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Atomic Cows: The Alamogordo Herd at Oak Ridge, Tennessee, 1945-1965

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I am submitting herewith a thesis written by Annamaria Haden entitled "Atomic Cows: The Alamogordo Herd at Oak Ridge, Tennessee, 1945-1965." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in History.

Tore Olsson, Major Professor

We have read this thesis and recommend its acceptance:

Robert Bland, Victor Petrov

Accepted for the Council:

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Atomic Cows: The Alamogordo Herd at Oak Ridge, Tennessee, 1945-1965

A Thesis Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Annamaria Felicia Haden

December 2023

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Abstract

This thesis examines the place of cows and agriculture in nuclear fallout research at Oak Ridge, Tennessee. The 1945 Trinity atomic bomb test exposed a herd of grazing Hereford cattle in Alamogordo, New Mexico, to radioactive fallout. The U.S. Army shipped this herd to Oak Ridge which led to the establishment of the University of Tennessee-Atomic Energy Commission Agricultural Research Laboratory (UT-AEC). The UT-AEC laboratory studied the Alamogordo herd until 1964 to understand the long-term effects of radiation. Close research and media following of the Alamogordo herd directly informed humans' attempts to dominate nuclear power by controlling nature. Scientists and nationwide media outlets celebrated the Alamogordo herd as proof of the animals' health and reproductive success after radiation exposure, aligning with broader efforts to ease atomic anxieties. However, as this thesis demonstrates, nature fights back because the Alamogordo herd thwarted these human narratives of control. Ultimately, my thesis engages with scholarship on agricultural, Cold War, and nuclear energy history. My research examines the changes in postwar America, such as rising atomic anxieties, vulnerabilities to industrial agriculture, "Atoms for Peace" movements, and civil defense efforts.

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Introduction

Twentieth-century Americans were obsessed with wielding control over the non-human world. In their eyes, control insinuated a sense of domination and mastery over the unpredictable and anxiety-producing consequences of both the natural world and human-caused disasters. Nowhere was this more prevalent than with nuclear technology. In 1945 Americans tested the first atomic bomb, which ushered in a rush of worry and uncertainty. It also ushered in a frantic search for control in the Cold War context of vulnerability and secrecy. The radiation exposure at the Trinity test site impacted all elements of life in the surrounding environment and aligned with this narrative of the American obsession with control.

A group of grazing Hereford cattle about thirty miles from the Trinity explosion site were the first immediate victims of the first atomic bomb test in July 1945. The Alamogordo herd brushed with history as they were the first examples to Americans that radioactive fallout could occur. This large group of cattle suffered from physically evident beta burns - caused by beta radiation - on the surface of their coats. Beta particles move rapidly through the air and deeply penetrate skin and tissue.¹ The U.S. Army purchased what became known as the Alamogordo herd and sent much of this herd to Oak Ridge, Tennessee. A “secret city” of the Manhattan Project and later central to nuclear research with the Atomic Energy Commission (AEC), Oak Ridge housed the Alamogordo herd for over twenty years to study the consequences of radiation on the herd’s general wellness and reproductive health. The herd’s accidental brush with the atomic era gave birth to a leading laboratory at Oak Ridge in 1948 named the University of Tennessee-Atomic Energy Commission Agricultural Research Laboratory (UT-AEC).

¹ Edward R. Ricciuti, “Animals in Atomic Research,” U.S. Atomic Energy Commission: Division of Technical Information, 1967, 12.

This thesis will argue that researchers at the UT-AEC laboratory projected a false sense of control and transparency regarding the herd's health as media coverage dramatized the herd's lives at Oak Ridge as proof that nuclear exposure was rarely dangerous. The laboratory even conducted stimulated fallout research with numerous other animals to prove that atomic research could have productive and "peaceful" uses. This research on the Alamogordo herd reassured the public that the nation had a firm and responsible hold on the consequences of radioactivity and reassured farmers that their livestock would be safe even if nuclear exposure occurred.

The story of the Alamogordo herd therefore sheds light on larger dilemmas of atomic anxiety in the Cold War era, the rise of civil defense, the "Atoms for Peace" campaign, and the vulnerabilities of industrial agriculture in the twentieth century. All of these elements speak to the American obsession with control over the non-human world which included the atom, radiation, the environment, and animals. Researchers of the Alamogordo herd masked the negative consequences the cows endured from nuclear fallout, such as the development of cancer and delayed wound healing, because it thwarted American narratives of control. "Atoms for Peace" campaigns cultivated a sense of control and confidence while at the same time justifying the continued use of atomic research for ulterior motives and political agendas. As Jacob Hamblin explains in his work about the global consequences of the nuclear age, "with the atom, nature's constraints could be overcome; nature's pulse could be quickened; nature's scourges could be outrun."² As my thesis will demonstrate for the Alamogordo herd, such control of nature never occurred and "peaceful" atomic research was never entirely peaceful or without victims. As a result, media outlets and Oak Ridge researchers worked to manipulate information

² Jacob Darwin Hamblin, *The Wretched Atom: America's Global Gamble with Peaceful Nuclear Technology* (New York: Oxford University Press, 2021), 7.

to advance this narrative of control and mastery over nuclear power and its consequences, in order to avoid any public panic about atomic age anxieties.

Despite American fantasies of control over the non-human world in all elements of American Cold War society, the natural world and animals often thwarted these narratives of human control. Americans attempted to dominate and mechanize animals with scientific expertise, genetics and breeding “improvements,” disease control, and veterinary health tests. However, diseases still spread and undesirable developments still occurred in animals’ bodies. Americans could not fully dominate animals and their bodies. This stark prevention of control caused significant human unease.

Similar to most dichotomies, “peaceful” and violent are not as distinct as humans may desire. Arguing that all “Atoms for Peace” research encompassed “peaceful” uses of the atom completely erased the suffering endured by animals in nuclear research experiments. The case with the Alamogordo herd is unique because they existed within both dichotomies of “peaceful” and violent atomic work, war and peace. The reason for their exposure was the Trinity test which three weeks later resulted in the deadly dropping of two atomic bombs on Japan. However, once researchers labeled the cows as radioactive, they used the herd to demonstrate “peaceful” uses of atomic work as they closely monitored the general health of the herd and enacted successful reproductive programs.

Scientists, bureaucrats, and the press celebrated the Alamogordo herd as examples of the benign nature of radiation. Such reassurance was embraced by many Americans, ranging from citizens concerned about nuclear attacks, farmers worried about supply chain disruptions and livestock health, and policymakers concerned about continuing atomic and nuclear research

despite antinuclear sentiments. This thesis will demonstrate how a specific group of cattle were central to this complex Cold War history and narratives of control.

In her foundational work, *Silent Spring*, Rachel Carson claimed that “nature fights back.”³ Likewise, the Alamogordo herd were not mere pawns in a game of human mastery. Despite the close scrutiny of their bodies and manipulation of information to ensure that the laboratory had the radioactive cows under control to prove radiation was not so dangerous, the herd still disrupted these fantasies control. Environmental historians, especially working within the subfield of animal studies, increasingly advocate for understanding the central role of non-human beings in human history.⁴ Like these scholars, I aim to reconfigure non-human beings as active participants in human history, not just passive objects used as machines or scientific material. Joshua Specht, who has contributed to scholarship on cattle, ranching, meatpacking, and the beef industry, stated that “Cattle are not sacks of flour.” Instead, his work configures them as “living, breathing, and misbehaving animals.”⁵ I aim for my work to contribute to this animal history through demonstrating how the Alamogordo herd thwarted human narratives of control and still captured the public and researchers’ attention when doing so.

Two core chapters constitute this thesis. The first, relying upon secondary literature, will explore visions of control during America’s entrance into the atomic age. Secrecy, civil defense, and “Atoms for Peace” were central elements of Cold War narratives of control. Additionally,

³ Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962), 245.

⁴ Albert G. Way, William Thomas Okie, Reinaldo Funes-Monzote, Susan Nance, Gabriel N. Rosenberg, Joshua Specht, and Sandra Swart, “Roundtable: Animal History in a Time of Crisis,” *Agricultural History* 94, no. 3 (2020), 455.

⁵ Joshua Specht, *Red Meat Republic: A Hoof-to-Table History of How Beef Changed America* (Princeton, NJ: Princeton University Press, 2019), 17; Way, et. al., “Roundtable: Animal History in a Time of Crisis,” 446.

Chapter One will analyze narratives of control in mid-twentieth century agriculture. Cold War agriculture aligned with atomic anxieties because of food supply chain vulnerability. Industrial agricultural systems also functioned as justification for civil defense and “Atoms for Peace.” These campaigns presented farmers as central to national defense, and “peaceful” atomic research for agriculture justified the continuation of nuclear development. However, just as the Alamogordo herd demonstrates, the history of industrial agriculture reveals numerous dangerous consequences of human tampering through science and technology, and another example of Americans’ inability to fully conquer the non-human world.

Chapter Two will zoom in upon the Alamogordo herd to illuminate their national fame and active disruption of human ideals of control. As the radioactive cattle endured significant negative consequences from nuclear fallout exposure, researchers and media outlets misconstrued this suffering to assure Americans nationwide that nuclear fallout was not dangerous. Such ambiguous coverage of the herd directly informs the American struggle to dominate the non-human world.

“The ‘control of nature’ is a phrase conceived in arrogance,” wrote Rachel Carson presciently in 1962.⁶ Cold War Americans frequently struggled to face the limitations of human superiority. The inability to control the non-human world caused significant discomfort to Americans. As Roger Horowitz explains in his work on American meat consumption, “we can’t succeed in completely controlling nature, and those who live by denying nature’s power are loath to concede their weakness.”⁷ Humans frequently coped with this inability of control through

⁶ Carson, *Silent Spring*, 297.

⁷ Roger Horowitz, *Putting Meat on the American Table: Taste, Technology, Transformation* (Baltimore: Johns Hopkins University Press, 2006), 154.

avoidance or ignorance. William Cronon's foundational work on the idea of wilderness demonstrates that humans frequently favor ideals of wilderness because it encompasses a space to escape. Frequently, detachment from the limitations of human superiority over the non-human world can provide humans a sense of power and ease despite living in environments that refuse to entirely subdue to human control. An ideal seemingly "untouched" wilderness outside of urban spaces can also offer a comforting level of escape and detachment from human-caused disasters.⁸ Cronon states that conceptions of wilderness as a pristine space outside of the vices of society is a way for humans to pretend "that our *real* home is in the wilderness, to just that extent we give ourselves permission to evade responsibility for the lives we actually lead."⁹ Cronon continues that "by imagining that our true home is in the wilderness, we forgive ourselves the homes we actually inhabit."¹⁰ My thesis aligns with a similar concept of ease through the manipulation of information from researchers, media coverage, and government officials to downplay the dangers of radiation.

Rachel Carson wrote in the early 1960s that "to have risked so much in our efforts to mold nature to our satisfaction and yet to have failed in achieving our goal would indeed be the final irony. Yet this, it seems, is our situation. The truth, seldom mentioned but there for anyone to see, is that nature is not so easily molded."¹¹ I aim for this thesis to illuminate this truth.

⁸ William Cronon, "The Trouble with Wilderness: Or, Getting Back to the Wrong Nature." *Environmental History* 1, no. 1 (1996), 7

⁹ Cronon, "The Trouble with Wilderness," 17.

¹⁰ Cronon, "The Trouble with Wilderness," 17.

¹¹ Carson, *Silent Spring*, 245.

Chapter I

Nature Fights Back

America's entrance into the atomic age was marked by anxiety and desires for both control and secrecy. The "Atoms for Peace" campaign and Federal Civil Defense Administration (FCDA) directly informed the American struggle for control. Secrecy and the manipulation of information also functioned as a way to ease atomic anxieties and safeguard a sense of mastery over the non-human world. Furthermore, the twentieth-century context of industrial agriculture closely aligned with "Atoms for Peace" and civil defense efforts. Numerous groups in Cold War America reacted to changes from the atomic age, ranging from civilian participation in civil defense, the shifting role of scientists and farmers, and the manipulation of information from journalists and government officials to censor radiation dangers. As this chapter will demonstrate, the Cold War context of agriculture, civil defense, and the justification of atomic research for "peaceful" purposes reveals the limitations of human mastery over the non-human world when nature fights back.

There is a deep historiography on civilian concerns in the atomic age. Some studies approach the question through the lens of environmental and agricultural history.¹² Other foundational contributions to scholarship cover the cultural narrative of fear in the atomic age.¹³

¹² Neil Oatsvall, "Atomic Agriculture: Policymaking, Food Production, and Nuclear Technologies in the United States, 1945–1960," *Agricultural History* 88, no. 3 (2014): 368–87; Neil Oatsvall, *Atomic Environments: Nuclear Technologies, the Natural World, and Policymaking, 1945-1960* (Tuscaloosa: University of Alabama Press, 2023); Helen Anne Curry, *Evolution Made to Order: Plant Breeding and Technological Innovation in Twentieth-Century America* (Chicago: University of Chicago Press, 2016); Helen Curry, "Radiation and Restoration; or, How Best to Make a Blight-Resistant Chestnut Tree," *Environmental History* 19, no. 2 (2014): 217–238.

¹³ Paul S. 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, 1994); Allan M. Winkler, *Life Under a Cloud: American Anxiety About the Atom* (New York: Oxford University Press, 1993); Nathan Hodge and

The secrecy of nuclear research and the dangers of radiation are also prevalent within this large field of nuclear history.¹⁴ Lastly, another body of atomic history scholarship focuses on atomic cities and the centrality of national laboratories.¹⁵ My work will contribute to these historiographies by analyzing how humans attempted to dominate the atom by controlling animals, specifically the Alamogordo herd, to ease public concern by dominating the natural world and organisms.

Secrecy was a central element to the initial stages of nuclear weapon development in America. For example, government officials considered the atomic work under the Manhattan Project “the best kept secret of the war.”¹⁶ Even the development of national laboratories for atomic research across the country fell under this necessity of secrecy. Notably, social historians distinguish that Americans used the term “secret cities” to specifically reference Oak Ridge,

Sharon Weinberger, *A Nuclear Family Vacation: Travels in the World of Atomic Weaponry* (New York: Bloomsbury USA, 2008); Jeff Smith, *Unthinking the Unthinkable: Nuclear Weapons and Western Culture* (Bloomington: Indiana University Press, 1989); Scott C. Zeman and Michael A. Amundson, *Atomic Culture: How We Learned to Stop Worrying and Love the Bomb* (Boulder: University Press of Colorado, 2004); Sarah E. Robey, *Atomic Americans: Citizens in a Nuclear State* (Ithaca, NY: Cornell University Press, 2022).

¹⁴ Ferenc Morton Szasz, *The Day the Sun Rose Twice: The Story of the Trinity Site Nuclear Explosion, July 16, 1945* (Albuquerque: University of New Mexico Press, 1984); Allen M. Hornblum, Judith L. Newman, and Gregory J. Dober, *Against Their Will: The Secret History of Medical Experimentation on Children in Cold War America* (New York: Palgrave Macmillan, 2013); Kate Moore, *The Radium Girls: They Paid with Their Lives, Their Final Fight Was for Justice* (London: Simon & Schuster, 2016); Olga Kuchinskaya, *The Politics of Invisibility: Public Knowledge About Radiation Health Effects after Chernobyl* (Cambridge, MA: MIT Press, 2014).

¹⁵ Charles W. Johnson and Charles O. Jackson, *City Behind a Fence: Oak Ridge, Tennessee, 1942-1946* (Knoxville: University of Tennessee Press, 1981); Leland Johnson and Daniel Schaffer, *Oak Ridge National Laboratory: The First Fifty Years* (Knoxville: University of Tennessee Press, 1994); Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (New York: Oxford University Press, Incorporated, 2013); Lindsey A. Freeman *Longing for the Bomb: Oak Ridge and Atomic Nostalgia* (Chapel Hill: University of North Carolina Press, 2015); Peter J. Westwick, *The National Labs : Science in an American System, 1947-1974* (Cambridge, MA: Harvard University Press, 2003).

¹⁶ Theodore Frederic Koop, *Weapon of Silence* (Chicago: The University of Chicago Press, 1946), 272.

Hanford, and Los Alamos.¹⁷ Paul Boyer, in his work on American thought and memory in the Cold War period, argues that local Tennessee newspapers “played up” this mysterious and dramatic secrecy of Oak Ridge to the extent that even the *New York Times* called Oak Ridge the “secret empire.”¹⁸

The Los Alamos site of the Manhattan Project notably caused local rumors to circulate during the war around surrounding cities, such as Santa Fe, regarding the mysterious work at the laboratory. Rumors varied that the Los Alamos site housed a poisonous gas factory, spaceship plant, or even a camp for dissidents.¹⁹ Despite these rumors, the world’s first atomic bomb test remained censored from the general American public, signaling the tight control around nuclear development. The government concealed the Trinity test until a few weeks later in early August 1945, when news of the Hiroshima and Nagasaki bombing dominated national headlines and radio shows. Boyer analyzes the initial reaction to this public entrance of the atomic age. Instead of a gradual change over time regarding the attitudes towards the development of nuclear weapons and atomic research, Boyer argues that the entrance into the atomic age featured a burst of “terrifying suddenness.”²⁰ As the nation entered the nuclear era fear would be “the constant companion of Americans for the rest of their lives.”²¹ Confusion, disorientation, fear, and anxiety dominated the currents of civilian emotion. *Time* magazine in December 1945 summarized numerous opinion surveys regarding attitudes about the atomic bomb to conclude that overall “the pollsters found awe, fear, cynicism, confusion, hope-but mostly confused fear and hopeful

¹⁷ Johnson and Jackson, *City Behind a Fence*, xx.

¹⁸ Boyer, *By the Bomb’s Early Light*, 6.

¹⁹ Szasz, *The Day the Sun Rose Twice*, 23.

²⁰ Boyer, *By the Bomb’s Early Light*, 4.

²¹ Boyer, *By the Bomb’s Early Light*, 5.

confusion.”²² Furthermore, this cultural narrative of confusion regarding the unknown implications of nuclear technology was not just prominent among average Americans, but also deeply impacted other groups in American society, ranging from scientists such as nuclear physicists that worked on nuclear weapon development to government leaders and policymakers.

The ambiguity and lack of transparency about the atomic bomb fueled the “Great Fear” that persisted throughout the atomic age.²³ Even though the public was not aware of the atomic bomb until after August of 1945, secrecy and censorship still remained central after World War II. For example, Theodore F. Koop, a censor that worked for the U.S. Office of Censorship explained that peacetime military censorship in 1946 became a patriotic duty among the American public. National policy characterized censorship and confidentiality as a form of patriotism and loyalty to America. In order to keep the Manhattan Project and the “secret formula” of the bomb exclusive to America and its close allies, editors, broadcasters, and “all literate Americans were told to see nothing, hear nothing and think nothing about the atomic bomb that the War Department itself did not proclaim.”²⁴ That last piece is essential to understanding the sense of supposed control behind public panic and the unknowns of the atom. Information about nuclear warfare even after the war was still “carefully orchestrated” by the government.²⁵ In Neil Oatsvall’s recent monograph about atomic environments, he explains how policymakers frequently averted and even misconstrued information to avoid atomic anxieties. Oatsvall writes that “Truman-era policymaking thus frequently downplayed any concerns about fallout radiation, at times even going as far as to eschew tracking radioactive clouds produced by

²² Boyer, *By the Bomb’s Early Light*, 24.

²³ Boyer, *By the Bomb’s Early Light*, 14.

²⁴ Koop, *Weapon of Silence*, 285.

²⁵ Boyer, *By the Bomb’s Early Light*, 5.

nuclear testing for fear of causing public panic.”²⁶ Regardless of the patriotism behind secrecy and promises of postwar “peaceful” atomic research, these elements never successfully cloaked overarching anxiety and fear after the wartime use of the atomic bomb. “Nor did the promise of peacetime atomic Utopia initially do much to diminish the post-Hiroshima fear,” explains Boyer.²⁷

After the public shock surrounding the atomic bombings in Japan, government leaders, bureaucrats, and scientific officials worked to mend the image and purpose of atomic weapons and nuclear research towards a less destructive aim. Americans were generally familiar with dangers associated with radiation from the highly publicized World War I radium dial workers.²⁸ Furthermore, researchers in the 1920s discovered that X-rays produced cancer after tests with animals.²⁹ Kate Brown’s foundational work on nuclear history unpacks the historical context of awareness between cancer and radiation. Brown explains that “by the 1940s, scientists had known for decades that radioactivity caused infertility, tumors, cataracts, cancer, genetic mutations, and general symptoms of premature aging and early death.”³⁰ Additionally, shortly after America dropped the atomic bomb on Japan, American journalists covered dangers of atomic power and radiation. For example, in 1946 John Hersey published a series of articles in *The New Yorker* about the bomb’s destruction in Japan. This early coverage from American journalists suggests that “the U.S. public knew that radiation represented a real threat to human

²⁶ Oatsvall, *Atomic Environments*, 49.

²⁷ Boyer, *By the Bomb’s Early Light*, 13.

²⁸ Szasz, *The Day the Sun Rose Twice*, 119.

²⁹ Brown, *Plutopia*, 52.

³⁰ Brown, *Plutopia*, 52.

health.”³¹ An emergence of antinuclear movements arose shortly after the public exposure of significant dangers from the atomic bomb.

Antinuclear activism occurred between 1950 and the 1980s. Early in the atomic age, Americans criticized the nuclear tests “that made ‘fallout’ a household word in the 1950s.”³² American antinuclear sentiments influenced some significant policy changes and nuclear test freezes and bans. For example, in 1958 President Eisenhower established a voluntary nuclear testing moratorium in response to public concern of nuclear fallout.³³ Veteran activists also established the publicity and lobbying organization called SANE, the National Committee for a Sane Nuclear Policy in 1957.³⁴ By the 1960s, public concerns about nuclear warfare with the Soviet Union during the Cuban Missile Crisis influenced President Kennedy to establish the Limited Test Ban Treaty. The late 1970s featured the emergence of a powerful nuclear disarmament campaign that continued into the 1980s, which influenced President Reagan to accept a treaty that banned intermediate-range nuclear weapons.³⁵ To aid these growing concerns about radiation danger, policymakers, and government leaders worked to settle atomic anxiety by downplaying the risks of atomic weapons and ensure a sense of control.

Policymakers reassured the public in face of these antinuclear sentiments that American laboratories would continue working with the atom but justified this by publicizing the primarily “peaceful” improvements that atomic work could provide. This postwar national “Atoms for Peace” campaign bolstered that nuclear research fueled “peaceful” uses of the atom, such as

³¹ Oatsvall, “Atomic Agriculture,” 378.

³² Winkler, *Life Under a Cloud*, 4.

³³ Winkler, *Life Under a Cloud*, 6.

³⁴ Paul Boyer, “From Activism to Apathy: The American People and Nuclear Weapons, 1963-1980,” *The Journal of American History* 70, no. 4 (1984), 824.

³⁵ Winkler, *Life Under a Cloud*, 4.

improvements in agriculture to benefit American farmers and maximize food production.

Furthermore, the national “Atoms for Peace” movement preached the seemingly benign benefits of nuclear materials and isotopes for medicine, industry, and educational research.

While atomic research continued after the war, it diverted into two directions: top secret military weapon development and peacetime uses. In 1946, the U.S. government under President Truman established the Atomic Energy Commission (AEC). The AEC was a government establishment that blended laboratory research, university collaboration, “big science,” and private industry. From its establishment, the AEC sought to transition the continual development of large technical systems and nuclear research but did so through positive, “peaceful” uses. As Helen Curry has shown, this post-World War II development of nuclear science represented the transition of atomic research from military under the Manhattan Project, to civilian-led by the AEC.³⁶ The committee that organized the AEC advocated for civilian control of the commission, and the founding general manager of the AEC was a civilian. The first chairman of the AEC, David Lilienthal, had previously served as the head of the Tennessee Valley Authority in the 1930s and during World War II. Throughout his work with the AEC, Lilienthal publically called for local community and civilian involvement in atomic affairs.³⁷ However, atomic age secrecy never entirely faded after World War II.

³⁶ Curry, *Evolution Made to Order*, 145.

³⁷ Boyer, *By the Bomb's Early Light*, 30.

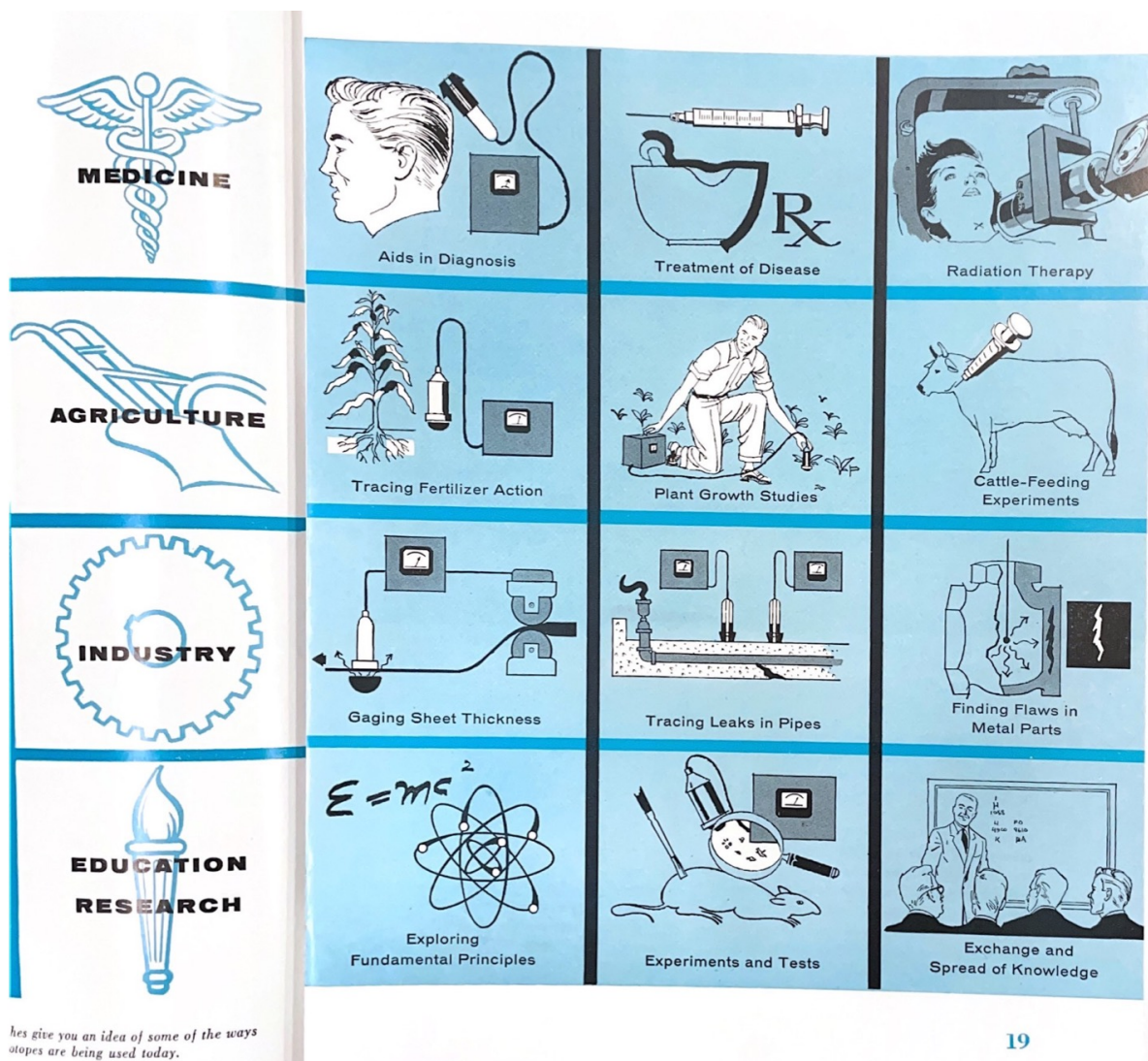


Figure 1 Image Scan from "The Atom in Our Hands," Union Carbide Corporation, 8th Printed Edition 1964. Hodges Library Special Collections Alvin Weinberg Papers: MPA-0332, Box 13, Folder 10, "Oak Ridge National Laboratory promotional brochures."

Government censor Theodore F. Koop wrote in 1946 that under the AEC, restricted data remained regarding atomic weapons, fissionable material production, and intended use of that material. The AEC could only disclose this data to the public so long as the commission could guarantee no harm to national security. Koop summarized that “the establishment of the [AEC] commission transferred from the Manhattan Engineer District, among other powers, the censorship of atomic information.”³⁸ Sustained secrecy after WWII aligns with the historical context of American concern regarding the Soviet Union’s nuclear weapon experiments. Increasing fear after WWII regarding the Soviet Union’s nuclear technology development deeply fueled other Cold War programs such as civil defense.

Along with the “Atoms for Peace” campaign, national civil defense efforts were also prominent in this cultural narrative. In 1951, President Truman established the FCDA. Civil defense preparedness aligned with the historical context of threats from foreign nuclear technology development as the Soviet Union successfully developed and tested their own atomic bomb by September 1949.³⁹ Civil defense encompassed both grassroots and federal elements of organization.⁴⁰ Civil defense administrator Millard Caldwell wrote to President Eisenhower in early 1952 describing this stratified character of civil defense. Caldwell wrote that “The Congress, the Cabinet, Federal officials generally, and State and city officials, country-wide, must face the facts of modern warfare. Civil defense is national defense.”⁴¹ Caldwell continued to explain the necessity of civilian protection to preserve democratic ideals when writing that “A

³⁸ Koop, *Weapon of Silence*, 289.

³⁹ Winkler, *Life Under a Cloud*, 67.

⁴⁰ Robey, *Atomic Americans*, 11.

⁴¹ United States, Federal Civil Defense Administration. *Annual Report - Federal Civil Defense Administration*, (Washington: U.S. Govt, 1951), vi.

public organized to protect its communities, keep the wheels of industry turning and to preserve the liberties of a free nation is essential to the future of America.”⁴²

Alongside this call for top-down organization, civil defense also relied deeply on local community mobilization. For example, numerous professionals outside of policymakers and government leaders, such as city planners, media specialists, journalists, psychologists, psychiatrists, and physicians worked to convince civilians that atomic age threats were not as dangerous as the public may assume. Professionals collaborating with the civil defense campaign after World War II argued that “fear had been exaggerated: ‘hysteria’ was uncalled for. The ‘sunny side of the atom’ was real and exciting; the radiation scare was overblown; and even if worse came to worst, civil defense offered hope.”⁴³

During the Cold War, Americans often used animals to prove mastery over nuclear weapons and ease fears regarding their use. For example, the early 1950s civil defense campaign featured the animated Bert the Turtle to teach children the protocol for protecting themselves during a nuclear attack. Civil defense consisted of a complex network of programs that included federal, state, and local level involvement, which stressed planning and preparedness for potential nuclear attacks or other postwar civilian emergencies.⁴⁴ The short film *Duck and Cover* featured Bert the Turtle to reference both his wisdom and preparation in case of a nuclear attack. Bert’s shell also reminded children of the protocol to “duck and cover” as if they had a shell like a turtle.⁴⁵ This popular animation from the FCDA used a non-human being to depict control and

⁴² United States, FCDA, *Annual Report - Federal Civil Defense Administration*, vi.

⁴³ Boyer, *By the Bomb’s Early Light*, 333.

⁴⁴ Boyer, *By the Bomb’s Early Light*, 311.

⁴⁵ *Duck and Cover*. Composed by Langlois, Leo, Film Producer, Actoroser, and Carr, Leonoser, produced by Archer Productions Company United States: Castle Films, 1952. Video.

preparation in the face of potential nuclear attacks. Like Bert the Turtle, Americans also used the Alamogordo herd for similar purposes, to represent control and knowledge regarding the unknowns of radioactive fallout.

Civil defense significantly aligned with Cold War narratives of control. The work of Laura McEnaney analyzes how government programs of civil defense attempted to police the private home life of 1950s American families. Similar to the patriotism behind wartime secrecy, McEnaney illuminates the levels of patriotism linked to support of civil defense. Antinuclear sentiments and suspicion of military power by the 1950s caused significant “dilemmas of control.”⁴⁶ McEnaney argues that in order to censor social critiques of militarization, the FCDA configured privatization of civil defense as a necessity in American homes. “‘The family,’ consecrated in the 1950s as private and apolitical, became the medium through which FCDA planners shifted the political discourse about nuclear defense from a question of national security to an issue of personal responsibility.”⁴⁷ The U.S. government’s obsession with power through control placed civil defense duties on all members of American families as a way to control civilian populations. McEnaney analyzes how the “family orientation of civil defense as a whole” directly contributed to the FCDA’s “attempts to predict and manage the behavior of men, women, and children in ways that served civil defense.”⁴⁸

Edward Deist’s comparative book on civil defense in the U.S. and Soviet Union also demonstrates the institutional control embedded in civil defense programs. Deist outlines the evolving definition of civil defense from the late 1940s to 1990s. For both America and the

⁴⁶ Laura McEnaney, *Civil Defense Begins at Home: Militarization Meets Everyday Life in the Fifties* (Princeton, N.J: Princeton University Press, 2000), 7.

⁴⁷ McEnaney, *Civil Defense Begins at Home*, 8.

⁴⁸ McEnaney, *Civil Defense Begins at Home*, 9.

Soviet Union, “civil defense was more than a concept; it was an institution – and these institutions strove to act in what they considered their own self-interest.”⁴⁹ Even the justification of the “Atoms for Peace” campaign shines light on efforts by policymakers to ease public fear while still pursuing their desired motives for control over the non-human world and domination over postwar atomic weapon development. Furthermore, Jacob Darwin Hamblin reveals how “Atoms for Peace” efforts were frequently deceitful. Hamblin argues that American cornucopian promises of “peaceful” atomic work connected to the American, as well as the Soviet Union and European nations, pursuit of global power domination. Hamblin explains that “Atoms for Peace” directly intersected with “seemingly disconnected topics, including racism, colonialism and neocolonialism, propaganda, surveillance and control, weapons programs and war.”⁵⁰

Ulterior political motives for international hegemony littered Cold War nuclear matters as the “global nuclear order seemed structured in ways reminiscent of the colonial era.”⁵¹ For example, the International Atomic Energy Agency (IAEA) illuminates the global consequences of the U.S. “Atoms for Peace” campaign. Promises of “peaceful” uses of the atom and international cooperation under the IAEA included an open flow of knowledge regarding nuclear technology and disarmament of the world’s superpowers to allow other countries to experience the civilian benefits of atomic power. President Eisenhower even provided sums of uranium fuel to the IAEA for global use to benefit people all around the globe. However, the IAEA functioned as a western power struggle for control rather than a worldwide spread of civilian benefits from

⁴⁹ Edward Geist, *Armageddon Insurance: Civil Defense in the United States and Soviet Union, 1945-1991* (Chapel Hill: The University of North Carolina Press, 2019), 2

⁵⁰ Hamblin, *The Wretched Atom*, 256.

⁵¹ Hamblin, *The Wretched Atom*, 3.

the atom.⁵² This struggle for global control signaled problems similar to events in the colonial era. For example, the IAEA featured paternalistic practices when policing arms control and monitoring how other countries used nuclear technology. This neocolonial superpower policing monitored countries that were former colonies such as Brazil, India, and numerous African countries. Hamblin explains that “IAEA was referred to as a ‘watchdog,’ known for its cadre of inspectors.”⁵³ Furthermore, the U.S., Soviet, and European governments often pushed the narrative that atomic energy promised improved agricultural practices to aid food supply. This narrative featured an ulterior political motive to control the non-human world through securing resource extraction sites for uranium and monazite supplies, useful for weapon development. Hinging on promises of improved agriculture from nuclear technology represents a form of neocolonialism. For example, uses of atomic technology to benefit food and export supplies represented a cure to “problems indistinguishable from those of the colonial era.”⁵⁴ However, despite the promises of “peaceful” benefits of the atom, these western governments refused to fully address the environmental contamination and public health hazards that extraction disasters and radiation dangers caused indigenous people and their land.⁵⁵

Historians also examine the race and class discrimination embedded in the seemingly inclusive messages of civil defense as a civic exercise of national defense duty for “all” citizens. For example, McEnaney stresses the inequalities embedded in the privatization of civil defense which targeted the control of Americans’ home-life. The exposure of this civil defense inequality was a chief concern among FCDA officials because “This intersection of militarization with race

⁵² Hamblin, *The Wretched Atom*, 3.

⁵³ Hamblin, *The Wretched Atom*, 4.

⁵⁴ Hamblin, *The Wretched Atom*, 7.

⁵⁵ Hamblin, *The Wretched Atom*, 7.

and class arrangements troubled federal planners because they feared that frank discussions of extant racial and class fissures might expose the inequalities built into ‘self-help.’”⁵⁶ McEnaney explains how inequality was embedded in civil defense “self-help” ideology with the example of exclusivity in 1950s suburban life because the “privatization of shelter was premised on suburbanization and home ownership, twin phenomena that included far more whites than nonwhites.”⁵⁷ However, African Americans, specifically the National Association for the Advancement of Colored People (NAACP), navigated the rhetoric of civil defense in vastly different ways than FCDA officials did. For example, the NAACP connected civil defense to a civil rights ethic to argue that “Jim Crow should be the only casualty of the nuclear age.”⁵⁸ The translation of civil defense to a civil rights ethic made FCDA officials uncomfortable because such arguments “gave preparedness a reformist meaning not anticipated or really welcomed by FCDA officials.”⁵⁹ Additionally, club women, organized in local level parent teacher associations (PTA) and neighborhood groups, and larger national groups like the General Federation of Women’s Clubs and the American Association of University Women, interpreted civil defense preparedness as an opportunity for membership, leadership, and stronger political influences.⁶⁰ This also caused distress to FCDA officials, who “were discomfited by the fact that they [women] injected a more social welfare and materialistic-feminist meaning into a quasi-military program.”⁶¹

⁵⁶ McEnaney, *Civil Defense Begins at Home*, 123.

⁵⁷ McEnaney, *Civil Defense Begins at Home*, 123.

⁵⁸ McEnaney, *Civil Defense Begins at Home*, 8.

⁵⁹ McEnaney, *Civil Defense Begins at Home*, 8.

⁶⁰ McEnaney, *Civil Defense Begins at Home*, 91.

⁶¹ McEnaney, *Civil Defense Begins at Home*, 8.

Overall, civil defense deeply impacted all sectors of American society ranging from policymakers, community employees and reporters, and civilians at home. As McEnaney explains, “Civil defense, in particular, reflected the breadth of militarization, for it was state agency, war story, family lore, and people’s mobilization all at once.”⁶² Furthermore, a useful metaphor for understanding how Cold War narratives of control impacted all members of American society comes from Paul Edwards’s closed-world discourse. The closed-world discourse illuminates the interconnection between science and technology, institutions, and culture. Considering the closed-world discourse in evaluation of American narratives of control demonstrates how these three categories greatly shaped each other in Cold War society.⁶³ Nuclear technology development, cultural perceptions of atomic power, and institutional structures did not function independently but instead deeply shaped each other. For example, antinuclear sentiments caused institutional action to freeze nuclear weapon usage, reflecting a social transformation of institutional decisions and technological developments. On the other hand, institutional regulation and control of nuclear power development used censorship to misconstrue information and prevent public concern. This example reflects institutional action to shift social reactions and dominate the course of technological development.

This simultaneous involvement in civil defense reveals that FCDA campaigns featured elements of both high modernism and low modernism. James C. Scott’s definition of high modernism aligns with top-down levels of control. High modernism demonstrates control at the government level through advances in science and technology and state level through

⁶² McEnaney, *Civil Defense Begins at Home*, 6.

⁶³ Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: The MIT Press, 1996), xiii.

knowledgeable elites, such as scientists and mechanized farmers.⁶⁴ The continuation of atomic research justified through “Atoms for Peace” contained elements of high modernism. For examples, researchers studied the Alamogordo herd to reassure the public of control by understanding the herd’s reaction to radiation with science and technology through their top-down level of expertise. However, Jess Gilbert’s work about New Deal agricultural leaders argues a concept of low modernism which bolsters the importance of civic engagement.⁶⁵ This aligns with the stratified nature of civil defense. Civil defense exhibited its low modernism through its enlistment of common citizens, recruited through the rhetoric of patriotism. However, citizens also participated in civil defense with autonomous motives, such as when the NAACP formulated their own arguments about civil defense rhetoric.⁶⁶ Categorizing civil defense as a civilian inclusive cause reassured the public of their direct contribution to civil defense, possibly reassuring to many as a sense of control in an age of anxiety, and participation in a previously top secret assignment.

While the FCDA exercised wide reaching influence across American Cold War society, civil defense messages faced significant limitations. Civil defense scholarship highlights the ultimate failure of FCDA campaigns, which frequently stemmed from contradictions embedded within civil defense messages. For example, many Americans criticized civil defense because of

⁶⁴ Jess Gilbert, “Low Modernism and the Agrarian New Deal: A Different Kind of State,” in Jane Adams, *Fighting for the Farm Rural America Transformed* (Philadelphia: University of Pennsylvania Press, 2003), 129.

⁶⁵ Gilbert, “Low Modernism,” 131; For more arguments about high and low modernism, see James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, CT: Yale University Press, 1998); Daniel Immerwahr, *Thinking Small: The United States and the Lure of Community Development* (Cambridge, MA: Harvard University Press, 2015).

⁶⁶ McEnaney, *Civil Defense Begins at Home*, 8.

the unlikely chances of survival from a nuclear attack.⁶⁷ Furthermore, the motives of both civil defense and “Atoms for Peace” attempted to balance dichotomies between peace and war. It seemed almost impossible for the American government to successfully balance proclamations of Cold War era peace while simultaneously preparing for another war or nuclear attack.⁶⁸

Another reason for the failure of civil defense ideology aligns with the human tendency to avoid fully facing the consequences of human-caused disasters. In evaluation of American antinuclear movements, Alan Winkler explains that even after marginal success, antinuclear activism frequently disappeared.⁶⁹ Winkler explains the inconsistent elements of this protest as a root of avoidance because “although serious problems still demanded solutions, most Americans- and their counterparts in countries possessing nuclear weapons- seemed unwilling to confront the issue further.”⁷⁰ An avenue for avoidance, Winkler continues that “most citizens of the U.S. have avoided thinking about vexing nuclear controversies in the naive hope that problems will disappear. . . They found it simpler to cast furtive, sidelong glances at the bomb, just as we do today, and so avoid facing it directly.”⁷¹

The psychological comfort that comes with control explains why American government and industries frequently conceal and manipulate information to help insinuate a sense of domination. The work of Olga Kuchinskaya examines public knowledge about radiation exposure after Chernobyl and analyzes the politics of invisibility. Kuchinskaya questions the complexities behind the politics of invisibility and the difficulties of addressing environmental

⁶⁷ Geist, *Armageddon Insurance*, 11.

⁶⁸ McEnaney, *Civil Defense Begins at Home*, 4

⁶⁹ Winkler, *Life Under a Cloud*, 4.

⁷⁰ Winkler, *Life Under a Cloud*, 4.

⁷¹ Winkler, *Life Under a Cloud*, 5.

dangers that were not immediately visible to humans. In evaluation of the relative categories of visibility and invisibility, Kuchinskaya argues that “imperceptible hazards such as radiation can either be rendered more publicly visible and observable or be increasingly obscured, depending on how they are represented.”⁷² Kuchinskaya also cites Rachel Carson as an example of manipulation to make hazards stay invisible to the public. For example, the American chemical industry protested and ridiculed Rachel Carson and *Silent Spring* in an effort to dismiss the hazards of their products.⁷³ The American government and industry efforts to limit the visibility of radiation risks align with Cold War ideals of control and false promises of wholesome knowledge regarding radiation hazards to help ease public panic.

The shifting role of scientists in American society demonstrates another example of Cold War struggles for control and the manipulation of public information to safeguard a sense of human dominance over the non-human world. Beginning in the late nineteenth century, Americans increasingly associated scientists with expertise. As Alan Marcus explains in his work on the dangerous synthetic chemical DES (diethylstilbestrol or stilbestrol) and meat consumption regulation, scientists institutionalized themselves as virtuous experts in numerous elements of life, such as agriculture. For example, by the late nineteenth century, agricultural colleges increasingly featured scientific training, scientists participated in experiment stations, and extension agents exercised scientific knowledge, reflecting this boom of expertise and professionalization surrounding scientists.⁷⁴ Overall, Marcus explains that the legitimacy of scientists provided policymakers and citizens with reassurance of control through knowledge as

⁷² Olga Kuchinskaya, *The Politics of Invisibility*, 159.

⁷³ Kuchinskaya, *The Politics of Invisibility*, 160.

⁷⁴ Alan I. Marcus, *Cancer from Beef: DES, Federal Food Regulation, and Consumer Confidence* (Baltimore: Johns Hopkins University Press, 1994), 3.

“scientific expertise seemed the sole means to guarantee quality and promote well-being.”⁷⁵

However, struggles to understand the consequences of atomic weapons suggests that scientists were not always cohesive and clear about the consequences of nuclear science and technology.

Geist’s comparative work regarding American and Soviet civil defense underscores that U.S. scientists lacked a clear understanding of the survivability of nuclear war, which made the scientific case for civil defense “flimsy.”⁷⁶ Furthermore, Alice Kimball Smith underscores this conflict among scientists between prophecy yet uncertainty. Smith evaluates the American postwar atomic scientists’ movement, which consisted of physicists, chemists, biologists, metallurgists, and engineers, some “with only a peripheral understanding of the nucleus were acquiring distinction as ‘atomic scientists.’”⁷⁷ Science received a spike in national interest after WWII because the atomic bomb had implications for all elements of life. Smith writes that after the entrance of atomic power, “science, once the exclusive province of a dedicated few, seemed suddenly to be of interest to everybody, and just as suddenly scientists found that they themselves possessed a hitherto unrecognized aptitude for practical things, whether it was making bombs or persuading legislators to espouse a particular course of action.”⁷⁸ Due to atomic anxieties in the Cold War era, scientists, similar to many other Americans like farmers, felt a spike of responsibility and shifting mission motives. While scientists faced an issue of unanimity, they worked to reach a level of consensus, even if it included uncertainty or inadequate information. Smith explains that atomic scientists pushed aside uncertainty to

⁷⁵ Marcus, *Cancer from Beef*, 3.

⁷⁶ Geist, *Armageddon Insurance*, 8.

⁷⁷ Alice Kimball Smith, *A Peril and a Hope: The Scientists’ Movement in America, 1945-47* (Chicago: University of Chicago Press, 1965), ix.

⁷⁸ Smith, *A Peril and a Hope*, vi.

reassure the public of the scientific authority they had over consequences of atomic power. Smith explains that “when scientists began speaking to a wider public, doubts had to be suppressed and certainties emphasized.”⁷⁹ Overall, the attempts among scientists to suppress any doubt or concerns despite the scattered understandings of nuclear matters reflects how narratives of control were frequently psychological. In other words, many Americans could reach a mental reassurance of control even if such control did not stem from reality. Like the case with postwar atomic scientists, they could instill a sense of control even if the research and knowledge about nuclear technology and its consequences remained mysterious.

Along with the authoritarian role of scientists in Cold War society, another social group that was especially essential to the career of civil defense were farmers. The work of Jenny Barker-Devine demonstrates the centrality of civic involvement in civil defense, especially in rural locations. Barker-Devine analyzes how civil defense directors argued that rural residents were as central to national defense as urban and military individuals. By the late 1950s, the FCDA coordinated with the United States Department of Agriculture (USDA) and State Cooperative Extension Services to advance campaigns for farmers about their vital role in civil defense. These programs stressed the necessity of farmers work for food supply, and characterized farmers as “budding atomic scientists.”⁸⁰ Such a sense of duty and responsibility among agricultural workers illuminates the centrality of industrial agricultural systems in this postwar context.

⁷⁹ Smith, *A Peril and a Hope*, 534.

⁸⁰ Jenny Barker-Devine, “‘Mightier than Missiles’: The Rhetoric of Civil Defense for Rural American Families, 1950-1970,” *Agricultural History* 80, no. 4 (2006), 417

Agriculture was central to civil defense and “Atoms for Peace” campaigns because it functioned as a way to prove “peaceful” benefits of atomic research while at the same time attempting to control the natural world in the face of nuclear vulnerabilities. By the Cold War period, American agriculture had become increasingly mechanized and industrialized. As the foundational work of Deborah Fitzgerald illuminates, as early as the 1920s, factory-like farming encompassed the ideal blueprint for American farming systems.⁸¹ This included changes on the farm from science and technology throughout the twentieth century, such as farm machinery like tractors and mechanical pickers, hybrid corn, pesticides, antibiotics, genetics, and breeding innovations. These changes in agriculture deeply impacted both crops and animals. One example was the poultry industry. As William Boyd has argued, “like hybrid corn, the story of the industrial chicken must be seen as part of a larger process of agro-industrialization, which has not only transformed the social practices of agriculture, food production, and diet in twentieth-century America but also facilitated a profound restructuring of the relationship between nature and technology.”⁸²

The rise of agribusiness was also central to these changes in agriculture. Agribusiness refers to the twentieth-century commercialization and industrialization of agricultural processes. Agribusiness also references the rise of businesses that specialized in all elements of agricultural production. Shane Hamilton notably argues that agribusiness aligned with ideas of technological determinism. Technological determinism, or the idea that the introduction of new or improved technology ushered in a somewhat inevitable sense of change, proved to be a powerful rhetorical

⁸¹ Deborah Kay Fitzgerald, *Every Farm a Factory the Industrial Ideal in American Agriculture* (New Haven, CT: Yale University Press, 2003), 3.

⁸² William Boyd, “Making Meat: Science, Technology, and American Poultry Production,” *Technology and Culture* 42, no. 4 (2001): 633.

tool for twentieth century agribusiness. “By the mid-1950s, the idea that technology was a strong force acting autonomously on human society had entrenched in popular culture, intellectual life, and political discourse. The atomic bomb, electronic computers, jet and rocket propulsion, and other new technologies of the late 1940s and early ‘50s convinced Americans that their world had been fundamentally transformed by these devices.”⁸³ This technological determinism embedded within agribusiness also justified lax government regulation over expanding industry firms.⁸⁴ While agribusiness introduced significant changes to food supply and farm systems with shifts in standardization, efficiency, and management, these changes were not always positive nor did they guarantee human control.

The industrial agricultural systems of the twentieth century, despite illusions of control and certainty, were highly vulnerable to detrimental consequences of science and technology. Agro-environmental historians emphasize that the industrialization of agriculture was not a perfected system of standardization and domination over the natural world. Instead, these systems frequently faced consequences such as disease, dangerous contamination to humans, unsustainable practices like monoculture, and an inability to fully control and breed animals or plants as mere objects for maximum meat, egg, or dairy output. The challenges that increasingly erupted for industrial agricultural processes speaks to Rachel Carson’s point that nature fights back.⁸⁵ All of these frequently negative consequences from twentieth century agriculture reveals that human superiority and complete control over nature was a false ideal.

⁸³ Shane Hamilton, “Agribusiness, the Family Farm, and the Politics of Technological Determinism in the Post–World War II United States,” *Technology and Culture* 55, no. 3 (2014), 576.

⁸⁴ Hamilton, “Agribusiness, the Family Farm, and the Politics of Technological Determinism in the Post–World War II United States,” 582.

⁸⁵ Rachel Carson, *Silent Spring* (Boston: Houghton Mifflin, 1962), 245.

To begin with, of the numerous consequences of factory-like agriculture, historians stress the human cost, especially in terms of labor, land ownership, and skilled operation. Adrienne Petty, in her work on small farmers in North Carolina demonstrates how agribusiness completely disrupted farm family systems. Petty explains that the rise of agribusiness was “hastened by technological and scientific advances that reduced the number of people needed to plant, tend, and harvest crops, while increasing agricultural output through high-yield seeds, fertilizers, insecticides, herbicides, and farm machinery.”⁸⁶ Notably, this entrance of modern agribusiness “supplanted or disrupted small-scale farming and a way of life worldwide.”⁸⁷ Additionally, Deborah Fitzgerald argues that technologies like hybrid corn effectively deskilled farmers, just as Taylorism deskilled factory workers.⁸⁸ Fitzgerald explains that the adoption of hybrid corn increasingly caused farmers to depend on the expertise and control of geneticists and seed dealers, which made farmers’ knowledge “obsolete.”⁸⁹

Additionally, this Cold War agricultural system increasingly relied on efforts to standardize only one crop or animal on farms. Farmers’ specialization in specific crops and livestock, such as with hybrid corn, broilers, or cattle in the industrial beef industry, reflects another phenomenon of twentieth century agriculture: an obsession with monoculture.⁹⁰ James C. Scott explains that high modernist frequently favored monoculture due to its “basic simplification imposed in the

⁸⁶ Adrienne Monteith Petty, *Standing Their Ground: Small Farmers in North Carolina Since the Civil War* (New York: Oxford University Press, 2013), 5.

⁸⁷ Petty, *Standing Their Ground*, 5.

⁸⁸ Deborah Fitzgerald, “Farmers Deskilled: Hybrid Corn and Farmers’ Work,” *Technology and Culture* 34, no. 2 (1993), 327.

⁸⁹ Fitzgerald, “Farmers Deskilled,” 343.

⁹⁰ Boyd, “Making Meat,” 652; Jack Ralph Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000* (Madison: University of Wisconsin Press, 2004), 121; Joshua Specht, *Red Meat Republic*, 11.

interest of ease of management and economic return”⁹¹ However, monoculture is an inherently unsustainable practice for the land, crops, and livestock. For example, the repeated production of a single crop over time can jeopardize the overall quality of the crop and soil fertility. Furthermore, animal monocultures can directly cause outbreaks of pathogenic bacteria.⁹² This reflects why sustainable farming practices frequently included rotating farm locations and different crops. For example, Native American farming practices exercised sustainable elements of shifting agriculture and the three-crop system with squash, corn, and beans. Changing farmland sites allowed soil fertility to regenerate after exhaustion from a few years of farming. Additionally, the use of squash, corn, and beans reflected ecological knowledge of the land. Corn, which leached soil of nitrogen, was supplemented with beans to supply nitrogen and squash to eliminate toxins.⁹³ Some European practices of mixed husbandry also practiced polyculture with crop rotation and manuring. Twentieth century agriculture did not practice this polyculture but instead supplemented science and technology, such as spiked use of chemicals or genetic manipulation to achieve uniformity and dominate the production of a single product.⁹⁴ Ironically, such science and technology still caused dangerous outcomes. For example, Rachel Carson revealed that monoculture directly contributed to high levels of toxic herbicides and pesticides because dedication to a single crop causes spiked insect populations to spike.⁹⁵ Overall, Carson critiques that “Nature has introduced great variety into the landscape, but man

⁹¹ Scott, *Seeing Like a State*, 21.

⁹² Boyd, “Making Meat,” 652; Scott, *Seeing Like a State*, 280.

⁹³ Jack Temple Kirby, *Mockingbird Song: Ecological Landscapes of the South* (Chapel Hill: University of North Carolina Press, 2006), 56.

⁹⁴ Kloppenburg, *First the Seed*, 316.

⁹⁵ Carson, *Silent Spring*, 10.

has displayed a passion for simplifying it.”⁹⁶ Along with the changes to labor and long term consequences from monoculture, the toxins and hazards from chemicals increasingly used in industrial agriculture also caused challenges for humans attempts to control nature.

In 1962, Rachel Carson published *Silent Spring* about the hazardous insecticide DDT (Dichlorodiphenyltrichloroethane). A German chemist first synthesized DDT in 1874, which became used as an insecticide after 1939.⁹⁷ By WWII, the American military heavily used DDT as an insecticide against diseases such as malaria and typhus. By the postwar period, American citizens used this chemical for household defense against insects and other pests.⁹⁸ Carson revealed that by the mid-1940s, DDT was just one of 500 new chemicals Americans used, 200 of which were used to kill pests and weeds.⁹⁹ Carson underscored the ecological consequences of these chemicals when she wrote that “These sprays, dusts and aerosols are now applied almost universally to farms, gardens, forests, and homes – nonselective chemicals that have the power to kill every insect, the ‘good’ and the ‘bad,’ to still the song of birds and the leaping of fish in the streams, to coat the leaves with deadly film, and to linger in soil.”¹⁰⁰ *Silent Spring* exposed the long-term detrimental impacts DDT caused the environment and human health. Once exposed to DDT, the chemical stores in tissues and organs, quite literally sticking to the body. This storage can cause significant dangers to both human and animal bodies such as chronic poisoning and degeneration of the liver, organs, and nervous system. The lingering characteristic of DDT exposure also causes this chemical to easily transfer or pass down to other forms of life through

⁹⁶ Carson, *Silent Spring*, 10.

⁹⁷ Carson, *Silent Spring*, 20.

⁹⁸ David Kinkela, *DDT and the American Century: Global Health, Environmental Politics, and the Pesticide That Changed the World* (Chapel Hill: University of North Carolina Press, 2011), 8.

⁹⁹ Carson, *Silent Spring*, 7.

¹⁰⁰ Carson, *Silent Spring*, 7.

consumption and runoff contamination. Carson explained examples with different livestock to reveal how consumption of DDT residue could cause significant contamination in human food supply chains. If cows consumed hay with DDT residue, then concentrations lingered in their milk and humans consumed milk products such as butter. Additionally, if chickens consumed DDT contaminated meal, DDT concentrations appeared in their eggs. Carson explained that “through such a process of transfer, what started out as a very small amount of DDT may end as a heavy concentration.”¹⁰¹ Carson noted that both human and animal mothers could pass down the poison through breast milk.¹⁰² Additionally, studies with birds revealed that DDT impacted reproduction and even found concentrations of the insecticide poison a generation after initial contact.¹⁰³

Along with DDT, another dangerous chemical of the Cold War period that directly impacted the environment and human health included DES. The U.S. Food and Drug Administration approved DES (diethylstilbestrol or stilbestrol) for market use in 1941.¹⁰⁴ DES was a synthetic chemical that functioned as an estrogen and a hormone distributor. Doctors prescribed DES as a menopause treatment and to prevent miscarriages. DES also served as an important synthetic chemical for the post-WWII cattle industry. The cattle industry used DES in cattle feed for growth enhancement and maximum milk and meat production.¹⁰⁵ However, DES had carcinogenic consequences and impacted human sexual development.¹⁰⁶ The direct prescription of DES to women and the extensive use of DES in cattle feed reveals the ecological

¹⁰¹ Carson, *Silent Spring*, 22.

¹⁰² Carson, *Silent Spring*, 23.

¹⁰³ Carson, *Silent Spring*, 121.

¹⁰⁴ Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven, CT: Yale University Press, 2010), x.

¹⁰⁵ Marcus, *Cancer from Beef*, 1.

¹⁰⁶ Paul S Sutter, “The World with Us: The State of American Environmental History,” *The Journal of American History* (Bloomington, Ind.) 100, no. 1 (2013), 112.

dangers of chemicals through numerous cycles of life. The FDA did not ban DES in cattle feed until 1979, an alarmingly late date given the fact that researchers in the 1940s “knew that it [DES] caused cancer and problems with sexual development in laboratory animals.”¹⁰⁷

Animals were frequently at the center of Americans’ narrative of control in mechanized agriculture. For example, William Boyd’s article about broiler production demonstrates humans’ inability to entirely control and industrialize complex organisms. The production of the industrialized broiler included changes in confinement, genetics research, and nutrition and disease control. Ranging from experiments with breeding, chicken genetics research to “improve” commercial broilers, the use of antibiotics to promote growth, and the use of vitamin D and ultraviolet light to circumnavigate the suffering chickens endured in confinement, all reflect failed attempts to industrialize these complex organisms as if they were machines.¹⁰⁸ For example, the use of antibiotics for uniform growth enhancement caused the outbreak of antibiotic resistant bacteria, which posed a significant danger to human consumption of these animals and food safety.¹⁰⁹

Overall, historians that analyze animal agriculture in the twentieth century frequently reveal the limitations of human domination of animals. Roger Horowitz in his work on meat in American diets, considers the restrictions of human domination over plants and animals. Horowitz explains that despite government regulations, inspections, science, and technology that attempted to configure animals’ bodies as convenient products for humans, Americans always faced challenges because “the animal body refuses to die – disorderly nature lives on despite our

¹⁰⁷ Langston, *Toxic Bodies*, x.

¹⁰⁸ Boyd, “Making Meat,” 638.

¹⁰⁹ Boyd, “Making Meat,” 634.

best efforts to use inorganic technology to control it.”¹¹⁰ For example, factory-like slaughterhouses and meat processing aligns with the “incomplete victories” over nature and animals’ bodies.¹¹¹ High speed meat processing lines seem efficient and under control as they kill and cut apart large amounts of animal carcasses, but still cause the outbreak and spread of harmful bacteria such as *E. (Escherichia) coli*, salmonella, and campylobacter.¹¹² With all of these examples of the limitations of human control over the land, plants, and animals, the vulnerability of agricultural systems and food supply chains represented another cause for anxiety in the atomic era.

Threats of a nuclear attack or the hazards of radioactive fallout could pose significant disruptions to American systems of agriculture and food supply chains. The importance of meat in American diets reached a steady upward trajectory not just as a favored item after wartime meat rationing but also as a product associated with a healthy diet. Reinaldo Funes-Monzote explained in a 2020 roundtable on animal history that “an animal protein-based diet became a synonym for well-being after World War II, and was replicated as the ideal diet for the rest of the world. The model largely came from the typical diet in the United States, which was centered on red meat and other animal protein sources such as milk, pork, chicken, and eggs.”¹¹³ Even as the consequences of industrialized agriculture already posed numerous threats to disruptions in meat supply ranging from disease outbreaks and genetic susceptibilities, the dangers of radiation

¹¹⁰ Roger Horowitz, *Putting Meat on the American Table: Taste, Technology, Transformation* (Baltimore: Johns Hopkins University Press, 2006), 154.

¹¹¹ Horowitz, *Putting Meat on the American Table*, 153.

¹¹² Horowitz, *Putting Meat on the American Table*, 153.

¹¹³ Albert G. Way, William Thomas Okie, Reinaldo Funes-Monzote, Susan Nance, Gabriel N. Rosenberg, Joshua Specht, and Sandra Swart, “Roundtable: Animal History in a Time of Crisis,” *Agricultural History* 94, no. 3 (2020), 471

posed another significant threat to this agricultural system. Overall, such an inability to fully control the environment, animals, and consequences of nuclear power caused Americans significant discomfort, often leading to manipulation of information and institutional surveillance.

Similar to the previous discussion of invisibility and avoidance regarding the consequences of radioactive fallout, a parallel tone of psychological control through disassociation occurred with factory farming and the hazards of meat processing. For example, Timothy Pachirat's work considers the politics of sight and power in industrialized killing. Pachirat stresses that modern slaughterhouses include strict surveillance and concealment regulations to erase the suffering of animals killed in these slaughterhouses and to maintain the exploitation of labor necessary for slaughterhouses to operate. Pachirat writes that "Distance and concealment shield, sequester, and neutralize the work of killing even, or especially, where it might be expected to be least hidden."¹¹⁴ Studying industrialized killing through the politics of sight and power reveals "the distance we create by constructing and reinforcing racial, gender, citizenship, and education hierarchies that coerce others into performing dangerous, demeaning, and violent tasks from which we directly benefit."¹¹⁵ Overall, Americans often attempted to reconcile the limitations of human control over the non-human world through avoidance, detachment, or corruption of information.

America was not the only country that experienced these changes in mechanized agricultural systems and the consequences of such tampering in the twentieth century.

¹¹⁴ Timothy Pachirat, *Every Twelve Seconds: Industrialized Slaughter and the Politics of Sight* (New Haven, CT: Yale University Press, 2011), 9.

¹¹⁵ Pachirat, *Every Twelve Seconds*, 9.

Comparative elements of agricultural history demonstrate that other countries across the globe grappled these attempts to conquer the non-human world. For example, in the Soviet Union, mechanization also dominated agriculture in the twentieth century. While differences distinguished the Soviet Union from U.S. agricultural production, such as state ownership of land and collectivized agriculture, there were still parallel elements that relied on science and technology to control the non-human world. Similar to American agribusiness that prioritized the use of science and technology, Khrushchev era agricultural policies bolstered the use of technology which resulted in the overuse of chemical and mechanical methods that caused significant environmental consequences.¹¹⁶ Additionally, similar to the American turn to mechanization to maximize food supply demands with underlying political motives to display control over the non-human world, historians studying other regions of the globe also distinguish these similarities between bureaucratic agendas and mechanized agriculture. For example, Tiago Saraiva studies Italy, Portugal, and Germany to demonstrate the relationship between fascism and science regarding ideals of food independence and dominating technoscientific organism breeding. Saraiva explains that “Mass mobilizations, new state structures, organic communities, and imperial expansionism- important parts of the fascist world- were imagined and enacted through the breeders’ new organisms: wheat, potatoes, pigs, sheep, coffee, rubber, and cotton.”¹¹⁷ Overall, it is important to note that mechanized agriculture and human attempts to dominate the non-human world were not always exceptional to America.

¹¹⁶ Paul Josephson, Nicolai Dronin, Ruben Mnatsakanian, Aleh Cherp, Dmitry Efremenko, and Vladislav Larin, *An Environmental History of Russia* (New York: Cambridge University Press, 2013), 146.

¹¹⁷ Tiago Saraiva, *Fascist Pigs: Technoscientific Organisms and the History of Fascism* (Cambridge: MIT Press, 2016), 14.

The American atomic era consisted of negative consequences from industrial agricultural systems and nuclear technology. These consequences demonstrate the limitations of human superiority when nature fights back. The Alamogordo herd encompassed all of these elements of America's obsession with control and the consequences of humans' inability to permanently dominate the non-human world. Chapter Two will examine the Alamogordo herd to demonstrate how non-human beings frequently thwarted American narratives of control.

Chapter II

Atomic Cows for “Peace”

At approximately 5:30 in the morning on July 16, 1945, the United States Army tested the world’s first nuclear weapon and ushered in the atomic age. The Trinity Test occurred in New Mexico, at the Jornada del Muerto desert basin. After the striking flash, mushroom-like ball of fire and smoke, and potent “stench of death” that lingered after the bomb detonated, radioactive fallout burned a nearby group of grazing cattle.¹¹⁸

This accidental exposure made evident that nuclear weapons directly impacted all living creatures, including animals. The Hereford cattle grazing near the Trinity explosion site were the first living beings to feel the impact of radioactive fallout. Soon known as the Alamogordo herd, this group of grazing cattle provided the public with its first glimpse of evidence that radioactive fallout from nuclear weapons could occur. The exposure impacted over three hundred cattle, which included cows, steers, bulls, and calves.¹¹⁹ Radiation damage was so extreme for some of the herd that it jeopardized the market value of their bodies. As a result, the U.S. Army sent a group of the exposed cattle to Oak Ridge, Tennessee, for further examination to understand the unforeseen consequences of Trinity and the long-term impacts of radioactive fallout.

The shipment of this group of cattle to Oak Ridge initiated a collaboration between the Atomic Energy Commission and the University of Tennessee in May 1948, which established the University of Tennessee-Atomic Energy Commission Agricultural Research Laboratory (UT-AEC). Alarm over the Alamogordo group of cattle informed the urgency to establish this

¹¹⁸ Szasz, *The Day the Sun Rose Twice*, 83.

¹¹⁹ Carl L. Tessmer, “Radioactive Fallout Effects on Skin: Effects of Radioactive Fallout on Skin of Alamogordo Cattle,” *Archives of Pathology* 72, no. 2 (1961): 176.

laboratory, and demonstrates the central role of animals in nuclear history. The UT-AEC laboratory studied the Alamogordo herd's general health, growth, breeding efficiency, offspring and fertility health, and the effects of radioactivity on the cattle's tissue, organs, and coats. These first victims of radioactive fallout from Trinity, sent to Oak Ridge, shines light on the centrality of non-human beings in nuclear history.

This herd grew famous as both local and national media covered the Alamogordo herd at Oak Ridge as an exemplar of America's control of nuclear power. Some of these cows received names such as Granny and Atom. The fame of the Alamogordo herd concluded in 1964 when the laboratory euthanized Granny, the last surviving member of the herd. The coverage of Granny's death was somber yet continually celebrated as bookend proof that radioactive cattle could still live long, healthy, and reproductively successful lives.

This chapter explores the experience of the Alamogordo herd at Oak Ridge, Tennessee, to argue that observations and publicity of this herd directly contributed to the national "Atoms for Peace" campaign. The UT-AEC laboratory encompassed an effort for humans to dominate nature by grasping the consequences of nuclear exposure. The Alamogordo herd received a public following and celebrity status as national and East Tennessee newspapers covered the experiments and observations of the herd. The public following of these cows reflects a cultural narrative of uncertainties and anxieties about the unforeseen consequences of nuclear exposure, yet reveals efforts to remain positive and broadcast authority and control over the atom by celebrating the sustained health of the herd and their reproductive success after exposure.

Public facing coverage of this famous herd primarily remained positive, celebrating the herd's "normal behavior" and efficient, healthy reproduction after their exposure.¹²⁰ However, scientific experiments and technical manuals from the UT-AEC laboratory, unfortunately, reveal that the victims of the world's first nuclear weapon endured negative consequences. The reaction to radiation found among the Alamogordo herd included beta burns, tissue sensitivity, vascular changes, and skin cancer. However, even government and laboratory documents featured conflicting and uncertain statements about the long-term effects of radiation exposure. This inconsistency across both public and scientific source material following the herd's lives uncovers an example of how nature fights back. The Alamogordo herd never fully conformed to the optimistic and reassuring expectations sought to ease atomic anxieties. Instead, the inconsistency across the coverage and findings about the herd reveals the centrality of animals in history because these cows showcased the irreversible damage of radiation, thwarting American efforts to conquer the non-human world.

The Alamogordo herd was significant in this Cold War historical context and atomic age cultural narrative. These cows brushed up against human history during their exposure at the world's first nuclear test and remained active members of the atomic age throughout their publicized life. The Alamogordo herd influenced nuclear research at Oak Ridge and their bodies caused disruptions for positive publicity and laboratory studies. The centrality of the Alamogordo herd at Oak Ridge challenges the stereotype that animals are passive objects solely acted upon, commodified, or dragged throughout the past. Understanding the central role of non-

¹²⁰ "‘Radioactive’ Calves Look and Act Normal," *The Washington Post*, July 12, 1947, 5.

human beings in human history can provide fresh insight on how the natural world deeply connected to and influenced human attempts to conquer the mysteries and fears of the atom.

Under the AEC, FCDA, and justification of “peaceful” atomic research, professionals continued to work with the atom after WWII. Still, they had to adjust their methods to ease or even gaslight public fear, by insinuating a sense of control and domination over the atom by understanding its long-term consequences. The Alamogordo herd were pivotal in this shift towards “peaceful” uses of the atom. Overall, this use of animals in atomic research exemplified an example to the American public of using atoms for “peace.” The Oak Ridge laboratory reassured the public of the safety of nuclear power in everyday American life by celebrating the Alamogordo herd’s reproductive success and seemingly healthy lives after their exposure.

While the public was generally aware of radiation dangers in the early twentieth century, the hazards or even possibility of radioactive fallout from an atomic bomb were unknown by the time Trinity exploded. The Alamogordo herd were the first victims of the atomic bomb and the earliest examples of evidence that the bomb could expose surrounding environments and living creatures to radioactive fallout far beyond the detonation site. In other words, the Alamogordo herd showcased for the first time that the dangers of an atomic bomb could spread across large distances and environments, as they were burned from the bomb while grazing about thirty miles away.¹²¹ The Alamogordo herd were the first victims of this entrance into the atomic age.

Alamogordo ranchers’ initial immediate cause for concern was the physical display of radiation exposure evident in the discoloration of the cows after the Trinity explosion. This

¹²¹ Szasz, *The Day the Sun Rose Twice*, 132.

discoloration, or beta burns, jeopardized the value of the cows' bodies on meat markets.¹²²

However, these discolored and burned cattle were still valuable to the anxious American public and researchers studying the atom for “peaceful” purposes. As a result, the U.S. Army bought the “damaged” cattle from the Alamogordo ranchers, Ted Coker and Homer Buraum, to utilize the herd for nuclear research efforts.¹²³ Of the over three hundred Hereford cattle exposed to radiation near the Trinity site, only a group of selected, severely burned cattle were sent to Oak Ridge. While source material varies regarding the specific number of cattle sent to Oak Ridge, the U.S. Army shipped about sixty cattle to the UT-AEC laboratory.¹²⁴ Herd members received a special sticker placed on their bodies that stated “these cattle are not diseased. They have been burned by the atomic bomb” before their shipment to Tennessee.¹²⁵ Once the Alamogordo herd arrived to Oak Ridge, they received a tattooed number branded on their skin with a hot iron.¹²⁶

The mysteries behind these atomic cows were so important that the Alamogordo herd, alongside American attempts to master the non-human world, influenced the establishment of a collaborative laboratory between the AEC and the University of Tennessee (UT). A.H. Holland, chief of the Office of Research and Medicine at the Oak Ridge Operations under the AEC reached out to the President of the University of Tennessee in Knoxville, C.E. Brehm, about establishing a management and research program for these cattle accidentally exposed to

¹²² Newell Stannard, *Radioactivity and Health: A History*. Pacific Northwest Laboratory Operated for the US. Department of Energy by Battelle Memorial Institute, October 1988, 1069.

¹²³ L. H. Hempelmann, “Nuclear Explosion 16 July 1945: Health Physics Report on Radioactive Contamination Throughout New Mexico,” (Los Alamos Scientific Laboratory: University of California, Los Alamos, New Mexico, 1947), 4.

¹²⁴ Tessmer, “Radioactive Fallout Effects on Skin,” 176.

¹²⁵ Szasz, *The Day the Sun Rose Twice*, 133.

¹²⁶ University of Tennessee Agricultural Experiment Station, “The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949” (1949), *Annual Report*, 163.

radiation. In late 1947, Head of the Department of Animal Husbandry, C.S. Hobbs, was appointed Vice Director to assist the development of this management proposal and organized technical personnel to study the herd. About five months later, the collaboration between the Atomic Energy Commission and the University of Tennessee, through the Agricultural Experiment Station in May 1948, established the UT-AEC Laboratory.¹²⁷ The Alamogordo herd's very existence directly informed the urgency to establish this laboratory.

The 1948 annual report for the Agricultural Experiment Station at the University of Tennessee announced this contract with notable terminology regarding the herd's status. The annual report stated that the Agricultural Experiment Station entered a contract with the AEC in 1948 to study "cattle that were injured when the experimental atom bomb exploded in New Mexico."¹²⁸ Noteworthy terminology associated with this herd included "damaged," which insinuated a loss of value and "injured," which implied a sense of negative harm or even evident suffering and discomfort these cattle endured after their exposure. Regarding the origins and purpose of the program, the 1949 annual report stated five principal points that outlined the urgent needs for this laboratory. The primary urgency behind this establishment of the UT-AEC laboratory directly centered around the Alamogordo herd.

¹²⁷ Thomas J. Whatley, *A History of the Tennessee Agricultural Experiment Station* (Knoxville: University of Tennessee, 1994), 55.

¹²⁸ University of Tennessee Agricultural Experiment Station, "The University of Tennessee Agricultural Experiment Station. Sixty-First Annual Report, 1948" (1948), *Annual Report*, 5.



Range cattle inadvertently exposed to radioactive dust in first atom bomb explosion in New Mexico, 1945, to be studied along with their offspring at University of Tennessee for possible effects. Gray hair, shown, was only effect immediately observable.

Figure 2 U.S. Atomic Energy Commission. Atomic Energy and the Life Sciences. Washington, U.S. Government. Printing Office 1949, 103.

For example, the UT-AEC program began because “Certain cattle and their offspring which had been accidentally exposed to the Alamogordo test bomb in July 1945 were located at Oak Ridge. These cattle represented important scientific material from the point of view of biological effects of radiation, and it was in the national interest that facilities be provided to enable a scientific study of these animals.”¹²⁹ As the program’s directors imagined, the Alamogordo herd was the principal reason for the lab’s establishment, however, terminology positions them as objects or “scientific material.”¹³⁰ As such, it speaks to the Cold War instinct of attempting to control the atom by mastering organisms. UT-AEC planners claimed that their facility was necessary both for the animals and national interest. Overall, examination of the herd directly aligned with efforts to control uncertainties of the atom by dominating organisms and seemingly ease both national anxiety and future emergencies.

The size and scope of the UT-AEC laboratory were impressive. A professor with the UT Animal Husbandry department named H.R. Duncan selected a site of 5,000 acres of land in the Oak Ridge Reservation along the Clinch River for the UT-AEC laboratory.¹³¹ The facility designated over nine miles of this land as fenced-in grazing space for the herd. Some facilities in the laboratory included an autopsy room and tissue dissection room to study animal flesh samples. The laboratory also included “hot” rooms where scientists carried out nuclear radiation exposure. Researchers used a radio-chemical and radio-biological laboratory to study chemical

¹²⁹ University of Tennessee Agricultural Experiment Station, “The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949” (1949), *Annual Report*, 158.

¹³⁰ University of Tennessee Agricultural Experiment Station, “The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949” (1949), *Annual Report*, 158.

¹³¹ “The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949,” 158.

reactions and radioactive isotopes.¹³² The UT-AEC facility also housed a “modern” operating room to perform surgeries on large animals.¹³³ Additionally, the grounds included a nutrition barn, radioactive counting rooms, a biochemistry laboratory, an animal room for small animals, and a darkroom.¹³⁴ Another mutual benefit of this collaboration with the university included the job opportunities that UT-AEC provided for qualified scientists and local graduate students increasingly researching atomic energy in agriculture. By the 1960s, the UT-AEC facility employed 160 permanent employees and the laboratory reached a value of about \$2 million.¹³⁵

The Alamogordo herd were not the only animals present in this Oak Ridge laboratory. The UT-AEC lab imported a group of control cattle to compare to the Alamogordo herd. Additionally, the laboratory conducted experiments with horses, sheep, hogs, chickens, rabbits, and rats.¹³⁶ While this laboratory started because of the Alamogordo herd, researchers also deliberately exposed lab animals to radiation to study any significant changes from exposure. For example, the UT-AEC laboratory housed a specialized apparatus called the “burro radiation field,” in which the scientists conducted full-body irradiation on large animals.¹³⁷

¹³² “The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949,” 161

¹³³ *UT-AEC Agricultural Research Laboratory* (Oak Ridge the Laboratory, 1966), 10.

¹³⁴ U.S. Atomic Energy Commission. *Atomic Energy and the Life Sciences*. Washington, U.S. Govt. Print. Off, 1949, 102.

¹³⁵ *UT-AEC Agricultural Research Laboratory*, 7.

¹³⁶ *UT-AEC Agricultural Research Laboratory*, 9.

¹³⁷ Curry, *Evolution Made to Order*, 170.

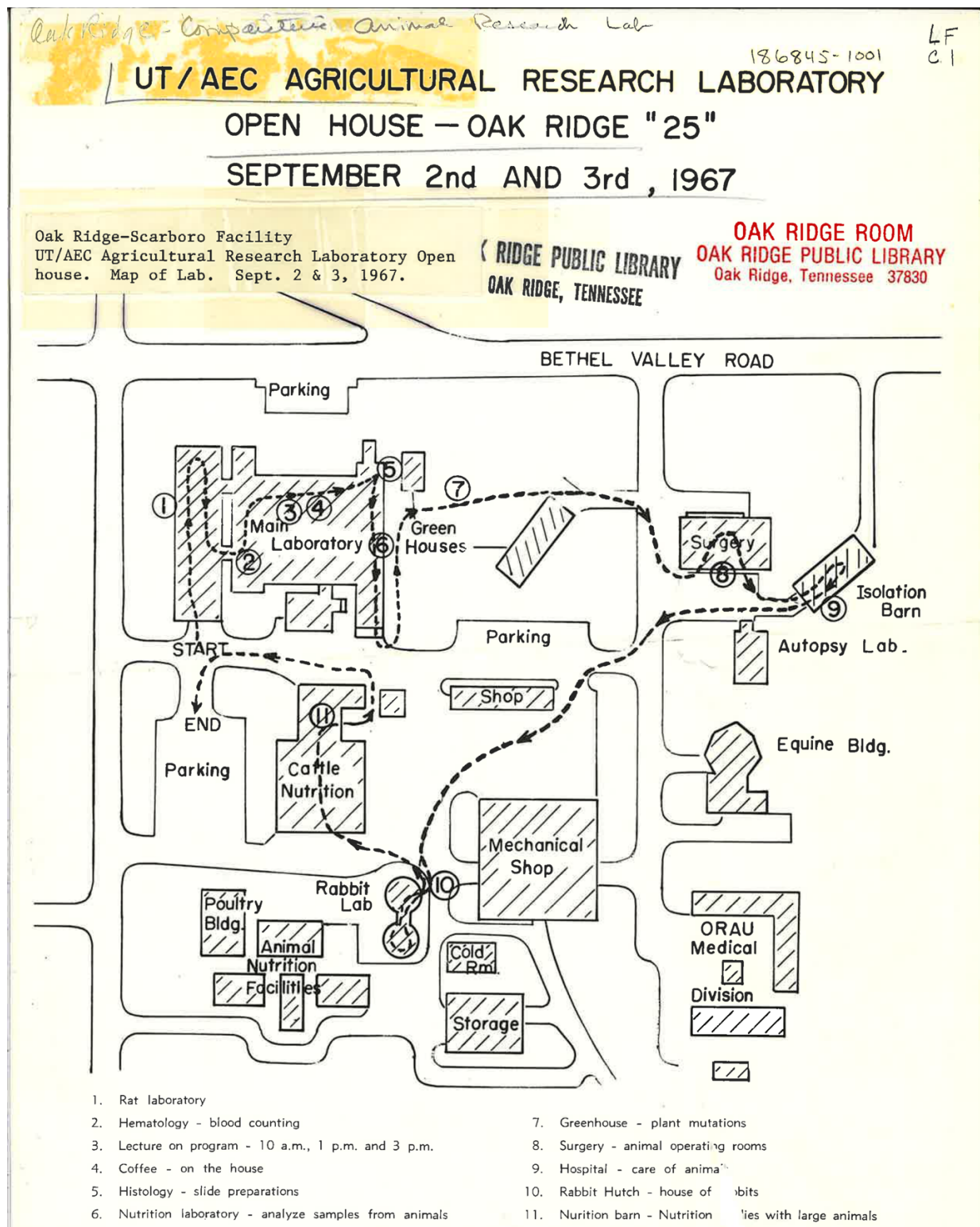


Figure 3 UT-AEC Research Laboratory Open House, Scan Courtesy of Michael Stallo, Oak Ridge Public Library.

The UT-AEC laboratory was foundational to understanding the long-term impacts of radiation exposure among the Alamogordo herd due to the observations and experiments that could reveal any negative consequences in the cows' reproductive and general health. In other words, it was essential to closely study these victims to gain mastery and knowledge regarding the consequences of radiation exposure. The laboratory observed the herd to study their general health and growth. Veterinarians conducted regular physical examinations of the cows and weighed the herd members monthly to monitor growth rates.¹³⁸ The laboratory also evaluated the long-term impacts of radiation on the herd's breeding efficiency, fertility, and the health of their offspring. Furthermore, experts conducted experiments on the herd to understand how radioactivity impacted the animals' tissue and organs.

J. Merrill Bird, farm superintendent at Oak Ridge, wrote a master's thesis, finalized by 1952, about the Alamogordo herd titled "The Effects of Irradiation from Atomic Bomb Fall-Out Upon a Group of Hereford Cattle." Bird confirmed the urgent need to study the herd because understanding the health of the herd had national consequences. Bird wrote that "Because little was known about the effects of any type of irradiation on farm animals, and because of great possibilities that human beings as well as other farm animals might be exposed to similar irritation, either from our own tests or from enemy action," there was a need for a detailed study on the Alamogordo herd.¹³⁹ Bird's thesis evaluated whether the Alamogordo herd experienced any germ plasma damage from radiation, pathological changes, whether malignant degeneration

¹³⁸ "The University of Tennessee Agricultural Experiment Station. Sixty-Second Annual Report, 1949," 163.

¹³⁹ James Merrill Bird, "The Effects of Irradiation from Atomic Bomb Fall-Out Upon a Group of Hereford Cattle," Thesis (M.S.) University of Tennessee, 1952, 1.

occurred on the herd's coat, and the impact of radiation on reproductive health. Bird compared the imported control group of cattle to the radioactive Alamogordo herd.

Another study included skin biopsy tests of the Alamogordo herd for over twelve years by Col. Carl F. Tessmer of the U.S. Army Medical Command.¹⁴⁰ Tessmer also served as the first director of the 1949 Atomic Bomb Casualty Commission.¹⁴¹ Additionally, Oak Ridge researchers studied the impacts radiation had on meat. For example, A. H. Holland, director of research and medicine at Oak Ridge, stated in 1949 that the AEC and UT project conducted research methods to help understand the "histology [the study of tissue] and edibility of meats."¹⁴² Researchers wanted to understand if there were any health hazards if humans consumed the meat of these radioactive cows. Understanding the impacts radiation had on cows' milk was another project conducted at the UT-AEC laboratory.¹⁴³ Despite these professional scientific studies of the herd, public coverage of the herd was never fully transparent and cohesive.

As soon as America entered the atomic age after Trinity, coverage and understanding of atomic weapons and the long-term impacts of them were conflicting and uncertain. Deliberately manipulated information regarding the consequences of radiation on the herds' bodies and immediate wellness of the herd persisted throughout the cattle's post-radiation stay at Oak Ridge. This is evident in both local and nationwide press coverage of the Alamogordo herd in newspapers and "Atoms for Peace" public brochures, and in the government documents, technical manuals, and scientific reports about the cattle.

¹⁴⁰ Tessmer, "Radioactive Fallout Effects on Skin," 176.

¹⁴¹ Tessmer, "Radioactive Fallout Effects on Skin," 189.

¹⁴² "The Story of Atomic Energy and Oak Ridge," *The Oak Ridger*, February 1, 1949.

¹⁴³ Stannard, *Radioactivity and Health: A History*, 1071.

The AEC and the UT-AEC laboratory published annual and semi-annual progress reports which frequently featured updates about the Alamogordo herd. However, even these government reports featured uncertainties and inconsistent statements about the herd. For example, an AEC report in 1949 cited that seven members of the Alamogordo herd passed away but plainly stated that the death was from “causes which could not definitely be attributed to their exposure.”¹⁴⁴ This statement reflects uncertainty surrounding causes of death for several herd members.

Additionally, even scientific reports on the herd published inconsistent findings about the health of the cattle, suggesting that the herd’s complex bodies were constantly changing and reacted in many different ways to the radioactive fallout over time. In other words, these cattle were complex sentient beings with a wide range of reactions to their exposure that were difficult for humans to gauge. For example, Bird’s thesis concluded in 1952 that in comparison to the control group of cattle, the Alamogordo herd had similar blood ranges, breeding efficiency, fertility, and generally satisfactory growth and weight. Some of the most significant differences between the Alamogordo herd in contrast to the control group were their physical coats, described as gray, thin, and even “dead appearing.”¹⁴⁵ Bird also found that artificially produced wounds took three times as long to heal than wounds did on the control group.¹⁴⁶

Diverging from Bird’s findings, Tessmer of the U.S. Army Medical Command, published a report which outlined the findings of skin and tissue biopsies taken from the Alamogordo herd for about twelve years, beginning in 1949. The 1961 report concluded that the animals’ skin tissue exposed to fallout endured “a series of changes indicative of radiation effect.”¹⁴⁷ Overall

¹⁴⁴ AEC, *Atomic Energy and the Life Sciences*, 102.

¹⁴⁵ Bird, “The Effects of Irradiation,” 65.

¹⁴⁶ Bird, “The Effects of Irradiation,” 65.

¹⁴⁷ Tessmer, “Radioactive Fallout Effects on Skin,” 189.

Tessmer concluded that the major patterns of changes found from the biopsies included “depth effect, tissue sensitivity, vascular changes, pigment and hair alternations and character of fibroblastic response.”¹⁴⁸ In addition, by the early 1960s, veterinarians at the UT-AEC laboratory discovered that three of the cows developed cancer about fifteen years after the herd’s exposure. Specifically, these cows had squamous cell carcinoma around the site of their radiation burns.¹⁴⁹

Few in the general public directly consumed these complex scientific reports. That consistent element of secrecy after WWII continued to impact the translation of this information to the public. For example, confidentiality was evident in Bird’s thesis as he explained that UT and Oak Ridge research workers unsuccessfully requested background information on the irradiated cattle which was “not available because it was a part of the TOP SECRET report on the first atomic bomb explosion.”¹⁵⁰ Moreover, in a letter correspondence between AEC officials about Bird’s finalized thesis, Kenneth Kasschau, director of the Research and Medicine Division at the AEC wrote that the thesis should not be printed for the public but only for students and animal husbandry experts.¹⁵¹ The AEC Biology Branch Chief, C. S. Shoup agreed with this confidentiality when replying that “In view of the negative character of the findings as to effects from the exposures and that the body of the thesis deals with general animal husbandry data, I do not believe we should make an effort to get the report into print at this time.”¹⁵²

¹⁴⁸ Tessmer, “Radioactive Fallout Effects on Skin,” 189.

¹⁴⁹ Newell Stannard, *Radioactivity and Health: A History*, 1071.

¹⁵⁰ James Merrill Bird, “The Effects of Irradiation,” 2.

¹⁵¹ “Thesis Report on Alamogordo Cattle, UT-AEC,” 1953. National Archives and Records Administration, Morrow, GA. RG 326 Atomic Energy Commission. Laboratory and University Div. Official Files 1944-1966 (Entry 019, Boxes 1-579), box 93.

¹⁵² “Thesis Report on Alamogordo Cattle, UT-AEC,” 4.



Figure 4 Oak Ridge scientists using a Geiger counter on a cow to measure radiation; "Experimentation on livestock by the Atomic Energy Commission at Oak Ridge, Tennessee," Westcott, Edward, RG 82, Box 49, File 114, 20804, Tennessee Virtual Archive. Courtesy of the Tennessee State Library & Archives.

Overall, a majority of public facing coverage of the herd remained simplistic, positive, and even celebratory. Media looked towards the herd as proof that radiation exposure was not as destructive and mysterious as American public panic may assume. Publicity coverage rarely highlighted any malignant discoveries of cancer, deep tissue sensitive, and wound healing issues that other scientific experiments affirmed.¹⁵³ This media positivity aligned with the laboratory's direct effort to ease public concern about the unknowns of radioactive exposure by displaying a seemingly controlled grasp over the herd's long-term health. As early as 1947, the *Washington Post* published that the "radioactive calves look and act normal."¹⁵⁴ The same month as the UT-AEC laboratory's official establishment in 1948, the *Nashville Tennessean* covered details of the project at Oak Ridge and stressed the initial aim to study the Alamogordo herd. President of UT, C. E. Brehm reported that the program reflected "the beginning of a search for peace-time uses of atomic energy in the field of agriculture."¹⁵⁵ In another interview at the end of 1948, Brehm celebrated the Alamogordo herd research at Oak Ridge due to the opportunity it provided young students to gain knowledge regarding genetics and effects of radiation exposure. According to Brehm, these research opportunities for UT students at the Oak Ridge facility provided leadership skills and even patriotic work to "perpetuate our democracy."¹⁵⁶ These praises about the UT-AEC laboratory aligned with ideals associated with civil defense and "Atoms for Peace."

In the 1950s, William L. Laurence, who was an official reporter for the Manhattan Project and first to write newspaper coverage about the atomic bomb, discussed the post WWII

¹⁵³ "'Radioactive' Calves Look and Act Normal," *The Washington Post*, July 12, 1947, 5.

¹⁵⁴ "'Radioactive' Calves Look and Act Normal," *The Washington Post*, July 12, 1947, 5.

¹⁵⁵ "UT Plans Farm for Atom Study," *Nashville Tennessean*, May 17, 1948, 3.

¹⁵⁶ "Brehm Outlines UT Expansion With \$24 Million," *Nashville Tennessean*, December 12, 1948, 3.

impacts of atomic weapons in a piece for the *New York Times*.¹⁵⁷ The *New York Times* published Laurence's article titled "Atom Effects: World-Wide Ruin by Contamination Held Doubtful" in their "Effects of Atom Weapons" civil defense series. Alongside digestible explanations of fission processes, uranium, plutonium, and safe levels of x-ray absorption in human bodies, Laurence cited the Alamogordo herd to analyze how radiation "dust" impacted animals and agriculture.¹⁵⁸ Laurence reassuringly stated that the herd's only reaction to radiation was the discoloration on their coat and noted that the burns also caused blister lesions on their skin. Laurence hastily concluded that by the end of 1949, only a year after the establishment of the UT-AEC laboratory, the herd successfully reproduced and displayed no other issues than their gray hair.

Booklets and brochures about the work at the UT-AEC laboratory directly spoke to the national "Atoms for Peace" campaign. Numerous colorful booklets and brochures with easy to digest language described the work at Oak Ridge as an example of "peaceful" uses of the atom, as if a visit to the Oak Ridge National Laboratory offered "A glimpse of peaceful atoms at work."¹⁵⁹ This glimpse into the "peaceful" work at Oak Ridge described the tests on experimental farms with cattle. For example, along with the reproductive procedures and close examination of the Alamogordo herd, the UT-AEC research program also injected isotopes into unexposed cattle subjects to determine if radioactive rays could provide better diets with more minerals, better disease defense, and aid muscle and bone development. This glimpse into the

¹⁵⁷ Boyer, *By the Bomb's Early Light*, 117.

¹⁵⁸ "Atom Effects: World-Wide Ruin by Contamination Held Doubtful," *The New York Times*, August 19, 1950, 8.

¹⁵⁹ "The Atom in Our Hands," Union Carbide Corporation, 8th Printed Edition 1964. Hodges Library Special Collections Alvin Weinberg Papers: MPA-0332, Box 13, Folder 10, "Oak Ridge National Laboratory promotional brochures," 17.

work at Oak Ridge suggested that these farm experiments with cattle offered a greater good to average Americans, such as local farmers around Oak Ridge, because “this research will show farmers how to cut feed costs and get more meat on the hoof.”¹⁶⁰

In the 1960s, Edward R. Ricciuti, head of the Department for the New York Zoological Society published a booklet under the AEC’s “Understanding the Atom” series on the central role of animals in atomic research. Ricciuti praised the work with the Alamogordo herd at Oak Ridge. Ricciuti described the “two-edged relationship” of studying atomic radiation on living organisms. While researching atoms “opened new frontiers” in biology and medicine, Ricciuti stressed that there still remained unknowns about how radiation impacted living organisms. Ricciuti stated, “the action of radiation on the living organisms, can be for better or worse.”¹⁶¹ To fully understand how nuclear energy could be used “for the good of mankind,” experiments with animals were necessary.

Ricciuti justified animal experimentation because exposing animals to radiation and studying the changes they endured was the closest, and seemingly safest step to understanding how radioactive fallout could impact humans. Ricciuti wrote that “from lesser creatures, scientists can predict what will happen to the most advanced animal- man.” While this language towards the radioactive animals situates them as “lesser” than humans, Ricciuti concluded with the similarity between humans and non-humans writing that “after all, man is not very different physiologically, from other animals, especially mammals.”¹⁶²

¹⁶⁰ “The Atom in our Hands,” 20.

¹⁶¹ Ricciuti “Animals in Atomic Research,” 9.

¹⁶² Ricciuti, “Animals in Atomic Research,” 10.

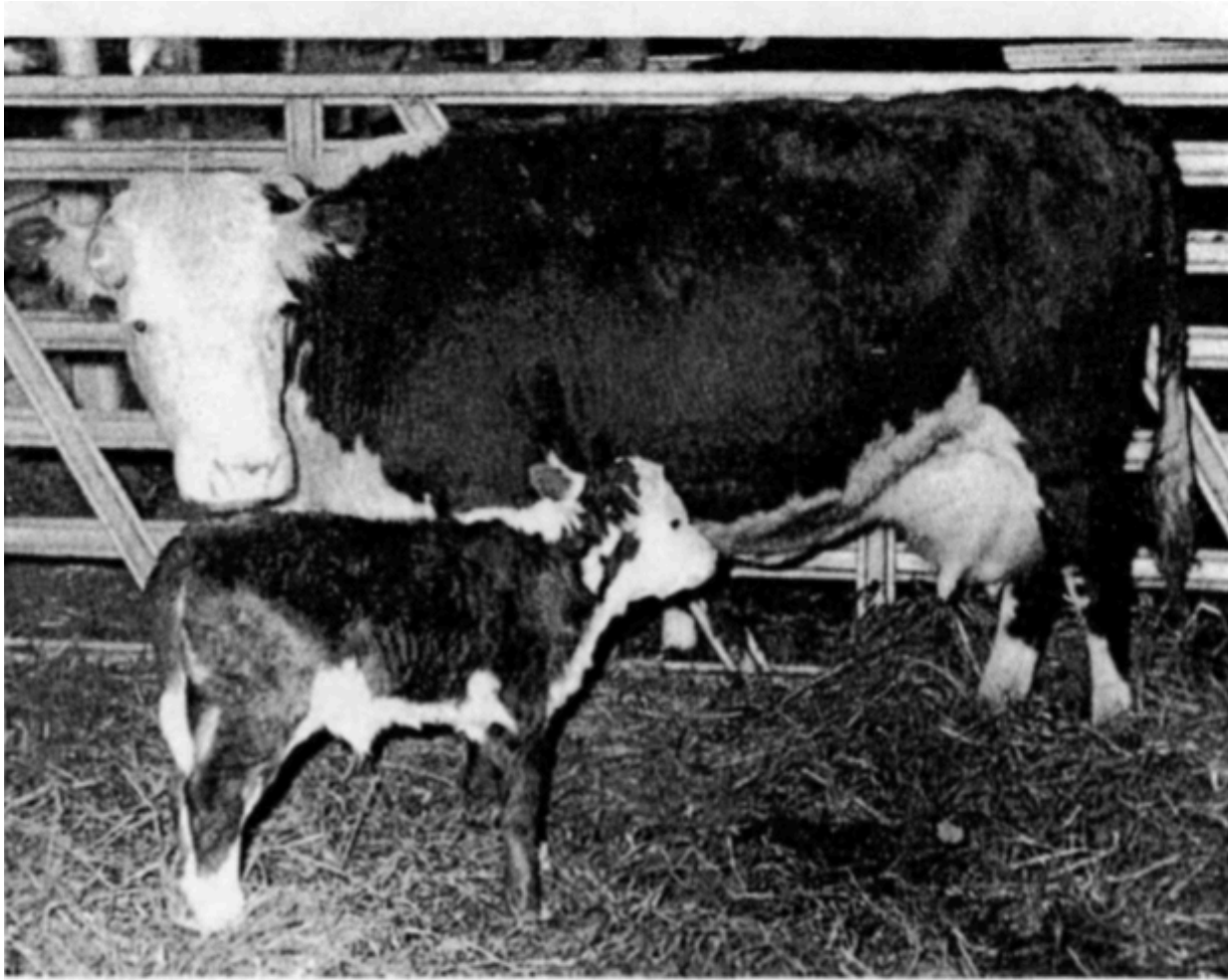
The most positive celebration of the herd centered around their fertility and reproductive success. Americans celebrated the long life of Granny, the longest surviving member of the Alamogordo herd. Reporters and Oak Ridge researchers commemorated Granny as proof that atomic exposure did not always have detrimental impacts. Ricciuti even directly configured the long life of Granny in his work as proof that radioactive exposure did not interfere with cattle's reproductive success because Granny gave birth to a healthy calf every year for sixteen years after her exposure.

The Alamogordo herd received significant elements of fame in this Cold War cultural narrative. The reason for Granny's fame included her brush with history and reproductive success thereafter, which eased public concerns about fallout. Granny received worldwide attention as both Tennessee and national newspaper headlines followed Granny's post-radiation life at Oak Ridge. Fortunately, extant video footage also celebrated Granny's reproductively successful life.

A 1970 short film produced by the Extension Service and the Comparative Animal Research Laboratory (CARL) of the UT Agricultural Experiment Station described how average American farmers could protect their livestock from radioactive fallout.¹⁶³ The video explains that animals which survived radioactive fallout could still live useful lives. The film then shows Granny, who looks directly at the camera, with a small calf behind her. The clip notes her successful birth of sixteen consecutive calves after fallout exposure as proof that radioactive animals could still be productive.¹⁶⁴

¹⁶³ Comparative Animal Research Facility (CARL) later name in the 1970s of the UT-AEC Laboratory; "Comparative Animal Research Laboratory," n.d. brochure. Oak Ridge Room, Oak Ridge Public Library.

¹⁶⁴ "Protect Your Livestock from Fallout," Short Film 1970. Accessed by the East Tennessee Historical Society, 2023, 22:08, <https://vimeo.com/794624902/f1d183b0ad>.



Granny and her 15th calf.

Figure 5 Granny and one of her calves; Edward R. Ricciuti, "Animals in Atomic Research," U.S. Atomic Energy Commission: Division of Technical Information, 1967.

This consistent celebration of Granny's reproductive success correlates with ideas in scholarship regarding ecofeminism. Both public facing and behind the scenes scientific research prioritized research of the herds' reproductive lives. Close scrutiny of the cow's fertility reflects how the UT-AEC laboratory exploited the herds' bodies for reproductive purposes to prove the benign nature of radiation. Literature on ecofeminism argues that the exploitation of women's bodies deeply aligns with the exploitation of the natural world to the extent that "both women and nature are treated as resources."¹⁶⁵ Ecofeminists suggest that the oppression of animal species is frequently parallel to demands on women's reproductive capacities.¹⁶⁶ Similarly, the pressure on Granny to produce a new calf for every year of her life after exposure reveals that the government sexually exploited this herd for their own benefits, to prove that radiation did not affect livestock's ability to reproduce. The celebration of Granny's reproduction across nationwide headlines suggests that Granny's life and even her name functioned as a piece of "Atoms for Peace" government propaganda.

Furthermore, research on the Alamogordo herd and other imported animals at the Oak Ridge facilities configure into work regarding the history of animal rights and experimentation. The exploitation of animals in biomedical research stirred significant philosophical, ethical, and social debates throughout the past.¹⁶⁷ For example, in the second half of the nineteenth century antivivisection movements emerged in Europe along with the start of the first animal protection

¹⁶⁵ Ariel Salleh, "Ecofeminism as Politics (Interview)," 2017.

¹⁶⁶ For example, ecofeminist writer Greta Gaard traces the connection that "women's socially reproductive labor is analogous to the female reproductive capacities and lives that are exploited in the production of cows' milk and the female egg-laying capacity that is exploited in chickens." Greta Gaard, "Ecofeminism Revisited: Rejecting Essentialism and Re-Placing Species in a Material Feminist Environmentalism," *Feminist Formations* 23, no. 2 (2011), 36.

¹⁶⁷ Nuno Henrique Franco, "Animal Experiments in Biomedical Research: A Historical Perspective," *Animals* 3, no. 1 (2013), 238.

society.¹⁶⁸ In 1975, Peter Singer’s pivotal work, *Animal Liberation*, forwarded philosophical arguments regarding the intrinsic rights of animals.¹⁶⁹ Despite growing protest against animal exploitation for scientific experiments, researchers continually justify testing on animals as a means to further the progress of medical and scientific advancement for humans. Sources praising research of the Alamogordo herd featured these justifications of animal research for the greater good of human health and knowledge. For example, Ricciuti’s AEC booklet about animals in atomic research reasoned that cows were “lesser” beings yet still served as the closest test subject to advance atomic technologies benefit to human health.¹⁷⁰

Another cattle from the famous herd was named Atom. Atom was an irradiated bull from the Alamogordo herd. Similar to Granny, researchers at the UT-AEC laboratory closely studied Atom for his reproductive capacities. The name Atom suggests a reference to Christian teachings of Adam, whose reproduction was essential for humankind. A Knoxville newspaper stated in the 1950s that the UT-AEC laboratory scientists “observe his love life more closely than the gossip columnists watch the Hollywood stars.”¹⁷¹ This coverage reflects the fame linked to the Alamogordo herd. Furthermore, a cow from the Oak Ridge control group went by the name Pal, short for Palmetto Perfection, described as a “fine purebred Hereford bull.”¹⁷² Coverage of Atom and Pal dramatized a rivalry between the irradiated Alamogordo herd versus the control group when explaining that “there was a feeling of competition between Atom and Pal.”¹⁷³ However,

¹⁶⁸ Franco, “Animal Experiments in Biomedical Research,” 251.

¹⁶⁹ Peter Singer, *Animal Liberation Now: The Definitive Classic Renewed* (New York: Harper Perennial, 2023).

¹⁷⁰ Ricciuti, “Animals in Atomic Research,” 10.

¹⁷¹ “First Victims of A-Bomb Fall-out, Cattle Thrive in 4th Generation,” *The Knoxville News-Sentinel*, July 17, 1955, 35.

¹⁷² “First Victims,” *The Knoxville News-Sentinel*, July 17, 1955, 35.

¹⁷³ “First Victims,” *The Knoxville News-Sentinel*, July 17, 1955, 35.

media about the Alamogordo herd was still complex and similar to government documents, often conflicting.

Among the handful of negative coverage regarding the herd, the *New York Times* in 1950 stated that the Trinity bomb explosion caused “definite pre-cancerous conditions in the animals,” directly referencing the Alamogordo herd studied at Oak Ridge.¹⁷⁴ This paper cited evidence of these pre-cancerous conditions from “tests by Government pathologists” and specifically interviewed Col. John H. Rust, a veterinarian surgeon and member of the Army Medical Service Corps. Despite Bird’s finalized thesis in 1952, Bird spoke with *The Washington Post* four years later in 1956 which published that Bird’s thesis proved the herd “escaped ill.”¹⁷⁵ Bird reported to the newspaper that the beta burns were merely surface burns and the discoloration was even common for hair breakage on all animals, such as horses whose skin rubs against saddles which causes their coat to grow back white. Bird also added that no genetic defects were apparent and while genetic issues were possible, they were “far from likely.”¹⁷⁶ This is a peculiar interview with the *Washington Post*, given the findings in Bird’s thesis of delayed wound healing suggesting deep tissue issues, whereas his translation of such findings to a national newspaper reassured that even the discoloration of the radioactive cows could occur on any farm animal with coat breakage.

The *Nashville Tennessean* in the early 1960s reported on the Alamogordo herd member that developed skin cancer over fifteen years after her exposure. The paper cited veterinarian Daniel G. Brown with the UT-AEC research laboratory. Brown explained in the article that

¹⁷⁴ “Atomic Bombs Made Cows Pre-Cancerous,” *The New York Times*, August 9, 1950, 11.

¹⁷⁵ “Study Shows Atom-Cattle Escaped Ills,” *The Washington Post* July 16, 1956, 12.

¹⁷⁶ “Study Shows Atom-Cattle Escaped Ills,” *The Washington Post* July 16, 1956, 12.

squamous cell carcinoma developed around the cow's right eye. Brown conducted surgery on the cow to remove the cancerous eye in 1959 but unfortunately discovered that cancer penetrated deeply into the tissue. The laboratory attempted to use even more radiation to halt the malignant cancer but was unsuccessful so decided to euthanize the cow shortly after in April 1960. The cow was seventeen years old. Alarming, the article explained that this particular cancer could be found in humans, reflecting how humans could experience similar dangers of radioactive fallout that the Alamogordo herd endured. Additionally, Brown stated in the article the detection of eye cancer in two other herd members at the laboratory.¹⁷⁷

Brown explained that "there is no reasonable doubt as to the role of radiation as the initial agent and as the major source of damage in the area of skin where the cancer occurred."¹⁷⁸ Brown continued that "I think we can say that if the cow had not suffered the skin damage" referencing the skin damage from her Trinity exposure "she wouldn't have had the cancer in that area."¹⁷⁹ Ironically, Brown, similar to numerous other primary sources, directly contradicted this point when concluding that "we can't prove the cancer of the eye itself was caused by the radiation."¹⁸⁰ This deflection and broad sweeping simplification of radiation consequences suggest the attempts to seemingly share information with the public to a limited extent to avoid public panic about cancer discovered after radiation. The newspaper article then, of course, touched on the cows primarily positive reproductive past. This cow notably had twelve calves since her Trinity exposure. However, the article stated that she also had two stillborn calves. This

¹⁷⁷ "Cow in A-Bomb Test Shows Skin Cancer," *The Nashville Tennessean*, January 24, 1962, 2.

¹⁷⁸ "Cow in A-Bomb Test Shows Skin Cancer," *The Nashville Tennessean*, January 24, 1962, 2.

¹⁷⁹ "Cow in A-Bomb Test Shows Skin Cancer," *The Nashville Tennessean*, January 24, 1962, 2.

¹⁸⁰ "Cow in A-Bomb Test Shows Skin Cancer," *The Nashville Tennessean*, January 24, 1962, 2.

was a rare mention of negative outcomes regarding the reproductive life of an Alamogordo herd member.

Another reference to negative consequences that directly contradicted Oak Ridge promotional booklets came from the '70s short film for farmers on how to protect their livestock from nuclear fallout. As previously noted, the film celebrates Granny as an example of radioactive cattle living “useful and productive lives.”¹⁸¹ However, the film also cites some alarming signs of negative results from the UT-AEC agricultural research laboratory experiments that injected cattle feed with radioactive isotopes. While the late 1960s “A glimpse of peaceful atoms at work” booklet headline featured coverage of this feeding experiment as a positive test that could safely benefit the cattle’s growth and nutrition, the film underscored dangers from the experiment.¹⁸² The film directly references the stimulated fallout research at the UT-AEC laboratory.¹⁸³ The coverage of this information directly speaks to the audience of American farmers, as the film signals the importance of remembering these survival signs and the different types of exposure damage that their livestock could endure from fallout. The film attempts to ease farmers’ atomic anxiety when explaining that “radiation damage doesn’t necessarily always mean death or loss of productivity.”¹⁸⁴ Staying aware of these signs would allow farmers to detect the livestock’s survival rate and avoid panic slaughter. Oak Ridge experiment results revealed that intake of radioactive materials while grazing in an open field caused significant harmful and even deadly consequences. The film describes that “Radioactive particles eaten by these animals at level approximating their intake while grazing fallout covered pastures was

¹⁸¹ “Protect Your Livestock from Fallout,” 22:05.

¹⁸² “The Atom in our Hands,” 17.

¹⁸³ “Protect Your Livestock from Fallout,” 10:44.

¹⁸⁴ “Protect Your Livestock from Fallout,” 10:30.

enough to cause their deaths in sixty days.”¹⁸⁵ If grazing cattle consumed a large amount of radioactive material, the animals stop eating within ten days.¹⁸⁶ Other signs included grinding of teeth, vomiting and diarrhea. Severe diarrhea could signal death within twenty days and animals that could not stand up also signaled death shortly after. Even signs for cattle confined in barns were severe.¹⁸⁷ These included loss of appetite, listlessness, fever, stiffness, and knuckling of fetlocks, all of which could indicate “approaching death.”¹⁸⁸ While the film pushes this knowledge as productive information for farmers to stay aware of survival signs, it completely contradicts coverage of these radioactive feeding experiments as ones that enhanced wellness. Instead, the film indicates that consumption of radioactive materials could cause severe side effects and death. Within all of this contradictory and manipulated coverage, human efforts of control over fallout consequences erased the significant suffering these animals endured after exposure.

The UT-AEC laboratory euthanized Granny in 1964 due to “advanced age.”¹⁸⁹ The somber yet continuously celebratory tone of reporting on Granny’s death bolstered that her reproductive history had “no fault” because she gave birth to one healthy calf every year after her sixteen years at Oak Ridge post radiation.¹⁹⁰ Granny was twenty-one years old by the time the UT-AEC lab put her to sleep.¹⁹¹ Once again, even the coverage of Granny’s death rang tones of

¹⁸⁵ “Protect Your Livestock from Fallout,” 11:11.

¹⁸⁶ “Protect Your Livestock from Fallout,” 11:30.

¹⁸⁷ “Protect Your Livestock from Fallout,” 12:00.

¹⁸⁸ “Protect Your Livestock from Fallout,” 12:30.

¹⁸⁹ “Cow 'Dusted' With Radiation In '45 Put to Death by A.E.C.,” *The New York Times*, November 8, 1964, 77.

¹⁹⁰ “Cow 'Dusted' With Radiation,” *The New York Times*, November 8, 1964, 77.

¹⁹¹ The average lifespan of cattle is about twenty years; Marianne Buza Murawski, “What is the buzz around cow longevity?” Michigan State University Extension, September 23, 2022.

conflicting and inconsistent information. For example, the *New York Times*, after celebrating the reproductive health of Granny, briefly explained the history of the Alamogordo herd and falsely stated that “no cancer was ever developed” in any of the herd members at Oak Ridge¹⁹²

While Granny was the last surviving member of the group sent to Oak Ridge, The UT-AEC laboratory studied up to four generations of the Alamogordo herd. Unfortunately, sources suggest that many members of the Alamogordo herd family were swiftly sent off to slaughter. As early as 1949 some of the cattle at Oak Ridge were anaplasmosis carriers and those carriers were sent to slaughter.¹⁹³ Anaplasmosis is a blood cell parasite that can easily spread between animals through a fly or tick bite. This blood disease causes cattle to suffer from fever, anorexia, weakness, aggression, decreased milk production, and sudden death.¹⁹⁴ As a result, the cattle which carried anaplasmosis could not be around other members of the herd due to the likely transmission of the disease. However, according to the UT-AEC scientists, those carriers were still safe for humans to consume. Atom was one of the carriers sold to slaughter in 1950.¹⁹⁵ Additionally, the *Nashville Tennessean* carelessly stated about the Alamogordo herd that “over the years, most of the animals have been killed off because they carried diseases.”¹⁹⁶ However, Bird notably stated during the time of his thesis research with the herd that he hoped to let the herd members “live just as long as they can.”¹⁹⁷

¹⁹² “Cow 'Dusted' With Radiation,” *The New York Times*, November 8, 1964, 77.

¹⁹³ “First Victims,” *The Knoxville News-Sentinel*, July 17, 1955, 35

¹⁹⁴ Amy Young, “Bovine Rrythrocytic Anaplasmosis,” UC Davis Veterinary Medicine, February 3, 2020.

¹⁹⁵ “First Victims,” *The Knoxville News-Sentinel*, July 17, 1955, 35

¹⁹⁶ “Cow in A-Bomb Test Shows Skin Cancer,” *The Nashville Tennessean*, January 24, 1962, 2.

¹⁹⁷ “First Victims,” *The Knoxville News-Sentinel*, 35.



Figure 6 Bird, Farm Superintendent, and Hobbs, Vice Director, posing with last surviving members of the herd; "First Victims of A-Bomb Fall-out, Cattle Thrive in 4th Generation," The Knoxville News-Sentinel, July 17, 1955, 35.

There seemed to be minimal concern about the food safety of these radioactive cattle's meat even though the laboratory worked to understand "the transport of radionuclides into man's food chain," yet still sent Atom off to the butcher due to the danger anaplasmosis posed to other livestock.¹⁹⁸ The '70s "Protect your Livestock from Fallout" film consistently stressed that farmers could still send their exposed animals off to slaughter so long as they pass "routine slaughterhouse standards and health regulations."¹⁹⁹ The video emphasized this in order to shine light on the need for coordination among local agricultural officials and American livestock farmers, in hopes to prevent "panic slaughter" of radioactive livestock due to, according to the film, the false panic that they were no longer valuable on meat markets.²⁰⁰

Just because the Alamogordo herd were nationally known did not make them immune to thoughtless slaughter, let alone respect as these sources, even while celebrating some of these cattle, oftentimes still viewed these animals as "lesser creatures."²⁰¹ The very fact that some of the Alamogordo herd members developed cancer years after their exposure, and how public and government documents either directly ignored this or over looked it as an uncertainty that radiation even caused the cancer, speaks to the motive of using this herd to prove the benign nature of radiation. The UT-AEC laboratory studied these cattle for over twenty years to grasp the consequences of radiation. However, when experiments revealed negative developments from radiation, such as deep tissue impact, delayed wound healing, and skin cancer, the journalists and even veterinarians reporting on these findings often swept these consequences

¹⁹⁸ C. R. Richmond, "Transfer of Radionuclides to Animals - An Historical Perspective of Work Done in The United States," Oak Ridge National Laboratory, 2008, 8.

¹⁹⁹ "Protect Your Livestock from Fallout," 21:38.

²⁰⁰ "Protect Your Livestock from Fallout," 21:36.

²⁰¹ Ricciuti, "Animals in Atomic Research," 10.

under the rug by simply reassuring readers that these consequences could not definitely connect to their exposure. Regardless, evidence suggests that radiation did cause irreversible damage, as seen in the findings of skin cancer that deeply penetrated around the sites of the cow's beta burns.

Ultimately, this is a story of humans trying to master the atom by controlling nature. However, as inconsistencies in public and scientific sources displayed, coverage of the herd remained ambivalent by the time of Granny's death in 1964. This uncertainty speaks to the unease behind the complex and unpredictable reactions the cattle's bodies showcased over time. In other words, inconsistent information regarding the Alamogordo herd uncovers human unease when nature fights back. Humans inability to fully grasp the consequences of nuclear weapons aligns with the historical context of this moment in history when Granny was euthanized.

In 1964, the year Granny passed away, Americans still looked to the natural world as a serene space that needed protection from nuclear destruction. The dramatic Lyndon B. Johnson presidential campaign commercial, "Peace, Little Girl," featured strong connotations regarding the natural world.²⁰² This antinuclear political commercial shows a young child in a serene field of trees and wildflowers, with birds singing in the background. This young girl is holding a daisy and counting off the petals of the flowers, even mistaking some of her numbers, all the more shining light on the reality, innocence, and peacefulness of the scene. The clip then stops and zooms into the child's eye as a man's voice counts down the detonation of an atomic bomb.

The clip at the end of the countdown depicts the dramatic atomic bomb explosion with its distinct mushroom-like ball of fire and loud explosion sound, a significant departure from the

²⁰² Tony Schwartz and Monique Luiz, "Peace, Little Girl," [Daisy political spot] 1964. Video.

peaceful scene of nature surrounding the young child. The daisy commercial dramatically states during the explosion scene that “these are the stakes,” and ends that “we must love each other, or we must die.”²⁰³ While this dramatic commercial directly references the need to protect “God’s children,” the fact that the young girl was standing in a natural environment holding a daisy flower shines light on the centrality of nature that the atomic age threatens. This depiction of the environment in the political commercial insinuates the potential for destruction of the natural world through the misuse of atomic weapons. This concept aligns with the Alamogordo herd because the UT-AEC laboratory advocated the importance of their research in order to understand the consequences radioactive fallout had on livestock, knowledge that could help preserve cattle production moving forward in the future, similar to how voting for LBJ could preserve that serene wildflower field and innocent child.

As Rachel Carson established in her foundational 1960s book, *Silent Spring*, “nature fights back.”²⁰⁴ This was what the Alamogordo herd did because despite efforts from the UT-AEC laboratory to control this herd and prove mastery over the non-human world, the cattle thwarted these human narratives of control. First, the herd, along with atomic anxieties, civil defense efforts, and “Atoms for Peace” work, directly influenced the establishment of a large-scale leading laboratory at Oak Ridge. Additionally, their bodies reacted in unpredictable ways to the irreversible damage from radiation, suggesting the limitations on the human mastery of the atom because even through seemingly “peaceful” nuclear research, there were still negative and undesirable repercussions and reactions. In many ways, referring to the cattle as “damaged” or “lesser creatures,” was all the more a strategy for humans to configure these animals into passive

²⁰³ Schwartz and Luiz, “Peace, Little Girl,” 0:56.

²⁰⁴ Carson, *Silent Spring*, 245.

objects only useful as meat or “scientific material.”²⁰⁵ Ironically, these cattle received national fame and worldwide interest, even to the extent that they received “red carpet treatment.”²⁰⁶

Once again, this aligns with the centrality of non-human beings in history; they refused to mold to the scientific desire for optimal health after exposure, and still awed and fascinated the public when doing so.

²⁰⁵ Szasz, *The Day the Sun Rose Twice*, 134.

²⁰⁶ Szasz, *The Day the Sun Rose Twice*, 133.

Conclusion

Long-term ecological consequences of science and technology continue to deeply impact American life in the twenty-first century. The Alamogordo herd, as an example of accidental radiation exposure of the surrounding environment and livestock from the first atomic bomb test demonstrates that the natural world and non-human creatures also faced the consequences of atomic research. Furthermore, this is a story of humans' inability to fully control the consequences of nuclear technology and chemical toxins. Human-made disasters frequently occur when handling nuclear and chemical technology. Americans continually struggle to fully grasp the results of contamination disasters as dangerous toxins frequently contaminate the environment. For example, the 1999 federal suit and 2004 class action lawsuit against the West Virginia DuPont Plant is a prime example of contemporary censored consequences of contamination.

In 1999, Defense Attorney Rob Billot defended cattle farmer Wilbur Tennant. Tennant complained of significant behavior change and death rates in his cattle and surrounding wildlife around his generational farm of 600 acres with up to 200 cattle in Parkersburg, West Virginia. The Dry Run Creek ran through Tennant's property. Nearby their property was the Dry Run Landfill, a waste landfill for the nearby DuPont chemical plant. Tennant's cattle increasingly died suddenly or displayed significant behavior changes such as increased "deranged" aggression and charging. Physical changes also occurred, such as major weightless, blackened teeth, and birth deformities.²⁰⁷

²⁰⁷ Nathaniel Rich, "The Lawyer Who Became DuPont's Worst Nightmare," *The New York Times*, January 6, 2016.

Bilott filed a federal suit against DuPont in 1999, which caused DuPont and the U.S. Environmental Protection Agency advisors to study the property. Their ruling declared that DuPont had no responsibility for the cattle's death and poor health; instead, that was the responsibility of Tennant's inadequate cattle care skills. As Bilott and his environmental team continued investigating DuPont's history, they discovered shocking details of previously suppressed information. DuPont, in 1951, began manufacturing Teflon, which contained the chemical PFOA (Perfluorooctanoic acid). This hazardous chemical can cause the development of pancreatic cancer, liver tumors, and birth defects in both human and non-human beings. By 1984, DuPont was aware that PFOA polluted drinking water supply sites around the plant but refused to disclose and admit these findings in court. PFOA was not the only chemical of concern spilling from the factory because DuPont also released over 60,000 other synthetic unregulated chemicals into the environment. In 1990, nine years before the first lawsuit, DuPont dumped 7,100 tons of PFOA into the stream that ran through Tennant's property. Due to the dumping of these toxins, the creek accumulated piles of "soapy froth," and the cattle and wildlife, such as deer, that drank from the creek suffered significantly.²⁰⁸

In 2001, Bilott filed a class action lawsuit that claimed 70,000 people were drinking poisoned water in West Virginia and Southern Ohio because of DuPont's chemical waste. By 2004, DuPont settled this lawsuit with promises of filtration plants in water districts and a \$70 million cash award to fund health tests for locals that consumed contaminated water.²⁰⁹ This case

²⁰⁸ Rich, "The Lawyer Who Became DuPont's Worst Nightmare."

²⁰⁹ "Lawyer Who Uncovered Dangers PFAS Presents 2022 Fedder Lecture," University of Maryland Francis King Carey School of Law, March 13, 2023.

is one of many that demonstrates the long-term consequences of human made disasters.²¹⁰ In both the case with radiation that impacted the Alamogordo herd, and the case of cattle poised with PFOA in the late-twentieth to twenty-first century by DuPont, cattle were immediate victims to the consequences of human-caused disasters.

Rachel Carson criticized in the 1960s that, “Radiation is no longer merely the background radiation of rocks, the bombardment of cosmic rays, the ultraviolet of the sun that have existed before there was any life on earth; radiation is now the unnatural creation of man’s tampering with the atom.”²¹¹ This thesis has demonstrated how Americans, ranging from citizens, scientists, farmers, journalists, and government officials, have dealt with, avoided, or manipulated the consequences of such tampering. Americans in the Cold War era aimed to understand the long-term consequences of radiation by attempting to control and maintain the “peaceful” narrative and health of the Alamogordo herd. Despite attempts to prove domination over the non-human world with science and technology through studying radioactive animals, Americans were unable to fully grasp the consequences of disasters from their own making as these animals thwarted human narratives of control. This remains a contemporary issue as Americans still cause, attempt to understand, and frequently censor radioactive and toxic chemicals that affect communities, animals, and the environment.

Additional elements of this history that are not fully addressed in this thesis include the gendered, racial, and class elements of control. Americans’ obsession with controlling the non-

²¹⁰ For further reading on the history of environmental contamination in America, view: William Boyd, *The Slain Wood: Papermaking and Its Environmental Consequences in the American South* (Baltimore: Johns Hopkins University Press, 2015); Jack Temple Kirby, *Mockingbird Song Ecological Landscapes of the South* (Chapel Hill: University of North Carolina Press, 2006).

²¹¹ Carson, *Silent Spring*, 7.

human world frequently associated dominance with masculinity and white supremacy. The luxury of distance and disconnect from human-caused environmental pollution and disasters also includes elements of race and class inequality important to scholarship on environmental justice. Additionally, the Oak Ridge National Laboratory imported and experimented on numerous other animals besides the Alamogordo herd. The story of those other animals and the suffering they endured during experimentation and deliberate radiation exposure deserves attention as well.

Overall, my aim has been to showcase the American Cold War-era obsession with control over the non-human world and how those narratives of control were thwarted because nature fights back. Control was not just derailed because humans made mistakes in long cycles of trial and error or did not yet reach the maximum expertise of science and technology by this Cold War period; instead, humans can never fully control animals because of the inability to conform sentient beings into static, machine-like objects. Consideration of animals and agriculture in nuclear history encourages a more ecological interpretation of harmful exposure consequences to better understand that radioactive materials deeply impact every element of life. Overall, the story of the Alamogordo herd demonstrates that non-human beings are central to fully understanding human history.

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Vita

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