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Deserts Will Bloom: Atomic Agriculture And The Promise Of Radioactive Redemption

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DESERTS WILL BLOOM: ATOMIC AGRICULTURE AND THE PROMISE OF RADIOACTIVE REDEMPTION

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ABSTRACT

This paper examines the rhetorical and visual strategies used in marketing atomic agriculture to the American public from the 1940s to the 1960s. The term “atomic agriculture” refers to various agricultural research programs that used radioactive materials, particularly radioisotope tracing and mutation breeding. In print and on screen, atomic boosters from government and industry offered the promise of a better world made possible by applying atomic energy to agriculture. I argue that the proponents of atomic agriculture combined futurism and nostalgia to create a techno-pastoral vision. They hearkened back to the nineteenth century while simultaneously imagining a bright postwar future. Moreover, they drew upon longstanding literary and visual devices, from anthropomorphism to Edenic restoration narratives. At times, however, their optimism about atomic cultivation vied with fears about radioactive contamination of the food supply. This darker counter-narrative was not incidental either. As with other images of the so-called peaceful atom, promoters were addressing public anxiety and ambivalence about its uses. Admittedly, research programs did produce substantial results, including insights on photosynthesis and new crop varieties. Yet, the only atomic blooms in deserts came from mushroom clouds, and rather than creating fertile farmland, industrial giants contaminated arable land with radiation. The promise of atomic agriculture was one of radioactive redemption, but it advertised a utopian future that never arrived.

TABLE OF CONTENTS

INTRODUCTION

On March 31, 1954, Congressman Carl Hinshaw convened hearings before the Subcommittee on Research and Development of the Joint Committee on Atomic Energy. The subcommittee had gathered to hear testimony on agricultural applications for atomic science. Scientists from the Atomic Energy Commission (AEC), U.S. Department of Agriculture (USDA), and several land-grant universities reported on the use of atomic science in agricultural research. In his opening remarks, Hinshaw called these public hearings "a refreshing departure from the closed-door approach which we have had to take in so many atomic-energy matters."[1]

Over the course of two days, ten expert witnesses enthusiastically described the progress of research in several areas. Radioisotope tracing allowed scientists to track the movement of elements through crops and livestock, while mutation breeding allowed them to induce genetic mutations in plants, selecting desirable mutations for inclusion in new crop varieties.[2] Pilot programs both in pest control and food preservation used

[1] U.S. Congress, Joint Committee on Atomic Energy, Subcommittee on Research and Development, *The Contribution of Atomic Energy to Agriculture*, 83 Cong., 2 sess., March 31, 1954, 1.

[2] For the history of radioisotope tracing in the life sciences, see Angela N. H. Creager, *Life Atomic: A History of Radioisotopes in Science and Medicine* (Chicago: University of Chicago Press, 2013). For more on mutation breeding, see Helen Anne Curry, "Industrial Evolution: Mechanical and Biological Innovation at the General Electric Research Laboratory," *Technology and Culture* 54, no. 4 (2013): 746–81; "Radiation and Restoration; Or, How Best to Make a Blight-Resistant Chestnut Tree," *Environmental History* 19, no. 2 (April 2014): 217–38; "Atoms in Agriculture: A Study of Scientific Innovation Between Technological Systems," *Historical Studies in the Natural Sciences* 46, no. 2 (April 2016): 119–53. Curry has a forthcoming book on the history of mutation breeding, *Evolution Made to Order: Plant Breeding and Technological Innovation in Twentieth Century America* (Chicago: University of Chicago Press, 2016).

irradiation to eliminate unwanted organisms, either sterilizing agricultural pests or killing harmful microbes in food.[3]

AEC chairman Lewis Strauss attended the second day of hearings. Earlier that week, Strauss had claimed that thermonuclear weapons permitted "the enhancement of our military capability to the point where we should soon be more free to increase our emphasis on the peaceful uses of atomic power at home and abroad."[4] Despite the softened tone, however, Strauss was no less of a Cold Warrior. Within a month, he convened an entirely different set of hearings, closed to the public and decidedly inquisitional in tone. In April 1954, he spearheaded the high-profile security review of J. Robert Oppenheimer, scientific director of the Manhattan Project. The security review was a vindictive political persecution, and the AEC revoked his security clearance, exiling him from his privileged position in official research and policy circles.[5]

These two sets of hearings from the spring of 1954 highlight the stark contrast between fearsome and benevolent images of Cold War atomic science. In the United States, public ambivalence and anxiety accompanied the emergence of the postwar nuclear program. Americans lived with the ever-present threat of nuclear annihilation and mounting concerns about radioactive contamination from various sources. At the same time, proclamations about the so-called peaceful atom proliferated in print, on air, and on

[3] For more on pest control and food irradiation, see John H. Perkins, "Edward Fred Knipling's Sterile-Male Technique for Control of the Screwworm Fly," *Environmental Review* 2, no. 5 (1977): 19–37; James Spiller, "Radiant Cuisine: The Commercial Fate of Food Irradiation in the United States," *Technology and Culture* 45, no. 4 (October 2004): 740–63; Nicholas Buchanan, "The Atomic Meal: The Cold War and Irradiated Foods, 1945–1963," *History and Technology* 21, no. 2 (June 2005): 221–49.

[4] Joint Committee on Atomic Energy, *Contribution of Atomic Energy to Agriculture*, 1.

[5] For a detailed account of the Oppenheimer hearings, see chapters 34-37 of Kai Bird and Martin J. Sherwin, *American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer* (New York: A. A. Knopf, 2005).

screen. According to historian Paul Boyer, “These two responses that seem so contradictory—the terror of atomic war and the vision of an atomic Utopia—were in fact completely interwoven.”[6] He continued, “The aim was not primarily to publicize peacetime applications per se, but rather to create a more positive—or at least more acquiescent—overall public attitude toward atomic energy.”[7]

The image of the atom as an instrument for human progress served the interests of public and private stakeholders in the burgeoning nuclear industry, from the Atomic Energy Commission and Department of Defense to industrial giants such as General Electric, Westinghouse, and General Dynamics. They sought to encourage support of, or at least tacit consent to, the American nuclear enterprise. Communication scholar Bruce Lewenstein found that this ostensible goal of “improving the public’s *understanding* of the relationships between science and society” was actually about “improving the public’s *appreciation* of the benefits that society received from science.”[8] On topics ranging from medicine and agriculture to energy and industry, atomic enthusiasm took on an almost sacramental quality. It seemed to offer a kind of radioactive redemption that justified the manipulation of world-destroying power and that finally freed humans from material want. In the case of agriculture, historian Neil Oatsvall argued, “Perhaps even more important than its obvious purpose of improving farming, atomic agriculture functioned as a way to show how splitting the atom could do more than unleash death and

[6] Paul Boyer, *By the Bomb’s Early Light: American Thought and Culture at the Dawn of the Atomic Age* (Chapel Hill: University of North Carolina Press, 1985), 109.

[7] Ibid., 294.

[8] Bruce V. Lewenstein, “The Meaning of ‘Public Understanding of Science’ in the United States After World War II,” *Public Understanding of Science* 1, no. 1 (January 1992): 62.

destruction." He added, "Studying atomic agriculture also opens a window into the perceived place of agriculture in both the United States and the world at the time."[9]

Atomic boosters envisioned hybrids of technology and environment with the power to expand human capabilities and lessen dependence on non-human variables. They imagined novel forms of "artifactual nature" in which humans gained unprecedented power to transform landscapes and tailor organisms to their specifications.[10] The atom as agricultural marvel served a dual purpose in the public relations campaign for atomic energy. For pro-nuclear interests, farming was another occupation for the hardworking peaceful atom, but it was also a boon for corporations with a stake in industrial agriculture. Just like petroleum, pesticides, and other chemicals, radioactive materials served as tools for wresting increased productivity from finite resources.

This paper analyzes rhetorical and visual strategies used in promoting atomic agriculture. First, I will look at anthropomorphic representations of the atom and Edenic visions of environmental restoration. Second, I will consider the language of productivity used to promote the industrialization of natural processes and the framing of atomic agriculture as both a humanitarian and strategic enterprise. Third, I will highlight competing counter-narratives, including fears about fallout on farms and pseudoscientific claims by an eager entrepreneur. I argue that the marketing of atomic agriculture created a techno-pastoral vision in which existing agricultural practices would be enhanced by

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[9] Neil Oatsvall, "Atomic Agriculture: Policymaking, Food Production, and Nuclear Technologies in the United States, 1945-1960," *Agricultural History* 88, no. 3 (Summer 2014): 384–85. At the Trinity test, J. Robert Oppenheimer allegedly recalled a phrase from the *Bhagavad Gita*: "I am become death, the destroyer of worlds." See James A. Hijiya, "The 'Gita' of J. Robert Oppenheimer," *Proceedings of the American Philosophical Society* 144, no. 2 (2000): 123–67.

[10] The concept of "artifactual nature" comes from Donna Haraway, "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others," in *Cultural Studies*, ed. Lawrence Grossberg, Cary Nelson, and Paula A. Treichler (New York: Routledge, 1992), 295–337.

atomic energy. This vision foregrounded humanitarian appeals and assurances of social progress, but it ultimately served the interests of industrial capitalism. At the dawn of the Anthropocene, the agricultural-industrial complex identified atomic energy as a new way for humans to demand what they wanted from the planet and take it.[11]

[11] My understanding of industrial agriculture as a corporate-government-academic complex paralleling the military-industrial complex comes from Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore: Johns Hopkins University Press, 2000), 11. For more on the Anthropocene, see Jan Zalasiewicz et al., "When Did the Anthropocene Begin? A Mid-Twentieth Century Boundary Level Is Stratigraphically Optimal," *Quaternary International* 383 (October 5, 2015): 196–203; Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35, no. 2 (January 2009): 197–222; Lindsey A. Freeman, "Anthropocene, Capitalocene, Cthulucene, Atomicocene," *UNC Press Blog*, April 23, 2015, http://uncpressblog.com/2015/04/23/lindsey-a-freeman-anthropocene-capitalocene-cthulhucene-atomicocene/.

CHAPTER 1: THE ANTHROPOMORPHIC ATOM AND TECHNO-PASTORALISM

Promoters of the peaceful atom insisted that scientists had tamed a powerful force of nature and made it into a servant. The atom now served at the beck and call of the humans who had unraveled its mysteries. Anthropomorphized versions of the atom were particularly attractive for marketing efforts. Such representations extended to atomic agriculture and became an integral part of its image. In popular sources, the infinitesimal atom became an obedient genie, a benevolent giant, and a helpful private eye. This domesticated atom was small enough to investigate places humans could not go, yet powerful enough to reshape environments on a staggering scale. Atomic energy thus became embodied as an entity which preexisted humans, yet now existed for the purpose of serving them.

The Walt Disney Company did not develop nuclear technology, but among its corporate sponsors were industrial giants General Electric and General Dynamics. Also, ideologies of technological progress were a vital part of the postwar Disney message, a prime example being Tomorrowland. While Disneyland park visitors could enjoy the futuristic attraction in California, television viewers across the country could watch Tomorrowland-themed science fiction episodes on *Disneyland*. Debuting in 1954, the weekly anthology show originated through an arrangement with the ABC network.

Disney had agreed to produce a weekly show in exchange for funding construction at Disneyland.[12]

"Our Friend the Atom" was a Tomorrowland episode that first aired in 1957 and was later distributed as an educational film in schools.[13] While introducing the episode, Walt Disney explains, "We don't pretend to be scientists—we're story tellers. So, we combine the tools of our trade with the knowledge of experts." Disney then hands the program over to host Heinz Haber, Disney scientific consultant and former Nazi scientist. Haber had come to the United States with other German scientists after the war, courtesy of the U.S. government. He was a leading researcher in aerospace medicine, and he also became a well-known science presenter for popular audiences.[14]

Using live-action demonstrations and animated sequences, Haber gives a primer on atomic physics and a short history of atomic theory. Haber then explains the applications of atomic energy by using "The Fisherman and the Genie," a classic tale from *A Thousand and One Nights*, as an allegory for the atomic age. In this Disney retelling, a fisherman snares an oil lamp in his nets. As he examines his unexpected catch, he unwittingly releases a powerful genie trapped in the lamp. The genie intends to destroy him, but the fisherman tricks the genie back into the lamp. The genie gains his freedom only by offering to grant three wishes. At this point, Haber interprets his allegory for the audience. By splitting the atom, scientists have released a powerful genie

[12] J. P. Telotte, *The Mouse Machine: Disney and Technology* (Urbana: University of Illinois Press, 2008), 100–102; Scott Bukatman, "There's Always Tomorrowland: Disney and the Hypercinematic Experience," *October* 57 (1991): 58.

[13] Leonard Rifas, "Cartooning and Nuclear Power: From Industry Advertising to Activist Uprising and Beyond," *PS: Political Science and Politics* 40, no. 2 (2007): 256.

[14] "Our Friend the Atom," prod. Walt Disney, dir. Hamilton S. Luske (*Disneyland*, ex. prod. Walt Disney), Walt Disney Company (ABC, Jan. 23, 1957); "Professor Dr. Heinz Haber," *Der Spiegel*, Oct. 16, 1957.

from its confinement. Although the atom has the power to destroy, humans have established their mastery and forced it to grant three wishes. The first is for an inexhaustible power source, the second for food and health, and the third for the "atomic genie to remain ever our friend." As Haber speaks, an atomic genie emerges from a nuclear reactor. A combination of South and West Asian stereotypes, the bare-chested giant wears a Sikh turban and speaks in heavily-accented English.[15]

In explaining the wish for food and health, Haber describes the process of radioisotope tracing. The segment on agriculture begins in a corn field. As one of the corn stalks darkens into a black silhouette, the genie sprinkles the surrounding soil with radioisotopes. The radioisotopes, pictured as twinkling white dots, bear a striking resemblance to Tinker Bell's pixie dust, seen in the 1953 film *Peter Pan* and the title sequence of *Disneyland* episodes. The dots move up the stalk of the plant, and a clicking Geiger counter comes into view. Haber explains, "With radioactive chemicals, we can now literally watch how plants grow, and we can trace plant nourishments from soil to fruit. In this way, science will help to produce bigger and richer crops." The genie repeats the process with silhouetted cattle, sprinkling radioisotopes in their feeding trough, and Haber continues, "The best food can be found for better and healthier livestock."[16]

The atomic genie was certainly an appealing metaphor. The AEC included its own genie in *Atoms in Agriculture*, one of more than seventy educational booklets available from the AEC. In the booklet, Professor Thomas S. Osborne explained the various agricultural applications of atomic science. Osborne was the director of mutation

[15] "Our Friend the Atom."

[16] Ibid.

breeding research at the Oak Ridge Agricultural Research Laboratory, a joint venture between the University of Tennessee and Oak Ridge National Laboratory.

In the first section, on radioisotope tracing, Osborne told readers about fundamental questions that were perplexing agricultural scientists. For example, scientists wondered, “When does a mouthful of hay reach a cow’s stomach? How long until nutrients get into her blood? Her milk?” Osborne suggested a solution to the problem. What about “some kind of miniature genie” to make the trip through plants or animals? Once the genie reached a particular spot, it would announce its presence. Fortunately, Osborne told readers, the solution was already available: “Such a helpful genie exists as the radioactive atom: he is invisibly small, obedient, transportable, digestible, immune to fire, flood, or famine, [and] able to travel under his invisible cloak to the secret hiding places of Nature’s creatures.”[17]

In addition to being a genie, the atom had other anthropomorphic manifestations in popular media. In *A is for Atom*, a 1952 cartoon from the General Electric Company (GE), the atom is both a private detective and a glowing giant. GE was a major player in atomic technology and research. Perhaps its largest nuclear project was management of the Hanford Works, an AEC plutonium processing complex in Richland, Washington.[18] In the early 1950s, GE hired John Sutherland Productions, a leading producer of industrial films, to produce an atomic public relations film. Sutherland was a former Disney animator who started his own studio in 1945. His client list was a “who’s who” of

[17] Thomas S. Osborne, *Atoms in Agriculture: Applications of Nuclear Science to Agriculture*, Understanding the Atom (Oak Ridge, TN: U.S. Atomic Energy Commission, Division of Technical Information, 1963), 3.

[18] Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (New York: Oxford University Press, 2013), 127–29.

American corporations, including DuPont and American Telephone & Telegraph. The final product, *A is for Atom*, uses anthropomorphic atoms and electrical giants to explain the basics of atomic science and illustrate practical applications. GE distributed the film to schools, reaching an estimated two million students per year.[19]

A is for Atom explains the basics of atomic science before moving on to the illustration of practical applications. At this point, two tiny atomic detectives, in Sherlock Holmes attire, leave the laboratory in a van marked "Private 'I' Sotopes." One detective is a Geiger counter, while the other is a radioisotope. Their first stop is a university agricultural station. The isotope hops into a bag of fertilizer, and the bag empties onto a plot of corn. The isotope enters the roots and rides up the inside of the stalk. The Geiger counter, perched on a leaf, detects him as he passes. As in *Disneyland*, rather than searching for radioactive danger, the Geiger counter searches for the helpful radioisotope whose energy is an aid to humans, not a threat. In the closing segment of the film, glowing atomic giants represent the supersized potential of the infinitesimal atom. Supersized and muscle-bound, their shapes are outlined in a white electrical glow against a night sky. They demonstrate their various industrial and scientific capabilities, from the engineer to the farmer to the healer.[20]

Whereas anthropomorphic atoms scaled up the unfathomably miniscule atom, depictions of agricultural abundance and environmental restoration scaled down vast, abstract topics and brought them into view. They gave readers or viewers a snapshot of

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[19] Mack Arnold, "Animating Ideas: The John Sutherland Story," *Hogan's Alley*, May 14, 2012, http://cartoonician.com/animating-ideas-the-john-sutherland-story/; "The Painless Plug," *Time* 69, no. 18 (May 6, 1957): 106; Spencer R. Weart, *Nuclear Fear: A History of Images* (Cambridge: Harvard University Press, 1988), 169.

[20] *A is for Atom*, dir. Carl Urbano (General Electric Company, 1952).

atomic farmland, whether it was a pastoral landscape or a restored Eden. According to historian Carolyn Merchant, wasteland-to-farmland is a stock narrative in Western culture. Its roots lie in the Judeo-Christian story of the Garden of Eden. The account in Genesis ends with Adam and Eve expelled from paradise and sentenced to never-ending struggle with a hostile natural world. Merchant argues that modern variations, such as wilderness and frontier myths, are Edenic recovery narratives, envisioning mastery of nature and a return to paradise.[21] Moreover, she has observed, "The most recent chapter of the book of the recovery narrative is the transformation of nature through biotechnology."[22]

Journalist William L. Laurence drew explicitly on the Edenic metaphor in describing atomic agriculture. Laurence was a well-known science writer for *The New York Times* who garnered praise for explaining scientific concepts to a lay audience. He was the only journalist present at the Trinity atomic test in New Mexico in 1945, and he witnessed the bombing of Nagasaki from a military observation plane. His nickname at the time was "Atomic Bill," and Paul Boyer later deemed him "the Manhattan Project's public-relations man."[23] In 1949, Laurence used Edenic imagery to describe the atomic garden at Argonne National Laboratory outside Chicago. Laurence presented Argonne as a place where "every tree is at the same time a tree of knowledge and a tree of life." Researchers were investigating the complex chemical reactions involved in photosynthesis. They raised plants in a greenhouse environment filled with radioactive

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[21] Carolyn Merchant, "Reinventing Eden: Western Culture as a Recovery Narrative," in *Uncommon Ground: Rethinking the Human Place in Nature*, ed. William Cronon (New York: W. W. Norton & Company, 1996), 132–59.

[22] Ibid., 153.

[23] "William Laurence, Ex-Science Writer for the Times, Dies," *New York Times*, March 19, 1977; Boyer, *By the Bomb's Early Light*, 187.

carbon dioxide, tracking carbon-14 isotopes as plants absorbed the gas during photosynthesis. According to Laurence, these "radioactive fruits," forbidden to humans, would cast light on the secrets of nature.[24]

The Eden portrayed in Genesis was a place of abundance, but also of lurking danger. The consequence of the Fall was a human existence full of pain and toil. Thus, Laurence cast the atomic garden as a new Garden of Eden. Full of dangerous radiation, it was also teeming with knowledge. This time, it was trees of scientific knowledge rather than the Tree of the Knowledge of Good and Evil. For Adam and Eve, the fruits of superior knowledge brought destitution and bodily deterioration. In the atomic garden, they could lead to healing and rejuvenation. Almost a decade after his piece on Argonne, Laurence still deployed Edenic language. In 1957, he wrote, "The vast power of the atom can open to the use of man the wealth in the world's wastelands. It can literally stretch the surface of the earth by turning regions now forbidden to man into fit dwelling places for scores of millions now living and for generations yet unborn."[25]

An early visual example of atomic Eden is seen in a 1947 Seagram's whiskey advertisement. In the late 1940s, the Seagram Company ran a series of advertisements with the tagline "By Men Who Plan Beyond Tomorrow." The ads appeared in popular magazines such as *Life*, *Collier's*, and *The New Yorker*. Each one featured some kind of futuristic innovation, from mobile supermarkets and videophones to flying cars and passenger spaceships. Bright color illustrations depicted these technological advances, and the accompanying text described how they would provide convenience and comfort

[24] William L. Laurence, "Eerie Atomic Garden Grows Weapons to Battle Man's Ills," *New York Times*, December 15, 1949.

[25] William L. Laurence, "The Great Promise of the Atomic Age," *New York Times*, October 27, 1957.

to postwar Americans. Invariably, and unsurprisingly, each one also made some connection, no matter how tenuous, to Seagram's "V.O. Canadian" brand of whiskey.[26]

One ad from the series proclaims, "Deserts Will Bloom Through Atomic Power." The artist's rendering depicts a fertile farming landscape in the middle of high desert. Buttes loom in the background and cacti grow in the foreground. Orchards and fields surround a cluster of farm buildings and a grain silo. What explains the existence of fertile farmland in the middle of arid desert? As the text explains, "New 'BREAD BASKETS' of the world can grow where only sand and scrub had been. Harnessed atomic energy will transform deserts into rich fruit and grain country." The "harnessed atomic energy" is depicted as a giant dome with two protrusions that resemble vacuum tubes. It can "provide power to tap subterranean water for irrigation, power to run machines, to operate utilities."[27]

Of course, the Seagram's advertisement obscures more than it reveals. The dome appears to be responsible for terraforming vast stretches of arid desert, but it is a black box, hiding its technological secrets from the viewer. While the Seagram Company was interested in selling whiskey, not the atom, this depiction of blooming deserts is very similar to the agricultural restoration seen in GE's *A is for Atom*. As the atomic giants go to work at the end of the film, the farmer giant towers over a desert landscape. In the foreground, a half-buried cow skeleton reinforces the land's hostility to cultivation. Under the giant's gaze, however, the barren vista transforms into a verdant landscape, featuring a sleek Mid-Century Modern house. Yet, the fields are nondescript, leaving

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[26] Benjamin Sitton Flowers, *Skyscraper: The Politics and Power of Building New York City in the Twentieth Century* (Philadelphia: University of Pennsylvania Press, 2009), 95–96; Seagram Company, "Deserts Will Bloom Through Atomic Power," advertisement, *Life*, May 12, 1947.

[27] Seagram Company, "Deserts Will Bloom Through Atomic Power."

their use in question, and scattered hay bales are the only visual indication of agricultural activity.[28] How this desert has come to bloom is not indicated. Even though an earlier segment explained radioisotope tracing, the miraculous transformation remains largely a mystery.

Back in Tomorrowland, the Disney atomic genie does more than sprinkle radioisotopes on the farm. The segment ends with the genie towering over a pastoral landscape with his arms outstretched. Narrating this idyllic rural scene, Haber announces, "The atom creates more food for our ever-growing population." Despite the futurism of "Our Friend the Atom," this scene hearkens back to nineteenth-century agriculture. Rather than the modernist home seen in *A is for Atom*, quaint red barns and church steeples dot the rolling green hills. Instead of nondescript fields, a field full of wheat shocks is in the foreground. Their presence is a puzzling anachronism in fields of the future. Shocks, also called stooks, are conical arrangements of sheaves (bundles of cut wheat). In traditional wheat harvesting, farmers used shocks to protect wheat from moisture until threshing and winnowing. However, the widespread adoption of combine harvesters by American farmers made such methods highly inefficient by comparison.[29]

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[28] *A is for Atom*.

[29] "Our Friend the Atom"; Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), 101–103; 120.

CHAPTER 2: INDUSTRIALIZED NATURE AND NUCLEAR DIPLOMACY

Promoters of atomic agriculture portrayed it as a harnessing and improvement of basic life processes. As GE said in its 1948 comic book *Adventures Inside the Atom*, "Scientists have found the source of the sun's strange and wonderful energy locked in the heart of the atom."[30] With radioisotope tracing, scientists hoped to reveal unknown chemical processes essential to photosynthesis. In mutation breeding, they induced mutations rather than waiting for them to arise in existing crops. In her study of the industrialization of American agriculture, historian Deborah Fitzgerald observed, "The philosophy of production that so often accompanied farm mechanization tended to view nature itself as an obstacle."[31] Commentators often characterized nature as mysterious and perplexing but secretly wasteful and inefficient. In their view, humanity would become less dependent on the vagaries of nature as scientists unlocked the secrets of natural phenomena and liberated humans from dependency on natural processes.

Using radioactive tracers, scientists investigated the chemical reactions involved in photosynthesis. In 1948, AEC chairman David E. Lilienthal wrote, "In agriculture, the horizons of new knowledge are practically unlimited. No field of study holds more promise for man than the work under way with radioactive carbon to learn one of

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[30] General Electric Company, *Adventures Inside the Atom*, 1948.

[31] Fitzgerald, *Every Farm a Factory*, 104-105. For more on the pursuit of industrialized and standardized nature, see Philip Scranton and Susan R Schrepfer, *Industrializing Organisms: Introducing Evolutionary History* (New York: Routledge, 2004); Robert G. W. Kirk, "'Standardization through Mechanization': Germ-Free Life and the Engineering of the Ideal Laboratory Animal," *Technology and Culture* 53, no. 1 (2012): 61–93; Nancy Langston, *Forest Dreams, Forest Nightmares: The Paradox of Old Growth in the Inland West* (Seattle: University of Washington Press, 1995).

nature's basic secrets—photosynthesis."[32] During the 1954 subcommittee hearings, Congressman Hinshaw was intrigued to hear that "we could relieve thereby any prospect of suffering from lack of sufficient soil on which to grow things when the population of the earth gets very large."[33] Senator Clinton Anderson of New Mexico told American advertising executives, "Nature isn't always too smart," and made a point of calling photosynthesis "remarkably inefficient."[34] Even with all their technological advances, humans still relied on crops for survival. Thomas E. Stimson, Jr., a longtime *Popular Mechanics* editor, wrote, "Only when we have learned to duplicate the photosynthesis process will we cease being parasites that live on the plants of the world."[35]

Some observers imagined the manufacturing of food through artificial photosynthesis in factories, bypassing plants altogether. It would take so-called "factory farming" one step further by placing agricultural production entirely inside factories. Margaret O. Hyde, author of dozens of popular books on science and health, addressed the topic in her *Atoms Today and Tomorrow*. Hyde speculated, "Such an accomplishment might improve the standard of living more than any other that may result from the use of atomic energy."[36] Similarly, Martin Mann, a senior *Popular Science* editor, wrote *Peacetime Uses of Atomic Energy* to explain the peaceful atom to a juvenile audience. He told his young readers that food manufacturing would someday be possible anywhere,

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[32] David E. Lilienthal, "Atomic Energy Is Your Business," *New York Times*, January 11, 1948.

[33] Joint Committee on Atomic Energy, *Contribution of Atomic Energy to Agriculture*, 16–17.

[34] U.S. Congress, Senate, Committee on Foreign Relations, *Atoms for Peace Manual: A Compilation of Official Materials on International Cooperation for Peaceful Uses of Atomic Energy, December 1953-July 1955*, 84 Cong., 1 sess., June 20, 1955, 526; 528–30.

[35] Thomas E. Stimson, Jr, "More Food from Light," *Popular Mechanics*, October 1948.

[36] Margaret O. Hyde, *Atoms Today and Tomorrow* (New York: McGraw-Hill, 1955), 101.

even “on rocky islands and barren deserts.”[37] As historian Angela Creager has shown, radioisotope tracing did, in fact, lead to breakthroughs in photosynthesis research. However, utopian schemes for manufacturing food with artificial photosynthesis did not take shape. In fact, Creager noted, “Solving the puzzle of photosynthesis did more to illustrate the power of carbon-14 in research than to revolutionize agriculture.”[38] Later efforts to develop artificial photosynthesis were about energy generation and photochemical storage rather than food production.[39]

Mutation breeding allowed humans to accelerate evolutionary processes by inducing hundreds or thousands of mutations at a time. In congressional testimony, geneticist Ralph Singleton predicted that the “science of radiation genetics will soon become one of the most important events in the history of agriculture and may far outshine such historic events as the development of hybrid corn.” Singleton reminded his audience that plant breeders had always relied upon mutations, but previously, they were limited to natural mutations. He continued, “So you can see why I think we are on the verge of a new era in plant breeding through the use of radioisotopes and the radiation that has come about with the advent of atomic energy.”[40] In his book, Mann told young readers, “Instead of laboriously growing crop after crop and watching for the one-in-a-

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[37] Martin Mann, *Peacetime Uses of Atomic Energy* (New York: Thomas Y. Crowell, 1957), 79.

[38] Creager, *Life Atomic*, 237.

[39] Nathan S. Lewis, “Artificial Photosynthesis,” *American Scientist* 83, no. 6 (1995): 534–41.

[40] Joint Committee on Atomic Energy, *Contribution of Atomic Energy to Agriculture*, 43–44; 55. For more on Singleton’s atomic research, see Curry, “Radiation and Restoration; Or, How Best to Make a Blight-Resistant Chestnut Tree.”

million natural mutation, plant breeders can treat seed or a growing plant and be sure of bundles of mutations."[41]

Citing success with plant irradiation, optimistic observers ventured the possibility of mutation breeding in livestock. An enthusiastic Singleton asked, "Instead of putting corn pollen in the pile, why not put spermatozoa of cattle, sheep or swine in the pile?"[42] He postulated that breeders could use artificial insemination to introduce irradiated sperm, even breeding disease resistance into animals.[43] Equally enthusiastic, Mann said, "It is not fantasy to speculate on steers with bodies that are practically all beefsteak…We should be able to breed sheep, cows, and chickens that are specialized 'live machines' for efficiently producing fine wool, rich milk, and big eggs."[44] Atomic agriculture boosters pictured plants and animals as industrial machinery that could be tailor-made for any conceivable purpose. Much of this speculation only became viable with the development of recombinant DNA technology.

Yet, despite the enthusiastic speculation about agricultural abundance, the United States was not experiencing a domestic food crisis. In fact, farm surpluses posed a challenge for postwar farmers. In its 1948 report, the Panel on the Impact of the Peaceful Uses of Atomic Energy highlighted this very problem. The panel consisted of eight American corporate executives or academic administrators, most with science or engineering backgrounds. It issued its final report to the Joint Committee on Atomic Energy of the U.S. Congress, and the report was subsequently published in the *New York*

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[41] Mann, *Peacetime Uses of Atomic Energy*, 88.

[42] "Pile" is another term for nuclear reactor.

[43] Joint Committee on Atomic Energy, *Contribution of Atomic Energy to Agriculture*, 56.

[44] Mann, *Peacetime Uses of Atomic Energy*, 96–97; 143.

Times. The panel asked "that those charged with meeting the farm surplus problem take into consideration the fact that such atomic developments—as other major new farm techniques—will contribute materially to farm output."[45] Thus, the primary beneficiaries would not be consumers or farmers. Rather, they would be those who stood to profit from selling new seed varieties, enhanced fertilizers, and other products.[46] Moreover, radical realignments of the agricultural sector, such as those caused by photosynthesis factories, would benefit industrial interests who would build and likely operate them.

Clearly, corporate interests were underlying any humanitarian considerations, but so too were Cold War strategic implications. Agriculture could be a weapon in the ideological war with the Soviet Union. Officials saw atomic agriculture as an opportunity to serve American interests at home and abroad. American government and industry would feed the world through the wonders of the atom, rather than menacing the world with nuclear weapons. In its report, the Panel on the Impact of the Peaceful Uses of Atomic Energy stated, "Only in this way can the United States bring to bear atomic contributions to agriculture, so as to demonstrate our historic sense of international humanitarian leadership."[47] In this view, agricultural advances would benefit domestic farmers and consumers, but perhaps more importantly, they were exportable to the non-aligned nations of the developing world. As historian Jacob Hamblin observed, "Atomic energy was a symbol of American mastery of nature's terrible power, and it was a gift

[45] Panel on the Impact of the Peaceful Uses of Atomic Energy, "Text of the Conclusions and Recommendations for Peaceful Uses of Atomic Energy," *New York Times*, February 1, 1956.

[46] For an earlier example of power shifts resulting from agricultural innovations and proprietary knowledge, see Deborah Fitzgerald, "Farmers Deskilled: Hybrid Corn and Farmers' Work," *Technology and Culture* 34, no. 2 (April 1993): 324–43.

[47] Ibid.

that Americans promised to bestow upon the world."[48] This attitude is apparent in statements by AEC chairman Lewis Strauss and Senator Clinton Anderson, both prominent, pro-nuclear federal officials.

Lewis Strauss was the consummate Cold Warrior, viewing nuclear supremacy as the only guarantee of public safety. He believed a well-fed population would not fall for Soviet promises of prosperity and equality. A prime example comes from his public remarks at the 1957 World's Conservation Exposition and World Plowing Contests in Peebles, Ohio. That year was the first time the multinational event, begun in 1952, was hosted by the United States. Organizers had built a temporary airstrip to handle the influx of more than 100,000 visitors to the sparsely-populated area. Farmers from more than a dozen Western-aligned countries competed in various plowing matches in hopes of winning a prestigious Golden Plow award. Strauss attended the event to dedicate a "peace cairn." The cairn included stones from all the participating countries and a plow to crown the memorial. In his address, Strauss stressed the ability of agricultural abundance to "break the back of dictator governments." He continued, "Starvation, periodic or endemic, is the soil in which communism flourishes."[49]

Senator Clinton Anderson was another promoter of atomic agriculture. After serving as Secretary of Agriculture under President Truman, Anderson returned to Washington as a senator from New Mexico, a state with a vested interest in the nuclear

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[48] Jacob Darwin Hamblin, "Let There Be Light ... and Bread: The United Nations, the Developing World, and Atomic Energy's Green Revolution," *History & Technology* 25, no. 1 (March 2009): 26. See also, Jacqueline McGlade, "More a Plowshare than a Sword: The Legacy of US Cold War Agricultural Diplomacy," *Agricultural History* 83, no. 1 (January 2009): 79–102.

[49] William M. Blair, "Strauss Praises Atomic Crop Gain," *New York Times*, Sept. 20, 1957; Ohio Academy of Science, "Guide to Thirty-Eighth Annual Field Conference of the Section of Geology of the Ohio Academy of Science," April 27, 1963, p. 23, Geology Section Field Trip Guides, Knowledge Bank (The Ohio State University, Columbus), http://hdl.handle.net/1811/44984.

industry. Like Strauss, Anderson spoke of the peaceful atom as an invaluable weapon to "wage the peace" with the Soviet Union.[50] In 1955, Anderson appealed to the National Advertising Executives Association (NAEA). Speaking at the NAEA summer conference, he urged American advertisers to market the atomic age as the dawn of a new era of peace and abundance.

Anderson pitched the peaceful atom in the form of an imaginary medicine show. He began, "I wish it could now be possible for me to put on a medicine show, like the old vaudeville act with the barker selling his wares to the country people—except that my wares would be atomic wares." The choice of the medicine show motif is notable. It evokes the image of a charismatic and energetic peddler, but it also carries connotations of deception and gullibility. Speaking to professional advertisers, however, Anderson deployed it in a tongue-in-cheek manner. The senator began his pitch with an example from mutation breeding, saying, "Today, I would like to open my own medicine show by giving a flower to the first lady I see in the assembly." He proposed giving the imaginary audience member a red carnation and a white carnation from the same seed stock, products of the mutation breeding program at Brookhaven National Laboratory. He told listeners that irradiation made each and every seed a genetic wild card.[51]

Strangely, Anderson did not elaborate on benefits of mutation breeding. Rather, he talked about the genetic effects of radiation on humans. Mutations in irradiated seeds manifest as the plants grow. In a similar manner, according to Anderson, the full effects of nuclear testing would remain unknown until enough generations received fallout

[50] Senate Committee on Foreign Relations, *Atoms for Peace Manual*, 407.

[51] Ibid., 526. Similar imagery has appeared in recent discussions of the CRISPR tool. See the mention of the blue rose in Michael Specter, "Can CRISPR Avoid the Monsanto Problem?," *The New Yorker*, November 12, 2015.

exposure in varying amounts. Using a disturbing agricultural analogy, he said they would have to wait "until oncoming crops of children have been brought into the world and grown to manhood—producing their own progeny and finally being weighed and measured to see if there are variations and mutations."[52] Since the beginning of atmospheric nuclear testing in the late 1940s, Americans had worried about radioactive contaminants reaching North America.[53] Anderson's remarks are cryptic, to say the least. Pro-nuclear officials in this period certainly conspired to downplay the dangers of radiation, but these statements are more than that. Anderson also seems to hint at some sort of long-term Darwinian social experiment.[54]

Following his disconcerting prediction, Anderson enumerated the wonders of radioisotope tracing. After explaining its medical applications, he moved on to agricultural uses, such as research on photosynthesis and animal nutrition. He hinted at more possibilities for agriculture by saying, "Time will not permit the story to be told even partially." Higher crop yields raised the problem of storage and shipment. Forecasting a higher population through medical advances, he said, "If more people need more food and hence agriculture turns out a greater volume, then surely the food industry will need the benefit of atomic energy to supply the raw food to a bigger market." He told them about the grand expectations for food irradiation and the resulting consumer products, such as "tastier potato chips" and "more nourishing meat in cellophane wrappers that keep it fresh and safe in an unrefrigerated showcase of a village store for 30

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[52] Ibid.

[53] Boyer, *By the Bomb's Early Light*, 352–53.

[54] Ibid., 188; Jacob Darwin Hamblin, "'A Dispassionate and Objective Effort': Negotiating the First Study on the Biological Effects of Atomic Radiation," *Journal of the History of Biology* 40, no. 1 (April 2007): 147–77; Jacob Darwin Hamblin, "Fukushima and the Motifs of Nuclear History," *Environmental History* 17, no. 2 (April 2012): 287–89.

days." In his closing remarks, Anderson appealed to the patriotism of advertisers. He implored them to advertise the wonders of the atom and help combat the "Moscow propaganda mill."[55]

Ever the Cold Warrior, Strauss had used the symbolism of the agricultural competition to claim the moral high ground for NATO members and other Western-aligned nations. In addition to talk of civic responsibility, Anderson bolstered his case by appealing to the corporate interests of advertising executives. Government-sponsored research would make new consumer products possible. The patriotic duty of selling the peaceful atom would be a prelude to selling "atomic wares" for their companies or clients.

[55] Senate Committee on Foreign Relations, *Atoms for Peace Manual*, 528–30.

CHAPTER 3: HOMEGROWN HAZARDS

Despite the assurances of Senator Anderson, the AEC, and industrial contractors, visions of atomic cultivation coexisted with public anxiety about radioactive contamination, including the vulnerability of the food supply. In case of nuclear attack, fallout from affected areas could spread and contaminate farms and ranches. More immediately, weapons testing and nuclear facilities seemed to pose an ongoing threat to public and environmental health, including crops and livestock.[56] Thus, hopes for atomic cultivation vied with contemporaneous fears about radioactive contamination of the very plants, animals, and agricultural landscapes that were supposed to benefit from the atom, not to mention the people who would consume those products. Explanations of atomic applications for agriculture often favored obfuscation over clarity or worked within a framework of acceptable risk. According to Hamblin, the language of risk was a way to "relocate decision-making power from the individual to a government without explicitly sounding like disempowerment."[57] Two educational films from the 1950s, *The Atomic Zoo* and *Atomic Energy Can Be a Blessing*, highlight this darker counter-narrative for the atom and agriculture.

The Atomic Zoo was a 1954 title from *The Magic of the Atom* series by the Handel Film Corporation. Producer Leo A. Handel specialized in academic films, releasing about

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[56] For more on civil defense and farming families, see Jenny Barker-Devine, "'Mightier than Missiles': The Rhetoric of Civil Defense for Rural American Families, 1950-1970," *Agricultural History* 80, no. 4 (October 2006): 415–35.

[57] Hamblin, "Fukushima and the Motifs of Nuclear History," 287–89.

150 in his career.[58] *The Atomic Zoo* features radioisotope tracing in animals, but for two very different purposes. The film juxtaposes footage of physiological research on animals with footage of radiation exposure testing on animals. In the opening sequence of *The Atomic Zoo*, the narrator begins, "This time, atomic energy has found its way into the animal kingdom. Here, it helps answer important questions relating to our daily living." He continues, "How does food, containing radioactive materials, affect animals? What effect, if any, has an atomic processing plant on the vegetation and livestock in its area?" The film then shows footage of radioisotope tracing in sheep, hens, and fish. The segment with hens depicts research at the Oak Ridge Agricultural Research Laboratory. This use of radioisotopes was the type of research heralded as the key to agricultural breakthroughs.[59]

The segments on sheep and fish, however, show a different use for radioisotope tracing. The research on sheep and fish took place at the Hanford Works. These researchers were not trying to develop better animal feed or breed better livestock. Rather, they were investigating the impact of radioactive particles on nearby plants and animals. The contaminants came from cooling stack emissions and recycled water from the reactors.[60]

In the segment on sheep, researchers distribute food pellets with varying amounts of radioactive iodine. They take blood from the animals and measure the level of radioactive iodine in the thyroid glands. The narrator confidently claims, "Results to date: certain knowledge that we are not harming the animals foraging near atomic

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[58] Geoff Alexander, *Academic Films for the Classroom: A History* (Jefferson, NC: McFarland, 2010), 102.

[59] *The Magic of the Atom: The Atomic Zoo* (Handel Film Corporation, 1954).

[60] Ibid.

installations." Researchers conducted similar tests on fish from the Columbia River. The plant pumped cooling water from the reactor to a settling tank to allow most of the radioactive particles to dissipate. After that, the plant returned the water to the river. The narrator, lacking definitive results, nonetheless reassures, "From this and many more tests, the effect of radioactive materials upon fish and aquatic plant life will be determined for the benefit of all mankind, through the magic of the atom."[61]

However, the lab tests turned out to be misleading. Food pellets seen in the film did not cause major concentration of radioisotopes in test subjects, but those pellets did not simulate field conditions. Organisms elsewhere in the food chain, particularly algae, absorbed and concentrated radioactive elements which were then passed on to fish, sheep, and other animals.[62] This chain of contamination was part of a larger history of environmental devastation at the Hanford Works. In her social and environmental history of Hanford, historian Kate Brown revealed the "slow-motion disaster" that left one of the Cold War's worst toxic legacies. Brown found that plant personnel "polluted the surrounding landscape freely, liberally, and disastrously," and after several decades of operation, Hanford left "hundreds of square miles of uninhabitable territory, contaminated rivers, soiled fields and forests, and thousands of people claiming to be sick."[63] Despite the image of corporate stewardship seen in *A is for Atom*, General Electric bears much of the responsibility for this environmental disaster.

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[61] Ibid.

[62] Creager, *Life Atomic*, chap. 10.

[63] Ibid.; Brown, *Plutopia*, 3; Andrew Jenks, "Model City USA: The Environmental Cost of Victory in World War II and the Cold War," *Environmental History* 12, no. 3 (July 2007): 552–77.

The Atomic Zoo combines original narration with stock footage from the AEC.[64] *Atomic Energy Can Be a Blessing*, a 1953 educational film, also uses stock footage to illustrate applications of atomic energy. The film was a production by The Christophers, a ministry founded by Father James Keller, a Catholic priest in Ohio.[65] However, *Atomic Energy Can Be a Blessing* highlights a problem in stock footage distribution. Once the AEC provided film to producers, it lost interpretive control and left open the possibility of factual error. In the case of the The Christophers, such error conflated the positive and negative aspects of atomic energy and agriculture.

The film opens with Keller seated next to co-host Fred MacMurray, a noted Hollywood actor. MacMurray professes his own ignorance of atomic science and says he previously associated it only with bombs. Presumably, the audience shared similar preconceptions and could identify with MacMurray. Because of that very problem, Keller says that an AEC official asked him to do a program on atomic science. Keller characterizes atomic energy as a divine blessing, saying, “God has put this enormous power in our hands—to be our servant, not our master.” On the subject of agriculture, Keller happily concludes, “More food for a starving world. A blessing indeed.”[66] The studio scenes with Keller and MacMurray alternate with stock footage narrated by Hal Gibney, another guest from Hollywood. Gibney was the narrator for *Dragnet*, a popular television police procedural.

[64] U.S. Atomic Energy Commission, *16mm Film Catalog: Popular Level, 1966-1967* (Oak Ridge, TN: U.S. Atomic Energy Commission, Division of Technical Information, 1967), ii; xviii.

[65] Christopher is the anglicized form of the Greek *Christoforos*, or Christ-bearer.

[66] *Atomic Energy Can Be a Blessing* (The Christophers, 1953).

During shots of the atomic garden at Brookhaven and the atomic greenhouse at Argonne, Gibney says, "Here is a scientist who is, for all intents and purposes, a farmer." The Brookhaven garden was a circular test field with a mechanism in the middle for raising and lowering an irradiation source. In the Argonne greenhouse, researchers used carbon dioxide tagged with carbon-14 to follow the movement of carbon through test plants.[67] Later in the film, footage shows scientists working with hens, sheep, and cattle. Gibney remarks, "Here we see atomic scientists who might even be called cowboys." However, in this attempt to exhibit atomic applications for agriculture, the film misidentifies some of its stock footage. While showing animal testing at the Hanford Works, Gibney cheerfully announces that researchers are trying to "build better lamb chops and mutton for the future."[68] The error turns radiation exposure testing from Hanford, a potential source of unease, into development of better livestock, a reason for atomic optimism.

Film misidentification by The Christophers was unfortunate but appear to be unintentional. That was not the case with misrepresentations by a small mail order company from Tennessee. While Senator Anderson had merely imagined a medicine show, entrepreneur Clarence J. Speas created one. Speas was the founder of Oak Ridge Atom Industries, a company that hawked irradiated seeds and plants. The company name encouraged people to associate it with nearby Oak Ridge National Laboratory. Speas was ambitious, placing advertisements in major national newspapers. These advertisements

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[67] Laurence, "Eerie Atomic Garden Grows Weapons to Battle Man's Ills."

[68] Ibid.

always referred to him as "Dr. Clarence Speas."[69] Presumably, like the company name, his title was an attempt to bolster the scientific credibility of his business. However, Speas did not hold a research degree in any field of science or engineering. In fact, he was a dentist from Burlington, Vermont. In the 1940s, the University of Vermont listed him as "Instructor in Oral Hygiene and Dental Medicine." After moving to eastern Tennessee, Speas had obtained an AEC cobalt-60 license to begin his irradiation operation.[70]

In his marketing, Speas often made ludicrous claims. For example, advertisements promised, "Each variety has its own special irradiation level."[71] Was Speas referring to the duration of exposure, the distance from the cobalt-60, or something else? For potential customers, at least, it suggested that Speas could tailor irradiation to achieve desired results on a commercial scale. This image was not anywhere close to the trial-and-error reality of mutation breeding or its time scale.

Speas was particularly bold in his advertisements that declared, "*These rays excite and invigorate* the living cells of the dormant seeds."[72] This claim hearkened back to the "First Atomic Age," what historian Matthew Lavine calls the period between the discovery of radiation and the 1945 atomic bombings. Lavine argues that American atomic culture originated in this period, rather than emerging *ex nihilo* after Hiroshima and Nagasaki. In these early decades, many people thought radiation might have

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[69] See, for example, Stern's Department Store, "Experiment with Atom-Energized Plants! Be an Atomic Gardener…Join Science Pioneers," advertisement, *New York Times*, Feb. 19, 1961.

[70] Ibid.; University of Vermont, "Officers of Instruction," *Bulletin of the University of Vermont and State Agricultural College* 40, no. 3 (March 1943): 20.

[71] John Surrey Ltd., "Atomic Energized Seeds Can Develop an Amazing Garden for You," advertisement, *New York Times*, May 9, 1964.

[72] John Surrey Ltd., "Atomic Energized Seeds Can Develop an Amazing Garden for You."

energizing and reinvigorating properties. Yet, even in the heyday of such enthusiasm, the American public was still ambivalent about radiation. Furthermore, scientists debunked the rejuvenation idea long before Speas claimed he could excite and invigorate cells.[73] In the case of mutation breeding, however, the targets of radiation were plants, not people. Perhaps, Speas hoped customers would conflate the creation of desirable mutations with the "invigoration of living cells."[74]

With his grandiose claims, Speas painted an even rosier picture than the AEC or corporate partners.[75] However, he was not without his critics. Renowned horticulturist R. Milton Carleton used his nationally syndicated gardening column to address Speas's claims. Carleton was a trusted expert voice for gardeners nationwide. He cautioned readers:

> Everyone has read about the frightening effects of atomic energy on humans. The same effects occur in plants and animals. Only rarely is a mutation of any value, say once in a million times. Even then, considerable knowledge and skill are required to detect such mutations. To expect an untrained home gardener to discover something worthwhile is like expecting to win the Irish Sweepstakes 10 times in a year.[76]

While Speas may seem like a curiosity, on the fringe of atomic marketing, the spirit of his claims was not all that different from advertising by industry and media giants. He too claimed to seize a greater share of what Nature was withholding. While his explanations obscured more than they clarified, so did the boosterism of Disney, GE, and others.

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[73] Matthew Lavine, *The First Atomic Age: Scientists, Radiations, and the American Public, 1895-1945* (New York: Palgrave Macmillan, 2013).

[74] For more on amateur atomic enthusiasm, see Paige Johnson, "Safeguarding the Atom: The Nuclear Enthusiasm of Muriel Howorth," *British Journal for the History of Science* 45, no. Special Issue 04 (2012): 551–71.

[75] "Atoms Give Zip to Seeds," *Milwaukee Sentinel*, April 28, 1961.

[76] R. Milton Carleton, "Don't Look for Miracles in Atomic-Treated Seeds," *Sunday Herald (Bridgeport, CT)*, April 15, 1962; "Rites For R. Milton Carleton, Horticulturalist," *Chicago Tribune*, September 5, 1986.

Moreover, he connected the promises of the atomic Eden to the day-to-day lives of consumers. For an urbanizing and suburbanizing population that had less and less contact with farming, atomic-energized gardening seemed to offer a concrete way to grasp the fruits of atomic bounty.

CONCLUSION

In the United States, public discourse about atomic agriculture, and the peaceful atom in general, had reached a peak by the late 1960s. Anti-nuclear sentiment and environmental activism were gaining momentum. Bruce Lewenstein observed, "A new era for popular science began in the early 1960s, when criticism began to appear of the unbridled enthusiasm for science that had reigned in the United States for the previous 20 years or so."[77] Even David Lilienthal had to admit that the heyday of the peaceful atomic vision had passed. He explained the disappointing reality by saying, "The peaceful atom has not ushered in a 'new world' but has rather become a part, a minor part, of the old one."[78]

The extraordinary had become ordinary, and remaining research continued without fanfare or spotlight. The feasibility of different schemes varied widely. Certain research programs yielded significant results. Radioisotope tracing aided in discoveries about plant and animal physiology, especially photosynthesis. New crop varieties were developed and introduced for domestic and international use. The USDA succeeded in eradicating the screwworm fly.[79] In contrast, projects like nuclear-powered terraforming and factory-based photosynthesis remained speculative. In monetary terms, the peaceful

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[77] Lewenstein, "The Meaning of 'Public Understanding of Science' in the United States After World War II," 62.

[78] David E. Lilienthal, *Change, Hope and the Bomb* (Princeton: Princeton University Press, 1963), 117–18.

[79] Creager, *Life Atomic*, chap. 7; Hamblin, "Let There Be Light ... and Bread"; Perkins, "Edward Fred Knipling's Sterile-Male Technique for Control of the Screwworm Fly."

atom was always a minor part of the atomic enterprise. Historian Spencer Weart found that funding for peaceful uses accounted for less than ten percent of AEC expenditures. Moreover, money for life science research, which would include agriculture, was only a small part of that amount.[80]

The unrealized dream of atomic agriculture sheds light on the political uses and cultural perceptions of agriculture in postwar America. Faced with the unfathomably small and large, promoters were creative in their representations. Atoms became embodied as anthropomorphic characters, while idyllic, even anachronistic, landscapes painted a picture of environmental restoration. Radioactive nature was the imagined staging ground for new kinds of organic factories that would meld the biological and the industrial, whether hyper-productive fields or farms inside factories. These programs held the promise of humanitarian aid on a global scale, while also providing a weapon in the ideological war with the Soviets. However, as Senator Anderson told advertisers, releasing the energy from atomic particles was ultimately a way of creating and dominating market opportunities.

Atomic agriculture was yet another arena in which the peaceful atom failed to be a panacea. Atomic energy certainly transformed landscapes, but not in the ways promised by boosters. The only atomic blooms in deserts came from mushroom clouds. Nuclear processing plants, especially the Hanford Works, caused environmental devastation on a staggering scale. Instead of creating fertile farmland, the industrial giant contaminated existing arable land. The promise of atomic agriculture was one of radioactive redemption, but it advertised an Edenic future that never arrived.

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[80] Weart, *Nuclear Fear*, 172.

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