruit during the Thanksgiving season because of pesticide contamination. The thalidomide syndrome also came to the public's attention shortly before the publication of *Silent Spring*, and the pictures of the distorted infant limbs caused by a supposedly beneficial drug certainly made people pay greater attention to Carson's message (Brooks, *House* 261; Graham 50–51; Taussig).

There was another issue, however, that played an equal or greater role in preparing the public to accept Carson's warning—an issue that has been largely overlooked.³ She was sounding an alarm about a kind of pollution that was invisible to the senses; could be transported great distances, perhaps globally; could accumulate over time in body tissues; could produce chronic, as well as acute, poisoning; and could result in cancer, birth defects, and genetic mutations that may not become evident until years or decades after exposure. Government officials, she also argued, were not taking the steps necessary to control this pollution and protect the public. Chemical pesticides were not the only form of pollution fitting this description. Another form, far better known to the public at the time, was radioactive fallout. Pesticides could be understood as another form of fallout.

People in the United States and throughout the world were prepared, or preeducated, to understand the basic concepts underlying Rachel Carson's *Silent Spring* by the decade-long debate over radioactive fallout preceding it. They had already learned that poisons, in this case radioactive ones, could create a lasting global danger. To understand the deep impact of this debate upon the public, we must review the history of the fallout controversy.

The Beginning

During the heady days of the late 1940s, when the United States was the only nation possessing the atomic bomb, Americans did not worry much about this symbol of international status and power. The major cultural contribution of the 1946 U.S. A-bomb tests at the Bikini Atoll in the Pacific was the name of a new French bathing suit (Eherhart). The Soviet Union's detonation of its own atomic bomb in 1949 destroyed this complacency, and the postwar nuclear arms race began. In 1951, the U.S.S.R. exploded another two devices and the United States sixteen. By the end of 1953, both nations had conducted a total of twenty-six more tests. In November 1952, the U.S. government exploded the world's first thermonuclear device, followed by the Soviets' detonation of their own device in August 1953. In March 1954, the United States tested its first portable superbomb (*SIPRI*: 1968/69 242; Fowler 16, 209).

By the early 1950s, the public was extraordinarily interested in atomic weapons. This early interest reflected nationalistic pride, fear of the Soviets, and fascination with the bombs and the mysteries of radioactivity rather than a major concern about public health. The majority of United States A-bomb tests were conducted in Nevada, and the resulting clouds of radioactive materials, which passed over populated areas of the nation, led to growing public anxiety despite reassuring statements by the Atomic Energy Commission (AEC; see "AEC Fifth Semiannual Report"). In March 1953, for ex-

ample, a *New York Times* writer reported that the AEC had determined there was no danger to American cities from the tests. The explanation may not have instilled great confidence, however. "Radioactivity in the atmosphere," he wrote, "decreases rapidly and the 'fall-out,' or settling of airborne radioactive particles, is hastened by rain or snow. The latter factor has caused upstate New York areas such as Rochester and Buffalo to be called 'radiation sewers'" (Laurence; see also "Bomb Tests").

In May 1953, Utah stockmen blamed the Nevada tests for the unexpected deaths of more than one thousand ewes and lambs. The AEC investigated the complaints and assured the stockmen that, although they did not know what was responsible for the deaths, it was certainly not atomic tests ("A.E.C. Denies"). A rancher and the wife of another rancher filed suit, claiming they had been injured by the same tests. The woman charged that "radioactive dust from the blasts had caused her hair to fall out, her skin and fingernails to peel off, and gave her recurrent nausea." The man complained of losing all his body hair ("2 Sue").

Although these events received national publicity, it was not until the "Bravo" test of the U.S. superbomb in the Pacific that the scope of the danger of fallout became widely known. Weather forecasts for this 1 March 1954 explosion were wrong, and the fallout was blown in an unexpected direction. Rep. Chet Holifield (Dem., CA), a member of the Joint Atomic Energy Committee, later characterized the test as "out of control," a charge that the chairman of the AEC denied. This denial was little consolation to the 28 Americans and 236 natives of the Marshall Islands who were exposed to radioactive fallout. Fortunately they were quickly decontaminated and relocated to a safe area ("H-Bomb"; "264 Exposed"; "Big Delay"). The fishermen on a Japanese tuna boat wandering near the Bikini test area were not so lucky.

The twenty-three seamen on the *Lucky Dragon* had no knowledge that a test was about to take place, but the distant, brilliant

light in the sky reminded them of stories of Hiroshima and Nagasaki. Nevertheless, they did not recognize the subsequent four-hour snow of strange whitish dust upon their vessel as a special threat. When they soon became ill and began to lose their hair, however, they became alarmed and turned homeward. It was two weeks before they reached Japan, and more days passed before the nature of their illness was discovered. During this period, they worked, ate, and slept in the midst of the fallout dust. After months of illness, most of the men recovered, but Aikichi Kuboyama, the radioman, died on 23 September (Lapp, *Voyage*).

The tragedy was compounded by its impact upon the fishing industry. Many of the fish brought back in the *Lucky Dragon* were found to be contaminated but not until after they had been sold. Radioactive fish were also discovered on other tuna boats, creating near panic in a nation dependent upon the sea for protein. One boat in eight returned with contaminated fish as ocean currents spread radiation from the Bikini test through the Pacific. The national consumption of fish and fish prices plummeted, and the industry suffered terribly (Lapp, *Voyage* 88–100, 177–78; Passin). All of these events were followed closely by the world press.

The bomb that dropped fallout upon the *Lucky Dragon* was very dirty, much more so than one would expect in theory from a hydrogen bomb. It was the first of a new kind of device that used inexpensive uranium 238 in massive quantities. Its deadly fission products and other debris were injected into the upper atmosphere by the blast to circle the globe. Independent scientists identified the nature of the bomb soon after the test and also discovered the presence of strontium 90, a particularly dangerous and long-lasting radioactive isotope (Lapp, *Voyage* 131, 148–56; Rotblat). This was not officially announced, however, until a June 1955 speech delivered by Commissioner Willard Libby of the AEC. He added the reassuring suggestion that, after a nuclear war, fallout could be removed from cities with “ingenious devices such as street sweepers,

in which the driver sits on a bag of sand or a thick metal slab to protect him from radiation” (Leviero 32).

The public was now less willing blindly to accept statements like this. The information and apprehensions originally shared by a few scientists were finding their way into the popular press and everyday conversation. Americans became increasingly alarmed when they discovered that their own food was contaminated.

Strontium 90

Oh where, oh where has the fallout gone,
Oh where can the poison be,
Why right in the milk and the other things
That the milkman brings to me.

Sen. George Aiken (Rep., VT) was displeased with this and other songs sung by “certain pacifist groups.” In 1962, he asked a congressional hearing witness whether he did not think “it was a great calamity that the critics of the use of milk and other dairy products did not advise the Maker before He set up the original milk program?” (United States, *Radiation Standards* 86–87, 94). The senator’s pique was prompted by the universal presence of strontium 90 in milk products, the resulting public anxiety regarding their wholesomeness, and the tremendous emotional leverage that the fear of radioactive milk gave the opponents of nuclear weapons.

A radioactive isotope, strontium 90 (Sr-90) has a half-life of twenty-eight years, making it a long-lasting component of fallout. Soon after World War II, the AEC recognized that Sr-90, which is chemically similar to calcium, can accumulate in bones and possibly lead to cancer (“AEC Fifth Semiannual Report” 119). In August 1953, its presence in animal bones, milk, and soil was first confirmed by the Lamont Geological Observatory. Lamont established a worldwide network for sampling human bone, and within a few

years found Sr-90 present in "all human beings, regardless of age or geographic locations" (Kulp et al. 219). Sr-90 found its way into humans via the ecological food chain, as fallout in the soil was picked up by plants, further concentrated in herbivorous animals, and eventually consumed by humans.

The news that Sr-90 was a dangerous component of fallout received wide publicity in 1954 when Japanese scientists discovered that it was a part of the dust sampled from the *Lucky Dragon*. The new superbombs created Sr-90 in far greater quantities than did the old A-bombs. Public concern increased as the 1950s progressed, the bomb tests continued, radiation levels rose, and the issue received a great deal of press attention (Lapp, "Strontium Limits"). In 1956, for example, *Newsweek* announced: "The testing of hydrogen bombs may have *already* propelled enough strontium 90 . . . into the stratosphere to doom countless of the world's children to inescapable and incurable cancer" ("Danger" 88). The magazine characterized Sr-90 as "the invisible bone-hitting particles" that "can never be removed" (88). The federal government established an elaborate system to monitor food and water for Sr-90 and other radioisotopes (Terrill). In addition, there were a number of private research projects that added to knowledge of this pollutant. Some were also designed to increase public awareness of the hazard.

The Consumer's Union, for example, conducted a major national study of Sr-90 concentrations in milk—a highly emotional topic because of the importance of milk in the diet of growing children. Sr-90 was found in a variety of foods in addition to milk, so the organization also conducted an annual study of the Sr-90 levels in the total diet, based upon typical menus of citizens living in a number of cities throughout the United States. The results of these studies were published in a series of articles in *Consumer Reports*, which had a readership in the millions ("Milk"; "Fallout in Our Milk"; "Strontium-90"; "Follow-up Study"; "Fallout and the U.S. Diet"; Michelson).

Another study, the Baby Tooth Survey, was a particularly imaginative combination of research and public education. In 1958, Herman M. Kalckar proposed an international study of the concentration of radioisotopes in baby teeth. The special advantages of baby teeth were that their age could be precisely established; they could, unlike bones, be collected as they were shed without injury to donors; and they were readily available, ensuring a large and continuous supply. Although a coordinated international program was never established, a number of smaller projects were eventually conducted around the world, beginning in St. Louis, Missouri.⁴

In 1958, the newly created Greater St. Louis Citizens' Committee for Nuclear Information decided to undertake a survey of Sr-90 in the teeth of children. The survey started in earnest at the beginning of 1959. To prevent unreasonable public fears as a result of the study itself, and because they would require the assistance of the citizenry, the committee initiated a public-education campaign and successfully gained the support of schools, medical institutions, libraries, Scout groups, and other community organizations. Initially they received teeth at the rate of one thousand each month, but the collection rate rapidly increased. By 1961, one million tooth survey forms had been distributed, and teeth were being received at the rate of 750 each week; a total of more than 67,500 by the end of the year. Nearly 10 percent of these teeth were coming from outside the St. Louis region. They received nearly 160,000 teeth by the end of 1964. Each child was given an I GAVE MY TOOTH TO SCIENCE button ("Baby Tooth Survey Launched"; Reiss 1169–70; "Baby Tooth Survey—First Results"; Logan).

The study became a model for similar projects around the world. Over the years, the scope of the committee broadened. The organization had a strong biological and ecological perspective, and its interests expanded from fallout to wider environmental problems. The name of its newsletter was changed to *Scientist and Citizen*, which eventually metamorphosed into *Environment*. What be-

gan as a mimeographed newsletter about fallout had turned into one of the nation's major sources of environmental information; and one of the committee's founders and best-known members, Barry Commoner, had achieved national prominence in the environmental movement (Logan 39; Fleming 40–46).

These and other studies, and the wide publicity they received, brought the issue of radioactive fallout very close to home. No longer was fallout a problem limited to a few Japanese fishermen or western ranchers. People around the nation knew that invisible radioactive material was in the air they breathed and lodged within their own and their children's bones. In learning about this hazard they also learned about the ecological food chain, the biological concentration of these materials, and the cancer and other radiation-induced effects that might strike them in future years.

On the Beach

Public anxiety about the effects of nuclear tests and atomic radiation was expressed in a series of science fiction motion pictures that were long on fiction and short on science. These 1950s masterpieces of the cinematic art included *The Beast from 20,000 Fathoms* (1953; resurrected dinosaur), *Them!* (1954; giant ants), *Tarantula* (1955; giant spider), and *The Incredible Shrinking Man* (1957; tiny man) (see Wright). Rather than representing true science fiction, these films were a modern version of Gothic horror. A literary or cinematic journey from the world of normal, everyday experience to one of fantasy and terror requires some device to encourage belief. Radioactive fallout provided such a device, an excuse for conjuring up demons in the form of mutants, monsters, and nature run amuck. The fall of radiation had become the modern equivalent of the fall of darkness and the stroke of midnight.

Beginning with the 1951 film *Five*, there also arose a new film

genre examining the theme of survival after World War III. Other films of this sort included *The World, the Flesh, and the Devil* (1959); *On the Beach* (1959); and *Panic in Year Zero* (1962). Each considered the plight of the survivors of nuclear war: facing one's certain death as radiation spread across the earth; being the last human beings on earth and bearing the responsibility for the future of the species; and surviving in the face of overwhelming disaster and the collapse of social order. Although most of these films were not of the highest quality, they presented to millions of people a terrifying image of the future and expressed the anxieties of their society (Shaheen; Stark).

On the Beach was an exception to the rule. It was a high-budget, prestige film designed to attract international attention to the issues of nuclear war and fallout. The novel, written by the well-known author Nevil Shute, was published in 1957 and became a bestseller with more than two million copies in print by 1960 ("Last Tale"). It portrays the despair and resignation of the citizens of Australia following a 1962 nuclear war in the northern hemisphere. They have to wait over a year for the radioactive air mass of the northern hemisphere to mix sufficiently with the southern air mass to bring their certain death, more than enough time to consider what lies ahead and for each to find his or her own way of coming to terms with the inevitable.

Many reviewers found it difficult to accept the calmness with which Shute's characters face their doom. The Australians go about the business of their lives, adjust to the shortages of supplies, and consider whether or not they will take the government-issued suicide pills that promise a quick death as an alternative to slow radiation poisoning. The trout season is opened early because few will be alive by the time the traditional date arrives. "But there was no orgy of immorality, no riots and looting of the haves by the have nots, no mass religious revival," wrote one reviewer with some dis-

appointment (Prescott). Another, however, wrote, “[I]f this thriller is ever televised, there may be a wilder stampede than Orson Welles wrought two decades ago with his *Martians*” (Sykes 4).

The film version of *On the Beach*, produced and directed by Stanley Kramer, was released by United Artists two years after the book’s publication. With over four million dollars invested, a large figure at that time, Kramer had the difficult task of making a box-office success out of a movie about a terribly depressing subject. He hired big-name stars: Gregory Peck as the American submarine commander, Dwight Towers; Ava Gardner as the less-than-glamorous alcoholic, Moira Davidson; and dancer Fred Astaire as the physicist, Julian Osborne. Casting Gardner and Astaire against type helped attract attention. The promotion of the film emphasized its relevance to major issues of the time—nuclear fallout and the survival of humanity in a nuclear age. This was, as *Variety* noted, “part of United Artists’ campaign to make the film what’s termed ‘a status symbol,’ meaning something to be seen despite its grim nature” (“*On the Beach*”). On 17 December 1959, the film premiered in eighteen cities around the world, with versions in eight languages. Gregory Peck and one thousand others attended the premier in Moscow. With this kind of promotion, it is not surprising that *On the Beach* was a major success. Two months after its release, it was still on top (“Not with a Bang”; “Topics”; Crowther; “Gregory Peck”; “National Box Office”).

Perhaps the most moving of the film’s scenes are those of the dead cities of the U.S. West Coast. Towers and his crew are sent to investigate strange radio signals coming from the area, hoping they are a sign that some human life remains. Raising the periscope to examine the coast, they find cities devoid of life. The images of San Francisco, its streets empty and without movement, are haunting. The final disappointment comes when they discover that the radio signals, which they have traveled halfway around the world to in-

vestigate, are created as a window shade randomly flapping in the breeze jiggles a Coke bottle against a telegraph key.

The film’s final scenes of Melbourne’s vacant, lifeless streets recall Dwight Towers’s thoughts in the novel as he drives through the city.

Very soon, perhaps in a month’s time, there would be no one here, no living creatures but the cats and dogs that had been granted a short reprieve. Soon they too would be gone; summers and winters would pass by and these houses and these streets would know them. . . . The human race was to be wiped out and the world made clean again for wiser occupants without undue delay. (Shute 276–77)

In addition to widespread and strong praise for the film, there were notes of criticism. Some reviewers leveled the same charge as had been directed at the book, arguing that the characters accepted their fate too calmly. Others complained that the film did not show the violence of the war or the physical agony of its victims. A *Time* reviewer wrote that the film “turns out to be a sentimental sort of a radiation romance, in which the customers are considerably spared any scenes of realistic horror” (“New Picture”). Lodging a different criticism, New York’s Gov. Nelson Rockefeller feared the film might diminish the nation’s “will to resist. . . . [S]ome of my kids saw the picture and came away with the feeling of ‘what’s the use?’” (Illson 42).

After a decade of preparation, the American public was ready to believe what *On the Beach* had to say. People understood that fallout can circle the globe and that this invisible poison, which they were unable to detect with their own senses, could threaten their lives and future. At a congressional hearing in mid-1961, Herman Kahn spoke of the scientists in the 1950s who did not believe nuclear war

was survivable. "In other words," he said, "the belief in the 'end of history' was an expert's belief, rather than a layman's belief. In fact, if the layman had been told fully and frankly what the experts believed, he would have been horrified. . . . The picture and book, '*On the Beach*,' reflected these views" (United States, *Civil Defense* 178–79). The "end of history," however, was no longer a concept known only to experts.

Seeking Shelter

Americans did not accept the "end of history" passively. The mid- and late 1950s witnessed growing public and congressional interest in fallout shelters. Gov. Rockefeller was a vocal advocate; and in the spring of 1960, he announced plans to build one in the basement of his New York Fifth Ave. apartment building. He made a special effort to influence the new president, John F. Kennedy. Given the well-known hazards of fallout and nuclear war, it was difficult for the president not to take steps to protect the population from this potentially disastrous threat. In a special message to Congress on 25 May 1961, he announced a major step-up in the nation's civil-defense program (Simpson; Illson; *John F. Kennedy* 403).

In June, Kennedy met with Premier Nikita Khrushchev of the U.S.S.R., who told him of the Soviets' intention to end the West's access to Berlin. In response, Kennedy made a radio and television report to the nation announcing an increase of \$207 million above the \$104 million already appropriated for civil defense—a total of five times the previous year's funding. This was only one part of a major mobilization of U.S. defense in preparation for the likelihood that the Soviet Union would sign a separate peace treaty with East Germany, thus isolating West Berlin. This was a grim message, in which he raised the specter of nuclear war with the U.S.S.R. The president's speech prompted an outpouring of national concern. In July, the Office of Civil and Defense Mobilization received 16,994

inquiries from the public, with a major increase following the speech—5,382 letters on 1 August alone (*North Atlantic* 42; *John F. Kennedy* 533–40; Kaplan 309; United States, *Civil Defense* 68).

On the night of 13 August, East Germany began constructing the Berlin Wall. The Soviet Union resumed testing nuclear weapons on 31 August. Since the end of 1958, the two nations had tacitly agreed to suspend nuclear testing; and between that time and August 1961, neither country had conducted tests. By the end of 1961, though, the Soviets had detonated more than thirty devices. The United States reestablished its own testing program and by the end of 1962 had detonated nearly ninety devices, compared to about forty of the Soviets' in the same year. The world of 1962 witnessed the largest annual number of nuclear explosions in history (*North Atlantic* 43; SIPRI: 1968/69 242; SIPRI: 1983 100). The background radiation level, which had dropped since 1958, again began to climb as nuclear debris was injected into the atmosphere.

The hostilities between the two nations reached a peak in October 1962, when Kennedy decided to confront the Soviets over their attempt to base nuclear missiles in Cuba. Five years after the publication of *On the Beach*, in the year of the novel's fictional holocaust, the world held its breath as the two superpowers poised on the edge of a terrifyingly real nuclear war.

Through the autumn of 1961, the administration had continued to promote the creation of public and private fallout shelters. *Life* magazine published a major article on fallout shelters in September, complete with an introductory letter from the president. "Nuclear weapons and the possibility of nuclear war," he wrote, "are facts of life we cannot ignore today. . . . The ability to survive coupled with the will to do so therefore are essential to our country." The article claimed that "97 out of 100 people can be saved" and provided diagrams of home shelters (including one soon to be available from Sears, Roebuck and Co. for seven hundred dollars) and tips on shelter living ("Fallout Shelters"). In December, the Defense De-

partment published a brochure promoting home shelters and other forms of fallout protection. Twenty-five million copies were distributed free from post offices and civil-defense offices throughout the nation (Kaplan 313).

The country was swept up into “shelter mania” as citizens with the means constructed fallout shelters in their basements and backyards. Entrepreneurs marketed kits of food and survival equipment for the well-outfitted shelter, and clothing stores catered to the special needs of doomsday. One Manhattan dress shop recommended “gay slacks and dress with a cape that could double as an extra blanket” (“Fallout Shelters”; “Survival” 19).

Shelter mania showed its dark side as citizens armed their home shelters to fight off neighbors who, in the event of a war, might want to share their limited space and provisions. A Nevada civil-defense official announced that it might become necessary to rely on vigilantes to defend his state from World War III Californian refugees (“Fall-Out Shelters Speeded”). “There is evidence that the Administration policies, which seem to emphasize an every-man-for-himself approach,” wrote *Newsweek*, “have succeeded in bringing out the worst side of human nature. Some citizens are behaving as if they were cavemen already” (“Survival”).

Criticism of the program grew. In November, Kennedy’s adviser Arthur Schlesinger warned the president, “Everywhere the shelter program seems to be emerging as the chief issue of domestic concern—and as one surrounded by an alarming amount of bewilderment, confusion and, in some cases (both pro and con) of near-hysteria” (Kaplan 312). *Newsweek* and *Consumer Reports* pointed out that the administration’s program did not provide protection from blast, heat, or firestorm, and did not provide for dispersing targets (“Survival”; “Fallout Shelter” 14). In December, the American Medical Association urged the nation to “stop worrying about radioactive fall-out and concentrate on getting ready for Christmas.” It went on to say, “There really isn’t very much that us average folks

can do about it anyway”; and, “If there is radioactive fall-out in the air, we’ll get some of it, and there’s nothing we can do about it” (“Stop”).

As the mania abated and cooler heads prevailed, Congress pared the president’s civil-defense-budget request for fiscal year 1962–63 from \$695 million down to \$80 million. Steps were taken to reduce the hazards of nuclear weapons with the signing in June 1963 of a treaty to install a “hot line” between Moscow and Washington and in August 1963 of the Limited Test Ban Treaty to halt above-ground testing (Kaplan 314; *North Atlantic* 45). The U.S. government would continue to support fallout shelters, but never again would the public display the kind of obsession that had characterized this period. Kennedy’s civil-defense program left a lasting impression upon the nation. The “end of history,” nuclear war, and radioactive fallout were no longer simply items of uncomfortable conversation. They were threats against which individual citizens had physically prepared. Worse still, the actions that their government urged were not designed for prevention. Instead, they were based upon accepting and accommodating to this overshadowing doom. In the following years, the ubiquitous fallout-shelter sign and its radiation symbol became part of the landscape as it graced schools, public buildings, subway tunnels, and many privately owned structures. It became a reminder of a terrifying, inescapable threat.

Chemical Fallout

Silent Spring was published on 27 September 1962—one month before the Cuban missile crisis and one year before the signing of the Limited Test Ban Treaty; almost three years after the release of the film version of *On the Beach* and two years before the release of Stanley Kubrick’s *Dr. Strangelove: Or, How I Learned to Stop Worrying and Love the Bomb*. The nation was steeped in years of debate about

nuclear weapons and fallout, which served as a point of reference to help people understand the hazards of pesticides and as a fearful symbol to motivate action.

The environmental and health hazards of radioactive materials were on Rachel Carson's mind as she wrote the book. In the summer of 1960, while deeply involved in writing *Silent Spring*, she also worked on a revised edition of *The Sea Around Us*. In a new preface, she wrote about the impact of fallout and of the ocean disposal of nuclear wastes upon the marine environment. She described how marine organisms can concentrate radioisotopes and wrote, "By such a process tuna over an area of a million square miles surrounding the Bikini bomb test developed a degree of radioactivity enormously higher than that of the sea water." In creating these materials, she warned, we must face the question of whether we "can dispose of these lethal substances without rendering the earth uninhabitable" (xi-xiii).

It is no accident, then, that the first pollutant Carson mentioned by name in *Silent Spring* was not a pesticide but strontium 90. Well known to the American public, Sr-90 was a tool to help her explain the properties of pesticides. Early in *Silent Spring* she wrote:

Strontium 90, released through nuclear explosions into the air, comes to earth in rain or drifts down as fallout, lodges in soil, enters into the grass or corn or wheat grown there, and in time takes up its abode in the bones of a human being, there to remain until his death. Similarly, chemicals sprayed on croplands or forests or gardens lie long in soil, entering in a chain of poisoning and death. (6, emphasis added)

Although this is the book's first reference to a specific pollutant, it is not its first allusion to fallout. The opening chapter, "A Fable for Tomorrow," paints a picture of a lovely rural midwestern town struck by a mysterious blight. People, animals, fish, and birds

sicken and many die. Roadside vegetation withers. What has happened to this town, now lifeless and without even the song of birds? In the nooks and crannies of the town's buildings, one can find a white powder that "had fallen like snow upon the roofs and the lawns, the fields and streams" a few weeks before. "No witchcraft," she wrote, "no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves" (3). This fall of pesticides upon the town conjures up the specter of radioactive fallout—a specter created intentionally by the author. In an early draft, Carson had written that the powder reminded the townspeople of the dust that fell upon the *Lucky Dragon*. She had also written that visitors to the town wondered if perhaps the wind had carried fallout from a bomb test and dropped it on the town (Rachel Carson Papers, "Chapter 1"). Not only does this chapter present a frightening description of potential pesticide hazards, it evokes the image of a town dying from nuclear fallout. On an even more subtle level, it recalls the images of lifeless American cities shown so graphically less than three years before in *On the Beach*.

Elsewhere in her book, Carson made an even more direct comparison between fallout and pesticides. Writing of a Swedish farmer who had died of pesticide poisoning and recalling the unfortunate radioman of the *Lucky Dragon*, she wrote, "Like Kuboyama, the farmer had been a healthy man, gleaning his living from the land as Kuboyama had taken his from the sea. For each man a poison drifting out of the sky carried a death sentence. For one, it was radiation-poisoned ash; for the other, chemical dust" (229-30). A few pages later, she wrote, "Certain chemicals, again reminding us of radiation products like Strontium 90, have a peculiar affinity for the bone marrow" (234). She also referred to the leukemia victims of the Hiroshima A-bomb to illustrate a similar hazard from pesticides (226). Other references to radiation are sprinkled throughout the book.

Lois and Louis Darling, *Silent Spring's* illustrators, also had ra-

diation in mind as they explored ideas for drawings. Their margin notes on a draft manuscript include a mushroom cloud sketch in one place and a note to illustrate the Swedish farmer—*Lucky Dragon* comparison in another (Rachel Carson Papers, “Typescript”). I have found no evidence that Rachel Carson directly suggested either of these possibilities to the Darlings. Although neither of these ideas found their way into the final book, they demonstrate the images the book brought to mind.

I am not suggesting that using fallout as an analogy for pesticides was a central part of the design of this very sophisticated book. As a thoughtful person who was aware of the issues of her time, however, it was impossible for Carson not to have been influenced by the decade of public discussion and debate. Both Carson and her editor, Paul Brooks, were well aware of the similarities between the effects of fallout and pesticides. And while, when interviewed nearly twenty-two years after publication of *Silent Spring*, Brooks did not recall that this was a major part of their conversation (Brooks, Personal interview), there is now evidence that he had suggested to Carson that she make the comparison.⁵ Carson and her book were products and representatives of their time, as well as shapers of it.

Fallout, one might say, was “in the air” and it is a tribute to Carson’s perceptive skill as an author that she was able to recognize and take advantage of the deep-seated cluster of social concerns surrounding it in the public’s mind. Not only did she tap into this anxiety and direct it toward pesticides, she also used the public’s existing understanding about the hazards of fallout to teach about the similar hazards of chemical poisons. Just as strontium 90 could travel great distances, enter the food chain, and accumulate in human tissue, so too could pesticides. Just as radioactive materials could produce chronic rather than acute poisoning, so too could pesticides. And just as exposure to radiation could produce cancer,

birth defects, and mutations, so might pesticides. The public already knew the basic concepts—all it needed was a little reminding.

A distinctive feature of the contemporary environmental movement is a profound and pervasive element of fear. It is a fear that, for good or ill, colors and sometimes distorts virtually every popular analysis of major environmental problems. This is not simply a fear that we will deplete a particular natural resource, lose pristine wilderness, or be poisoned. It is the belief that we may well be facing the “end of history,” that we as a species might be doomed. This anxiety burst to the surface with the destruction of Hiroshima and Nagasaki. It is rooted in the omnipresent threat of nuclear destruction.

The generation that promoted Earth Day 1970 grew up in the shadow of nuclear destruction. This threat became a tacit part of the way in which people understood their world. It is no surprise then, that the belief in the imminent end of the earth became integrated with more traditional conservation concerns. This younger generation did not create the anxiety, nor did its elder, Rachel Carson. She did, though, write one of the first and most eloquent books bridging the gap between the environmental movement and this new fearful vision of Armageddon.

Notes

I wish to thank Prof. Allan Krass, Hampshire College, for his helpful comments on a draft of this essay.

1. For the history of *Silent Spring* and the controversy surrounding it, see Linda Lear’s biography of Carson; as well as Brooks, *House*; and Graham. See also Ehrlich.

2. For an examination of the history of pesticides and their regulation in the United States, see also Dunlap; Rudd; and Graham.

3. This is not to say that this issue—radioactive fallout and nuclear waste—was never mentioned. A number of writers included them in their lists

of pollutants that were of public concern at the time. What I am proposing here is that the decade of public discussion and anxiety about these pollutants, particularly fallout, that preceded the publication of *Silent Spring* played a special role in preparing the public to accept Rachel Carson's message. It is this point that has largely been overlooked. Fleming has come closest to identifying this special relationship between fallout, pesticides, and the contemporary environmental movement: "Anybody who has been alarmed by atmospheric pollution from nuclear tests could see that [Carson] was talking about other dimensions of the same problem. She, for her part, invoked the menace of strontium 90 as an ominous backdrop to her indictment of DDT" (43). This special relationship, the educational impact of the fallout controversy, and the use of fallout as an analogy of pesticides are the foci of this essay. Dunlap provides the most extensive examination of the ways that bomb tests and fallout prepared the public to question the benefits of technology, including pesticides (74, 102-4, 187, see also Nash 252). Weart provides a detailed examination of the American cultural response to the phenomenon of radioactivity through the twentieth century.

4. The number of Sr-90 citations in the *New York Times Index* rose rapidly in 1957, peaked in 1959, and dropped sharply the next year, never to return to the 1957 level. This suggests that the Consumer's Union, St. Louis, and related studies came late and informed, rather than precipitated, the public discussion.

5. After the earlier version of this essay was first published, Linda Lear found a 29 March 1960 letter from Brooks to Carson in which he suggested that comparing radiation and chemicals would help awaken her readers to the dangers of pesticides (see Lear 374-75).

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