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Silent Spring at 50 (Chapter 9)

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9. Agricultural Revolutions and Agency Wars: How the 1950s Laid the Groundwork for *Silent Spring*

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Silent Spring has acquired iconic status in the history of the environmental movement. Rather than just a popular science writer, Rachel Carson is virtually a secular saint, having been martyred by her death from cancer shortly after completing her *magnum opus*.[1] A half-century after publication of the book, most people agree that Carson and *Silent Spring* appear to have changed public opinion about pesticides in general and DDT in particular.

But, as Desrochers and Shimizu discuss in Chapter 3, debates about pesticides began long before Carson's book. In this chapter, we will show that *Silent Spring* is a populist expression of a struggle over the regulatory authority governing American food production between two federal agencies with dramatically different visions: the Food and Drug Administration (FDA) and the federal Department of Agriculture (USDA). This struggle took place at the same time as important technological changes in food production and delivery were remaking rural America. Just as agriculture underwent a dramatic productivity revolution that changed the face of American farming, marketing, new home appliances, and increased participation in the labor force by women radically changed the kinds of food Americans ate. The consumption of processed foods increased significantly, and, concomitantly, concern about the purity of those foods increased as well. (Food purity was central to the "guinea pig muckraking" discussed in Chapter 3.)

The combination of these trends with the agencies' turf conflicts created the conditions in which powerful parties with conflicting interests in pesticide policy would have clashed

regardless of whether Carson had written *Silent Spring*. Institutional entrepreneurs at the FDA used public concern over food safety, and the processing industry's desire for protection from public perception of food safety threats, to gain advantages in its struggle for power with USDA. This conflict aided in the organization of environmental pressure groups already coalescing over opposition to publicly funded pesticide spraying. *Silent Spring* was one more expression of conflicts unleashed by larger changes in agriculture.

DDT provided a particularly convenient target for both the FDA and the nascent environmental pressure groups because it was in widespread use. Its ubiquity and cheapness meant there were few organized interests to defend it. As a commodity in the 1950s, DDT was a low-margin product that competed successfully with higher margin, less effective, and more dangerous products.[2] As a result, agricultural chemical producers had little interest in spending resources to protect DDT. The primary costs of restrictions on DDT were ultimately borne not by American agricultural interests but by residents of developing countries where malaria and other diseases are persistent problems. Being poor, nonwhite, and far away, those people had little influence in the debate over DDT. Indeed, some environmentalists ultimately argued against DDT's use even for malaria control precisely because it lowered death rates in developing countries.[3]

In this chapter, we first sketch out the larger changes in agriculture and federal regulation of agriculture that set the stage for the debate over DDT in the late 1940s and 1950s. We then use the record of hearings held in 1950 and 1951 to explore how the competing interests at FDA and USDA used the issue in their larger struggle for control over the growing processed food market. Finally, we use these materials to put *Silent Spring* into a broader context, showing how conflicts over pesticides in the 1950s helped position *Silent Spring* to create a movement. Carson was not a voice in the wilderness; she had powerful allies in government and industry. We conclude by fitting this explanation into economist Bruce Yandle's "Bootleggers and Baptists" theory of regulation.

The Second Agricultural Revolution

Farms in 1930 were not much different from farms 50 years earlier.[4] Productivity had slowly improved through better tools and

better crops, but tractors would not outnumber horses and mules until 1950.[5] Most farms were diverse operations. Many farmers produced much of their own food and sold the surplus eggs, butter, milk, chickens, vegetables, and other products to local customers and retailers, as well as raising a primary cash crop.[6] This changed rapidly after the war, as increases in "the efficiency of production in almost every specialized area of agriculture and marketing of foods made it cheaper to buy almost any type of food than to grow one's own."[7] Even for farm families, commercial food processing replaced much of the home processing previously used to store food for the winter, partly as a result of increased labor force participation by women during the war.[8] An even faster transformation occurred in urban areas. Sixty-five percent of food sold at retail was partly or fully processed by 1940, rising to more than 80 percent by 1960, making food processing one of the nation's largest industries.[9] One measure of the expansion was the spread of frozen foods. Frozen foods were limited in the 1930s, in part because of a lack of freezers in stores and homes. By 1944, over 70 percent of households had refrigerators and freezers, and "frozen foods were widely accepted."[10]

Just as the market for farm products was shifting as food processors became the primary buyers of farm output, the labor shortages resulting from the war led to "a virtual explosion in production per acre and per worker."[11] Labor productivity in agriculture grew almost three times as fast as labor productivity in manufacturing from 1950 to 1970;[12] total factor productivity growth after 1935 rose at six times the rate from 1900 to 1930.[13] This growth resulted in part from the post-war recovery's luring of labor out of agriculture, which spurred further efforts to substitute capital for labor.[14] In the 30 years after World War II, only communications, electrical machinery, and chemicals surpassed agriculture's productivity growth.[15]

The revolution in agricultural productivity was driven by the spread of mechanical equipment, vastly increased fertilizer use, improved crops, and the new insecticides, herbicides, and fungicides widely available after World War II.[16] These were not accidental innovations. Beginning in World War I, a "formidable dual system" promoted innovation in agriculture, with public institutions funding research[17] and training agricultural engineers and private manufacturers turning these inputs into improved technology.[18] Major companies such as Hercules invested heavily in

developing synthetic pesticides in the 1930s.[19] Mechanization freed the 72 million acres used for work animal feed crops in 1910 for other crops.[20] Increases in fertilizer production during and after the war meant that, "for the first time in human history, the average farmer could grow crops on the same fields year after year."[21] By the end of World War II, there had been a widespread "chemical revolution" in agriculture.[22] This revolution helped agriculture expand on the intensive production demanded by war needs.[23]

The chemical revolution was a critical part of broader changes in agriculture. In the 1920s, both public research institutions and private manufacturers "assumed greater authority in determining biological and chemical resources (seed, chemical fertilizers, pesticides) and for new machinery (tractors, combines, and mechanical corn pickers). In part, this was spurred by discoveries during World War I of the pest-killing properties of substances manufactured as explosives and for gas warfare."[24] As a result, from 1920 to 1940, farmers began to shift their focus: "they dwelled less on questions of innovation and more on problems of adoption."[25] Thus, just as farmers' markets were changing to meet the rising demand from food processors, the source of agricultural productivity increases was shifting from farm to laboratory.

The new technologies from the labs transformed how crops were produced. For example, post–World War II herbicides allowed dramatic reductions in labor by eliminating the need to cultivate row crops for weed control. "For corn, herbicides raised production more than had hybridization. Farmers could now reduce the width of corn rows from three feet or more to as little as twenty inches, in some cases almost doubling production."[26] Aerial crop dusting—a technology pioneered about 1921—made widespread use of pesticides possible in many more crops than hand sprayers had allowed.[27] By 1926, aerial spraying of several thousand acres of potatoes threatened by pests accomplished with just two pilots, a mechanic, and a single plane what would have taken 2,000 ground workers.[28] By the early 1950s, more than 5,000 airplanes were involved in aerial spraying.[29]

This revolution in agricultural technology meant that the 1950s were a time of significant change in American agriculture. Farms grew larger, used less labor, and sold to large commercial buyers rather than consumers or local stores. Growing a crop involved new

seeds, new fertilizers, new herbicides, and new insecticides. Not only was agriculture more mechanized than before the war, production was becoming a sequence of complex, interrelated decisions about appropriate application rates of fertilizers and pesticides. Livestock operations were undergoing similar changes, as large commercial feedlots displaced smaller farm-based operations.[30] Similarly, farmers' relationships with the market and the government were also changing. Such shifts create uncertainties, in which policy entrepreneurs have openings.

Regulating Agriculture

Prior to the New Deal, the federal role in agriculture was largely limited to support for research intended to boost productivity.[31] But farmers were unhappy with this limited role and had been lobbying to change that focus for more than a decade. While *farms* in 1930 were not much different from farms 50 years earlier, *farmers* in 1930 were better organized politically than farmers had been in 1880. In particular, falling agricultural prices after World War I prompted agricultural interests to organize politically in search of "parity" in prices, that is, a price level for their crops relative to other goods (especially those they bought) that was the same as during the "golden era" of 1910–1914.[32] The formation of a powerful, bi-partisan "Farm Bloc" in Congress after World War I was one of the more visible results of increased focus on politics by agricultural interests.[33] In a short period, the Farm Bloc passed "the Packers and Stockyards Act, the Futures Trading Act, the Agricultural Credits Act of 1921, amendments to the Federal Farm Loan Act, the Capper-Volstead Cooperative Marketing Act of 1922, and the Agricultural Credits Act of 1923," before splitting during bitter battles over the McNary-Haugen bill[34] that sought to bring prices back to pre–World War I "parity."[35]

While the split temporarily reduced farm interests' clout in Congress, the Farm Bloc's successes gave powerful evidence of farmers' political clout when they did agree. Further, many of the new agricultural programs themselves prompted additional organizing efforts. For example, the Farm Board created by President Herbert Hoover in 1930 had a director representing each major crop and a staff distributed around the country whose job was to organize farmers into cooperatives and cartels to boost farm income.[36] Government efforts at promoting political organization by

farmers predated even the Farm Bloc. USDA had begun efforts to organize farmers in 1914, attempting to create an analogue to a chamber of commerce for agriculture. In 1917, it called a meeting of all farm organizations that led to the creation of the National Board of Farm Organizations and an early attempt to create a "national rural policy."[37] Such efforts further encouraged political organization by helping farm interests coalesce into organized groups.

By the time Franklin Roosevelt was preparing to take office, agricultural interests were powerful enough that he directed that whatever program his underlings designed for agriculture, it be one that was acceptable to farm interests.[38] One measure of agriculture's clout was that the task of writing production codes for agriculture was given to USDA rather than the National Recovery Administration.[39] The regulatory program that emerged still shapes agricultural policy today in two important ways.[40]

First, New Deal agricultural policy furthered organization among farm interests, requiring farmers to join local groups to participate in programs under the Agricultural Adjustment Act of 1933 and putting AAA offices in "every farming county in America."[41] Moreover, because the "confusing array" of agricultural programs adopted during the New Deal had no guiding principle,[42] interest group politics could be given free rein. There were thus good reasons for farmers to pay close attention to politics: "by the 1930s, the USDA was one of the largest governmental agencies in the world and was the most powerful one for a single occupational interest. In 1931, it had 25,000 employees . . ."[43] As historian Paul Conkin summarized,

> In no period of American history has the federal government undertaken so many initiatives or inaugurated so many programs to aid one economic sector. Farmers received payments for cutting production and subsidies to carry out necessary conservation practices; they received price supports for five basic commodities and crop insurance as a form of disaster relief. In fact, the sheer number of new programs still confuses most historians, just as they confused the legislators who approved them and the farmers who benefited from them.[44]

Second, the New Deal married farm incomes to government policy. By giving the federal government a major role in determining commodity prices, it created a powerful alliance between USDA

and farm constituencies. This alliance's efforts at promoting higher prices through programs that gave farmers incentives to produce more intensively expanded the use of pesticides dramatically. The one constant in the farm policies inaugurated by the New Deal was the tying of participation to production levels. As a result,

> [p]roduction controls made it more difficult for small farmers to compete with larger ones, and larger and more efficient farmers gained the greatest benefits from farm policies. In the long run, the most enduring benefits of price-raising subsidies were an increase in the value of farmland and an even greater importance for base acres. One long-term effect of this product-based system was a tendency for small, less competitive farmers to leave agriculture, often selling their land to more commercially successful neighbors. At the same time, the large and expanding Department of Agriculture, despite internal battles, continued to cater to its prime constituency—the most affluent and capable farmers.[45]

The labor shortages produced by World War II furthered this movement and reduced federal investment in efforts to keep people on the land[46] as well as generating ever more opportunities for lobbying.[47] As farms got larger, technology improved the ability to increase yields. This was reinforced by the many farm policies that encouraged intensive production such as the 1950s Soil Bank, which limited the land farmers could use, encouraging more intensive cultivation of their remaining acreage.[48]

As a result, by the 1950s the federal government's relationship to agriculture was different than it had been in 1930. The USDA now played a major role in determining farm income through its many programs, federal agencies were significant sources of farm credit, and federal policies reinforced trends toward larger farms focused on commodity production.[49] Further, both public- and private-sector research provided agriculture with a steady stream of technological improvements that continued to raise productivity. Finally, consumers' preferences for high standards of appearance in produce also pushed farmers toward greater chemical use.[50] In response to these changes (and partially a cause of them), agricultural interests were well organized politically and paid close attention to the federal policies that played such an important role in determining their income. The early 1950s were marked by constant struggles over the level of

price support the federal government would provide.[51] Moreover, constant increases in production as a result of subsidies during the fifties drove farmers toward more intensive techniques in efforts to maximize yield.[52] This kept farmers in a "cost-price squeeze" and heightened the importance of federal assistance, focused on those USDA thought most likely to succeed.[53]

The creation of a powerful federal agency dealing with agriculture and the transformation of agriculture into an area of the economy dependent on federal policy did more than create incentives to speed the transformation of a nation of small farms using animal power to produce a broad range of products into a nation of large farms relying on mechanical power, fertilizers, and pesticides to produce single crops. It transformed many agricultural decisions into political questions, to be settled (at least in part) through bureaucracies and legislatures rather than in the marketplace. As USDA's size and budget grew, and rural populations continued to shrink, farm interests developed a growing interest in making alliances with nonfarm interests to protect the farm programs that had become a key source of farm income.[54] Pesticide issues became a part of this politicized and rapidly changing landscape.

The Growth of Pesticide Use

DDT played its first major role in World War II, sparing servicemen and civilians from scourges of pests, such as mosquitoes and lice, and the diseases they carry, such as malaria and typhus. As Donald Roberts and Richard Tren explain in this volume, immediately after the war, DDT was used for mosquito control both at home and abroad. Its use quickly expanded into agricultural pest control, where its combination of safety for humans, toxicity for insects, and low cost made it popular.[55]

DDT was not the first agricultural pesticide, of course. Insect pests had been problematic during the last half of the 19th century; many of these pests were non-native species that had been brought to North America by cargo and immigrants.[56] The most common solutions to pest problems were inorganic poisons, substances such as "Paris Green" (copper acetoarsenite) and lead arsenate.[57] By the 20th century, problems included the peddling of ineffective products by scam artists to unsuspecting farmers[58] and free-riding by some farmers, whose failure to spray their crops with effective

insecticides allowed insects to harm their neighbors' crops.[59] To address effectiveness issues, federal and state governments imposed consumer protection regulations, most often requiring labels to disclose the active ingredients.[60] Free riding was addressed by mandatory spray laws in the Pacific Northwest.[61]

Those commercial insecticides developed in the 19th century and used before World War II required high enough doses that they could cause acute medical problems for people who ate food with pesticide residues still on them.[62] Because the effective ones were based on highly toxic chemical substances such as arsenic, farmers, consumers, regulators, and food processors worried about residues. This was a particular problem in the apple market, where high loss rates were common, especially for apples shipped from the Northwest to eastern and foreign markets. People wanted fruits free of worms, but worries about residues caused some governments to restrict the sale of sprayed crops not fully washed. For example, in 1925 two shipments of apples from the United States to London were rejected because of spray residue.[63]

Hence, farmers and food processors were aware of the potential problems posed by agricultural chemicals well before DDT appeared on the scene. James Whorton quotes an 1891 contributor to *Garden and Forest* who worried about the long-term impact of the use of "a most virulent mineral poison,"[64] a concern similar to Carson's worries over the aggregate impact of DDT. During the 1920s and 1930s, the medical profession took increasing notice of the dangers of the arsenical pesticides.[65] And in *100,000,000 Guinea Pigs*—discussed by Desrochers and Shimizu in Chapter 3—Arthur Kallet and Frederick Schlink devoted a chapter to the dangers of arsenic and lead residues and blamed the FDA for failing to be more aggressive. Similarly, *The American Chamber of Horrors*, authored by the FDA's information officer, included a chapter on "How Much Poison Is Poisonous?" which cast the FDA as heroically attempting to save children from foods with pesticide residues.[66]

Indeed, the new pesticides coming into use during World War II represented a step toward solving these problems, since they were not acutely toxic to humans and were applied at lower doses than earlier pesticides. DDT and other organochlorines[67] rapidly grew in use, as they appeared to be safe for both farmers and consumers as well as effective.[68] By the end of the war, DDT and the other

members of its chemical family had almost completely replaced most other insecticides in agricultural use.[69] Moreover, tax incentives for DDT production and federal money to build plants created a ready infrastructure for DDT when peace came.[70]

Not surprising, farmers loved the new generation of pesticides. As the USDA was fond of noting in its congressional testimony in the postwar years, damage to agricultural output from pests cost $4 billion a year, almost 1 percent of GDP at the time.[71] The new pesticides offered significant savings. For example, using DDT to control the horn fly increased milk and beef output by $45 million in the states that kept statistics on the matter.[72] Where DDT was used, the USDA estimated that cattle gained an average of 50 pounds more.[73]

While agricultural interests and the USDA focused on the benefits of increased productivity from the new pesticides, other agencies were less enthusiastic. Beginning in the late 1940s, both the Fish and Wildlife Service and the FDA began to raise questions about DDT and other new pesticides. Early FWS involvement is important to the *Silent Spring* story because Carson worked at FWS for many years, where she headed publications and developed a reputation as a science writer for the public. As Desrochers and Shimizu note, Carson edited some FWS publications that were critical of DDT. Although her own work about DDT appeared many years later, she was aware of negative views about DDT at a time when most people were still celebrating its benefits in agricultural use and the relief it provided to millions of people suffering from many diseases.

What Carson Saw

DDT received good publicity during the war. For example, *The Saturday Evening Post* titled one article "How Magic Is DDT?"[74] Prof. Edmund Russell of the University of Virginia concludes that hundreds of such articles "cemented DDT's reputation as a miracle worker."[75] But not everyone shared the popular press's enthusiasm. The day after Nagasaki was bombed, the FWS warned that "DDT is toxic to both human beings and animals."[76] The degree of the problem was not well understood, and tests were begun. A week after the surrender of Japan, Secretary of the Interior Harold Ickes and FWS Director of Wildlife Research Clarence Cottam both warned of damage to wildlife, beneficial insects, and crops from DDT use.[77] They asserted that even a single application could do significant harm to

nature. While its benefits during the war may have warranted ignoring the side effects, that was no longer the case in peacetime. Cottam unsuccessfully sought to prevent DDT's release for civilian use until the FWS could assess its impact.[78]

In 1945, Carson wrote to *Reader's Digest*, proposing an article on FWS research about what DDT "will do to insects that are beneficial or even essential; how it may affect waterfowl, or birds that depend on insect food; whether it may upset the whole delicate balance of nature if unwisely used."[79] That same year, the Audubon Society (of which Carson was an active member) held a conference on DDT at which C. H. Curran of the American Museum of Natural History warned that the pesticide could "kill almost [all], if not all, cold-blooded animals."[80] In 1946, the FWS issued a "warning" that "care must be taken in applying DDT to field and forest areas if wildlife is not to be endangered."[81] Marine life—an area of particular concern to Carson, as Kaufman describes in this volume—was thought to be most at risk as high kill rates were observed among fish in ponds sprayed with DDT at multiple test sites. Carson wrote a series of articles for the *Baltimore Sun* "whose theme was often the same—marine ecologies in some state of crisis" while she worked at FWS.[82]

The agency's annual report for 1948 noted that its studies of DDT began in 1945 and that "it is unsafe to apply by airplane more than two pounds of DDT per acre if harm to birds, mammals, and amphibians is to be avoided."[83] For many years to come, the agency continued tests and lobbied for increased funding for tests of DDT and other pesticides.[84] By 1965, the agency was reporting that "amazingly small amounts of pesticides can kill shrimps, crabs, and other aquatic life," such as "one part of DDT in one billion parts of water."[85]

Meanwhile, the Public Health Service was singing in praise of the glories of DDT. The experience in World War II at controlling malaria, yellow fever, dengue, and other diseases was a wonder.[86] While not advocating willy-nilly use of DDT, the PHS saw huge potential benefits in extending its use. The PHS and U.S. Army issued a "Joint Statement of Policy" for the "Use of DDT for Mosquito Control in the United States," advocating spraying DDT on houses to kill adult mosquitoes, using it as a larvicide where it would not harm fish and wildlife, and applying it by aircraft in large areas when needed.[87]

A test spraying of 513 rural houses in the South noted the cost was only 74 cents per house, and the mosquito population remained reduced for months.[88] The PHS soon reported that "the highly effective insecticide, DDT powder, obtained through the Public Health Service, is being used to spray the workers [seasonal migrant workers who were often infected with lice] before they board the train in Mexico City [to come work in the United States]."[89] A year later, in 1946, a report from the new Communicable Disease Center (which replaced the Office of Malaria Control) noted that "the advent of DDT wrote a new chapter in the history of insect control, yet the surface of this important subject is barely scratched."[90] The next year the British reported success in ridding a prison of bed bugs by application of DDT: "It is . . . no mean achievement to obliterate bugs from an infested prison. . . ."[91]

Not unmindful of the criticism of injury to wildlife, the PHS did its own investigation of the impact on wildlife from spraying a swamp with DDT. The mosquitoes died but, presaging Rachel Carson, it reported in 1947 that bird "singing continued into July and August" after months of spraying.[92] In 1948, the PHS was reporting on the beneficial effects of aerial spraying with DDT in urban areas to reduce the population of flies.[93] In the 1950s, the PHS was still reporting health benefits from DDT spraying, such as in outhouses and in areas subject to flooding,[94] but more impressive in those years were many reports from around the world of the huge impact on disease control, especially malaria, from the spraying of DDT.[95] The effects were a near miracle from the viewpoint of public health experts.

Scrap among Agencies

FWS was casting doubt on DDT because of its impact on wildlife. Soon, and more important to the long-run debate, it gained a potent ally. The FDA claimed that the new pesticides had serious human health consequences, as described below. The FDA had begun as the Bureau of Chemistry within USDA, then changed its name to the Food and Drug Administration in 1930, and finally separated from USDA in 1940.[96] Solving a botulism outbreak in 1919–1920 (ultimately traced to a California packing plant) and ending sales of a new antibiotic that turned out to be fatal for some users in 1937 were high-profile successes for the agency.[97]

Even before DDT appeared on the scene, the FDA was heavily involved in pesticide residues, spending over a third of its budget on residue enforcement in 1933.[98] Food regulators generally had focused on residue issues—which became their "single most serious concern"—at least since a 1919 conference on the topic.[99] The 1925–1926 publicity in Britain over arsenic residue on American apples also prompted concern among exporters, who saw the potential for disaster.[100] That incident prompted the bureau to consider establishing a publicly acknowledged tolerance for residues; previously, the agency's tolerance levels had not been released to the public.[101] In 1927, the bureau convened a conference in Salt Lake City to discuss tolerances, which it hoped would settle the issue.[102] It did not.[103]

The residue issue gained additional traction when Assistant Agriculture Secretary Rexford Tugwell, a key member of Franklin Roosevelt's "brain trust," pushed the issue to the forefront after receiving a citizen complaint about the use of lead arsenate on food crops.[104] Moreover, there were other constituencies outside the shrinking population that earned its living in agriculture worried about chemicals in food. Organic farming entrepreneur J. I. Rodale launched the magazine *Organic Gardening and Farming* in 1942,[105] and his 1948 book *Pay Dirt* attacked DDT.[106] Indeed, Russell argues that investigations into charges of war profiteering during World War I transformed chemical companies generally into "iconographic 'merchants of death'" for much of the public by the 1930s.[107] Consumers might not have wanted to grow their own organic tomatoes, and welcomed the convenience offered by the new processed foods, but the postwar years were also the time when protoenvironmentalist books such as Fairfield Osborn's *Our Plundered Planet* (1948) and William Vogt's *Road to Survival* (1948) were best sellers (whose impact is discussed by Desrochers and Shimuzi in this volume), evidencing some broader disquiet among the general population.[108]

These concerns prompted the federal government to revisit its pesticide regulatory strategy after the war. One of the first battles was over the proper approach to investigating the scientific issues, and the National Academy of Sciences prevailed over USDA in the organization of the academy's Insect Control Committee. Particularly irksome to USDA was that the committee "was dominated by medical doctors and chemists who had specialized in chemical weapons" while entomologists were deliberately excluded

as committee members.[109] USDA did not lose every battle, as it succeeded in shaping the 1947 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to its liking. The 1947 Act gave USDA primary control of pesticide regulation and focused on notification and informational labeling.[110] Crucially, the new statute did not mandate testing of substances before marketing, as the FDA had urged. Most importantly, Congress rejected the FDA's bid for control of the entire pesticide regulatory process. But FIFRA's passage did not end the struggle for regulatory turf. USDA had regulatory authority that the FDA wanted. DDT and other chemicals would serve as a vehicle in that fight. And from the start of that struggle, while the FDA assailed many pesticides as dubious, it gave DDT special attention, as we discuss below.

The 1947 version of FIFRA required that product labels include the product name, name of maker or distributor, list of ingredients, net contents, warning about use, and directions for use.[111] USDA was given, but rarely exercised, authority to require testing to demonstrate safety when used as directed. In a minor victory for the FDA, the statute required USDA to consult with the FDA to determine if residuals on food were acceptable, as the presence of residuals could put a chemical, or at least certain uses of it, under the authority of the Federal Food, Drug and Cosmetic Act of 1938 (FFDCA). In practice, however, USDA rarely interacted with the FDA on pesticide issues.

The FDA did not abandon its quest for regulatory authority after its defeat by USDA in 1947. As early as 1949, FDA Commissioner Paul Dunbar argued that DDT's war use had been a "reasonably calculated military risk" but that the civilian calculus would be different.[112] The agency began a campaign to discredit USDA's administration of FIFRA. Bit by bit, FDA was successful, as the 1958 amendments to the Food, Drug and Cosmetics Act gave the FDA power to establish residual clearances for pesticides [113] so that, from that point forward, USDA had to coordinate registrations with the tolerances set by the FDA for food and animal feed crops.[114] The key with respect to DDT was not the final outcome but the dynamics of the struggle for regulatory authority, to which we now turn. Moreover, the FDA needed an issue on which it could win public support, because it had made powerful enemies in Rep. Clarence Cannon, a Mississippi Democrat, and Rep. John Taber, a New York Republican, both of whom sat on the House Appropriations Committee. In the mid-1930s,

Cannon—who raised apples—barred the FDA from spending money on investigating harmful effects of pesticide residues on humans.[115] In the 1950s, annoyed at the FDA's unwillingness to compromise on a label for canned beets to allow a company from his district to sell cut-up regular beets as "baby beets," Taber cut the agency's budget by 15 percent from 1951 to 1954.[116]

The House Select Committee Hearings

The House of Representatives passed a resolution in 1950 calling for an investigation into chemicals in food products and named Rep. James J. Delaney of New York as chair of the House Select Committee to Investigate the Use of Chemicals in Food Products.[117] Delaney chose Vincent A. Kleinfeld, the FDA's general counsel, to be the committee's chief counsel. Kleinfeld played an important role in pesticide law from this point forward. Not only did he co-found a law firm in 1953 that specialized in FDA-related law, he served as plaintiffs' counsel in the landmark (and unsuccessful) suit against DDT spraying on Long Island to control gypsy moths in 1957.[118] (Carson relied on materials collected by the plaintiffs in that suit in her research for *Silent Spring*.[119]) Kleinfeld's firm notes in its history that Kleinfeld served as counsel to the "Delaney Committee" and helped craft concepts incorporated into the FFDCA relating to pesticides, chemicals, and food additives.[120]

Kleinfeld masterfully ran hearings for the select committee, which received major coverage in the media as hearings moved around the country.[121] Agricultural interests were represented on the committee and, as we noted, powerful in Congress, and those members were fearful of costly regulatory controls that could limit farmers' access to useful chemicals or raise their costs, or could reduce USDA's authority. Kleinfeld was therefore constrained in his ability to directly challenge those interests. A frontal assault on USDA's authority would have been futile. Instead, Kleinfeld used USDA and agricultural witnesses' testimony to paint USDA as a biased agency beholden to agricultural interests and ignorant of the harms that were being inflicted on, or might be inflicted on, the public by the use of toxic chemicals that tainted food. The hearings effectively built a case that the FDA needed greater authority to protect the public from toxic risks by enhanced testing of chemicals present in the food production process.[122]

At the hearings, the assistant secretary of agriculture discussed the importance of chemicals in agriculture but noted USDA's concern that sprays should be safe.[123] The director of USDA's Plant, Soil, and Nutrition Laboratory discussed soil conditions around the country and agreed with Kleinfeld that organic farming could be productive and healthy.[124] Physicians from CDC and NIH discussed their concerns about DDT, attacking the USDA standard of five parts per million in foodstuffs as too generous given the lack of knowledge of safety for human consumption.[125] Witnesses noted that the *Journal of the American Medical Association* had discussed whether "Virus X," a health scare sparked by a New York physician's articles, could be caused by DDT poisoning.[126] A professor of medicine from the University of Cincinnati who focused on environmental health hazards testified that not enough was known about DDT, but that "it is probably responsible for such conditions as suicidal tendencies, aplastic anemia, pneumonia, leukemia, "Virus X", arteriosclerosis, and even cancer."[127]

Kleinfeld carefully built a case that agricultural chemicals should not be sold until proven safe and that DDT was the tip of the chemical iceberg.[128] His proposed remedy was for an "impartial board" of scientists to determine what should be allowed on the market[129] and to subject products to extensive premarketing testing, beginning with animal tests and then, for products that passed the first hurdle, human testing to search for safe exposure levels.[130] In short, Kleinfeld sought an FDA standard for agricultural chemicals that mimicked the FDA standards for drug approval. Without such standards, he argued, public health was threatened and, thereby, agriculture was threatened because of the possible backlash against chemically tainted foods.[131]

Agricultural representatives fought back. Dr. George Decker, the head of economic entomology at the Agriculture Experiment Station, University of Illinois (a major land grant university), testified that while about 200 farmers were killed every year, and 300 debilitated, by farm machinery in Illinois alone, none had ever died from chemicals used on farms and FIFRA regulations were adequate safeguards.[132] He noted that most food shipment seizures ordered by the FDA were due to insect infestations, not excessive levels of spray residue.[133] Kleinfeld responded that just because there was no evidence of current deaths from DDT and other pesticides, that did

not mean pesticides did not cause "chronic illnesses" that had not yet been discovered.[134] Foreshadowing one of Rachel Carson's main themes (see Meiners, in Chapter 6, reviewing cancer evidence), a committee member noted that the incidence of cancer was rising in the United States over time and speculated that there "might be a connection between some of these insecticides and chemicals being used."[135] Kleinfeld cited a British scientist who stated that DDT and other insecticides upset the balance of nature (another key theme in *Silent Spring*; as discussed by Gregory in Chapter 7),[136] and asked the witness if there should not be extensive testing of all chemicals before use.

Dr. Decker addressed several key issues. Americans had come to expect quality produce. Not only did that expectation dominate the market, it was part of the law. The public "will no longer accept the old scabby apple or the wormy apple. When you and I were young the worm had to look out for himself when we ate an apple. Today, the Department of Agriculture would not let that apple move in interstate commerce. As a matter of fact . . . the Food and Drug Administration could take action on an apple moving in interstate commerce because it had a worm in it."[137] As to Kleinfeld's assertion that new chemicals should be tested for perhaps 15 years before being certified for use, Decker replied that the notion was good in theory but not in practice. "Such would be desirable, but such is utterly prohibitive and impossible. If every new and potential chemical that may be valuable as a pesticide . . . had to have fifteen years of study we would never have a new chemical introduced."[138] In fact, chemicals were field tested by scientists, just not under such prohibitive conditions. As to the claim that insecticides upset the balance of nature, Decker stated that the result, even if a chemical was worse than anticipated, was not catastrophic. There was no evidence that such a problem had happened. "But if I wiped out every insect in an entire county in my state this year, every insect beneficial and bad . . . next year or the year after, the population would be approaching normal, and within five years the balance would be right back where it started."[139] Nature is tougher than city folks might think.

Arguments at the hearings went back and forth. Agriculture experts from various colleges generally defended the then-current practices and cited evidence that DDT and other sprays were not harmful to humans as currently used. A Utah State professor

testified that evidence from rat studies showed that DDT at high levels is harmless. A member of the committee blasted the notion, saying that rat studies did not mean that DDT was not harmful to humans.[140]

The attack on DDT was weakened by evidence from agriculture researchers which showed that DDT was not present in food products consumed by humans. Kleinfeld countered this point with testimony from a junior researcher from a new organization, the Texas Research Foundation (TRF). Although numerous senior researchers from universities and USDA had testified that DDT residue in plant and animal foods was consistently within the 5 ppm level believed to be safe, a TRF representative with a recent master's degree from Oklahoma A&M University (now Oklahoma State) reported DDT levels up to 14 ppm in milk and up to 69 ppm in beef.[141] Furthermore, he testified that DDT was absorbed into cereal crops such as corn, making its way into many other foodstuffs. This testimony reframed the issue as how to resolve contradictory scientific evidence. Crucially, this testimony—cited for years to come—was buttressed by testimony from food processors, who expressed concern about toxins making their way into the products they sold. Beech-Nut worried that baby food could be tainted.[142] A lawyer representing numerous food processors noted a lack of effective regulation.[143] Not only was more publicly funded research needed, but standards like those employed by the FDA for drugs before approval should be employed.

A final theme in the testimony came from a representative of the organic farming community. An organic farmer testified that organic agriculture was an alternative that avoided the problem of toxic residues in food: "The use of poisons in the growing and processing of our foods has steadily increased until today millions of pounds of these poisons are used, of which a considerable amount is consumed by our people."[144] Tying organic agriculture to the commercial food processing industry, he reported that some food processors demanded organically grown crops so they would know there would not be chemical residue. Furthermore, he asserted that organic farming was better for the environment and sprays were unnecessary because nature was "in balance" on organic farms. Such techniques were viable, based on the example of French farmers, who he claimed had never used sprays.[145] Finally, the organic farmer

repeated the concern that DDT caused "Virus X"[146] and accused agriculture colleges of pushing chemical use.[147]

The testimony cast the credibility of agricultural experts in doubt. For example, when a USDA poultry expert explained that chemicals used in and around egg-laying facilities did not get inside the shells and any residues were generally washed away in cleaning, the committee expressed skepticism about his certainty.[148] The next witness, a doctor from the American Cancer Society, testified that while rising U.S. levels of cancer were due partly to longer life spans, the increase might also have been caused by the millions of pounds of chemicals being used on crops.[149] Indeed, he even suggested that the chemicals used in growing tobacco might result in it causing cancer.[150] He concluded that, given the myriad risks, more research and regulation, especially by the FDA, was needed. This conclusion was echoed by a researcher from the National Cancer Institute.[151]

As the 19 days of hearings moved around the country, similarly conflicting testimony was presented. Agriculture representatives, while never opposed to more research, pointed to the lack of evidence of harm from current spray levels and the great increase in output allowed by the use of sprays—not only increasing agricultural productivity but saving forests as well. They also noted that the new generation of sprays was clearly less harmful than the lead arsenates and other sprays used in previous years.[152]

Critics of agriculture widened the assault, raising the issue of hormone use in animal production. A scientist from Swarthmore called for a complete ban.[153] UCLA dermatologists agreed, saying that hormones were unsafe and extensive testing was needed because latency issues might exist that could not be known for years.[154] A medical professor from the University of Southern California testified that estrogen in animals could cause a sex change in people consuming such food products.[155] A California doctor reported that while he did not think estrogen caused cancer, it caused cancer to spread.[156] A scientist from the drug industry, testifying about the hormone issue, recommended expanded FDA powers to ensure public safety.[157] Other testimony on the issue was in conflict; there seemed to be no scientific consensus about the matter, but if the critics were right, the risks were substantial.

Witnesses raised multiple food safety issues. People were reminded of a mass poisoning at an Oregon state hospital in 1942

that killed 47 people.[158] Regular themes included the dangers of mislabeled products,[159] the need for the burden of proof of safety to be on manufacturers, the inadequacies of FIFRA, and the need for stronger FDA oversight.[160] Kleinfeld found an instance of a commercial chemical in use in agriculture that was not registered under FIFRA; this was evidence of sloppy USDA practice and, he noted, people die from improper use of chemicals.[161] Kleinfeld was not the only one concerned. Industry representatives from the National Canners Association and the Grocery Manufacturers Association testified about their concerns over chemical toxicity.[162] As the director of the National Canners Association Research Laboratories noted, "Industries are concerned primarily with the unavoidable presence of pesticide residues on certain crops."[163]

As the hearings drew to a conclusion in California, conflicts persisted. A University of California professor of agriculture testified that existing controls were sufficient; the FDA process would be too long and costly and, besides, FDA proceedings had all the fairness of a kangaroo court.[164] Kleinfeld attacked him, and others, who questioned the wisdom of expanded FDA control. He used witnesses from the cosmetics industry, who, his questioning implied, knew little about the scientific testing of the chemicals they were selling. The chemicals could be toxic, Kleinfeld regularly implied, citing, for example, the case of a woman who died during a hair permanent procedure in Georgia in 1941.[165] The hearings ended with a California allergist testifying that DDT and other sprays made people sick. He claimed people suffered from a strange lethargy after exposure and that DDT was particularly bad, present in the milk supply, and steps were needed to "protect our infants."[166] Committee chair Delaney went so far as to publish an article in *American Magazine* entitled "Peril on Your Food Shelf."[167] Ultimately, the hearings helped the FDA secure passage of a 1954 amendment to the Food, Drug, and Cosmetic Act, requiring inclusion of toxicity and residue studies in petitions to the secretary of Health Education and Welfare for permission to market a new pesticide.[168]

This review of the 1951 hearings illustrates three important parts of the saga of the regulation of DDT. First, it illustrates how prominent the criticisms of modern pesticides generally, and DDT in particular, had become soon after widespread use of these products began and long before *Silent Spring* crystallized these concerns.

The themes voiced in these criticisms continued into the 1960s and 1970s: the need for caution in adopting new technologies that affected the food supply, the promotion of organic farming as an alternative, and a reliance on scientific uncertainty created by an unwillingness to make judgments between any points of view that could marshal someone in a lab coat to defend it. Stories about "Virus X" or a strange lethargy, put forward by witnesses with weak credentials seemingly counted equally with the views of the agricultural establishment and thereby served as a basis for caution. The testimony suggested science was in conflict. At a minimum, there should be more money for research, and extensive federal oversight might be warranted.[169] The committee gave a junior researcher at an unknown Texas foundation the same credibility it gave many experienced scientists with more impressive credentials. The committee treated impracticable ideas, such as reliance on lower-productivity organic farming techniques, as worthy of consideration. *Silent Spring* was the most noteworthy attack on DDT and pesticides through 1962, but virtually all of the criticisms it made were well developed and being articulated more than a decade earlier.

Second, powerful interests within the government saw pesticides as an important issue long before *Silent Spring*. Considerable attention has been paid to USDA's promotion of pesticide use in the 1950s, including its subsidizing of public spraying programs aimed at eradicating pests like the fire ant and gypsy moth,[170] while FDA's role has not received as much. As the records of the 1950 and 1951 hearings demonstrate, Delaney and Kleinfeld were masters of congressional and regulatory techniques. They made a case for expanded FDA authority, which enhanced Delaney's power in Congress and Kleinfeld's authority as general counsel of FDA, which he would soon leverage in private practice. Indeed, Kleinfeld's questioning of the witnesses at the hearings foreshadowed his questioning of government witnesses in the 1957 Long Island case involving the spraying of gypsy moths.[171] This does not require imputing bad motives to them; we have no reason to doubt they believed in what they were doing. Rather, the point is that their beliefs were aligned with their career interests. The result was that Delaney and Kleinfeld laid important groundwork for *Silent Spring* by stoking the public's fears of the new technologies.

Third, food processing companies were crucial players in the debates over pesticides. Organic farmers, a few researchers, and individuals who feared "Virus X" would not be a sufficient constituency to attract much congressional attention, and the millions who had bought *Our Plundered Planet* or *Road to Survival* were not yet organized into an effective political constituency, as they would be by the end of the 1960s. Beech-Nut and other food processors were rightly concerned about the issue. If, in fact, toxins were present in foodstuffs, food processors would be the main defendants as easily identifiable parties with deep pockets. Not only was food processors' liability for contaminated products well-established in American tort law,[172] but the issue was receiving attention in the legal press.[173] Moreover, getting chemicals out of the food supply was costly. At the hearings, Beech-Nut reported that it spent $668,000 over six years (more than $5.5 million in today's dollars) removing pesticide residue from baby foods and peanut butter.[174] The director of toxicology for Swift & Co., a major brand name meat packer, supported more controls: "It is my opinion that any food processor proposing to incorporate a new nonfood material into a food product that is to be made for commercial use should be required to pretest such a material to assure adequate evidence of innocuousness in the human dietary."[175] And the new FDA commissioner appointed in 1954 focused on cultivating the industries regulated by the agency, in an effort to build support for the agency. As his deputy put it, "in order to administer a regulatory law, the regulator has to have a constituency; he has to have someone who will back him before Congress."[176] The 1959 controversy over cranberries contaminated with aminotriazole—a controversy that Carson biographer Mark Lytle says Carson followed "[d]ay by day . . . especially the fortitude shown by HEW Secretary Arthur S. Flemming in the face of hostile industry reaction to the ban"[177]—drove the issue home to the food processors.

Although tighter controls on pesticides could mean higher agricultural prices paid by food processors, they appeared to prefer to reduce the likelihood of tort litigation and the possible damage to their brands that litigation could cause. For example, Beech-Nut was a major food processor. Even one story that babies were poisoned by pesticide residues in their baby food, let alone a successful suit, could cause sales to collapse.[178] All industry,

and consumers, would pay higher prices if input costs rose, but as long as everyone in the industry shared the cost, the impact on profits would be minimal. Moreover, the larger firms were the ones with the most at stake, and they were the firms that testified at the hearings.[179] Regulations can be costly, but in almost all regulatory experiences, large firms have an easier time bearing the costs than smaller competitors.

Why Was DDT the Primary Target?

DDT was the first, and most widely used, of the new class of insecticides discovered around the time of World War II. That alone made it a logical target. Moreover, unlike many other chemicals used only in agriculture, DDT's nontoxicity for humans meant that it was widely used in insect control programs outside rural areas—as Carson highlighted in *Silent Spring*—making it highly visible to those not directly involved in agriculture and so lacking a direct economic benefit from its use. Farmers, on the other hand, who were profiting from the new pesticides, and whose regular contact with them provided personal experience that contradicted claims like those about "Virus X" and other ills would prove to be a much more difficult audience for pesticide critics throughout the battles over pesticides.

While DDT use was extensive, its use in the United States peaked in 1959, well before *Silent Spring*;[180] DDT production peaked in 1962, the year the book appeared. Production dropped 40 percent by 1966, and domestic use fell by half between 1958 and 1966.[181] By 1966, DDT, toxaphene, and aldrin, members of the same chemical family, constituted just half of the pesticide market. One reason was that pesticide producers preferred alternatives because newer products had intellectual property protection that increased profits. In contrast, the World War II bargain between the military and pesticide producers to secure sufficient production of DDT to meet military needs included grants to multiple companies of the right to produce it,[182] reducing those companies' incentive to invest heavily in DDT's defense. The five major DDT producers[183] would suffer lost sales of DDT from restrictions on DDT, but as makers of substitutes, they would gain sales of their more profitable proprietary products. The

substitutes were more costly than DDT, which was one reason farmers had not previously switched to such alternatives.

These tradeoffs were recognized during the later fight over banning DDT. For example, USDA reported in 1970 that the ban meant winners and losers in the industry.[184] A few years later, reviewing the ban on DDT, the Environmental Protection Agency concluded that the largest impact was on cotton.[185] The 1975 EPA review concluded that DDT was still in use on 17 percent of cotton farms in 1971 and that those farmers doubled their pesticide cost by 1973 as a result of the ban.[186] So certain farmers suffered greater economic injury than others, but the impact was not draconian, as pesticide cost was estimated to be just 5 percent of the production cost of cotton.[187]

There are costs and benefits to any change. The new generation of more costly pesticides that replaced DDT and its chemical siblings were short lasting, so the problem of residual effect was lessened, but were more potent at the time of application. USDA reported that the new pesticides were more dangerous to the users and would cause increased injury to wildlife and to beneficial insects at the time of application.[188] The new insecticides were more costly, in part because of the more stringent permission process. As early as 1970, only 1 in 1,800 new compounds tested made it to market after years of research.[189] "The requirements for registering new pesticides are likely to increase. This would tend to reduce the competition in the pesticide industry. On the other hand, the markets for new products created by banning organocholorines would be attractive to manufacturers."[190]

DDT's most important use was in mosquito control in anti-malaria programs, as described in detail by Roberts and Tren in Chapter 8. Carson barely mentioned its public health use in *Silent Spring*. This may have been partly because the primary public health uses by that time were in Africa, Asia, and Latin America, out of sight of Carson and her readers. Indeed, by the time of the ban, most of the DDT produced in the United States was exported. At no point in the debate over DDT begun by *Silent Spring* was there more than passing discussion of DDT's huge impact in reducing malaria and other scourges. One reason was that foreigners suffering from malaria do not vote in U.S. elections. Even taking this into account, there was less sympathy for the foreign ill and dying than might be expected, given the commitments the United States made during the same

period to development aid, the Marshall Plan, Food for Peace, the Peace Corps, and other programs that were at least nominally aimed at improving the lives of nonvoters. The ugly truth is that the writers who were articulating nascent environmentalism in the late 1940s and early 1950s saw overpopulation as an overriding threat and so were harshly critical of the use of DDT precisely *because* it would save lives.[191]

Finally, again and again, while organochlorides were condemned as a group, DDT was held up for special attention by Kleinfeld and others. While other sprays of the same chemical group, such as aldrin, were used in agriculture as much as DDT and seemed to have the same environmental characteristics, there may have been an element of marketing involved in singling out DDT. "DDT" is simple. "Organochlorides" does not have much of a ring to it. And while "chlorides" may sound suspicious, "organo" sounds, at least to ears today, like "organic," which is "good," like organic farming.

Putting the Battle over DDT in Context

Silent Spring may have been the spark that ignited the modern environmental movement, but it was one of many sparks thrown off by the post–New Deal realignment of American agriculture. The industry had moved from multicrop, relatively small, non-capital-intensive operations using traditional agricultural methods and selling in local markets into monocrop, relatively large, capital-intensive operations using modern techniques, selling to commercial food processors, and dependent on federal programs for portions of farm income. The combination of this transformation and the parallel transformation of the American diet created conditions under which interest groups both inside and outside the federal government sought advantages.

Inside the government, USDA and its farm-state allies engaged in high stakes battles for resources and control over agricultural policy. As part of that conflict, they had to contend with the FDA and its allies' efforts to expand their authority. DDT, in particular, and pesticides, in general, provided the FDA coalition with a useful tool with which to assert a claim to authority, playing off popular concerns over chemicals and the uncertainties created by the transformation of agriculture. Those battles—illustrated by the hearings we described—both reacted to and expanded public concern

about food safety and the role of pesticides in agriculture, laying important groundwork for *Silent Spring* as well as likely introducing Carson to the topic through her work at FWS. Outside the government, the food processing industry sought a safe harbor against the impact of possible contamination both on sales and in tort actions.

The economist Bruce Yandle coined the term "Baptists and Bootleggers"[192] to explain how interest alignments among otherwise opposing or nonaligned groups could facilitate regulation. Traditional models of regulation posited that regulations emerged because they were in the "public interest" or, in the alternative, they evolved because politicians had been "captured" by economic interests. Yandle posited that some voters support regulatory controls that have no particular economic benefit to them but do provide economic benefits to others. He developed a model of unwitting political cooperation among divergent groups in support of particular regulatory measures. The name he gave the phenomenon, for purposes of alliteration, not disparagement, came from Baptists who support restrictions on the sale of alcoholic beverages on Sunday. They support such regulation for the good of society. But such legislation has hidden supporters, the bootleggers, who earn their living by skirting the regulations that make their livelihood possible. The two groups have nothing in common and do not explicitly cooperate, but their different interests combine to strengthen the incentives for politicians to regulate. One group has a publicly acceptable interest but insufficient clout to achieve its aims; the other group has an economic interest but lacks a publicly acceptable justification for action. Both provide political support for regulations that limit certain economic activity that would otherwise occur.

The creation of a coalition that ultimately would succeed in obtaining a federal ban on DDT in 1972 had aspects of a bootleggers and Baptists coalition. Environmentalists were the "Baptists." Pesticide manufacturers, looking to move beyond generic products such as DDT, played the role of the bootleggers, accepting enhanced regulatory authority by the new EPA as the price of creating significant barriers to entry in order to protect their markets. USDA ceded environmental authority to EPA but preserved its larger agricultural policies. That is not to suggest that the battles over DDT in the late 1960s and early 1970s were not heated and intense, for

they were. But the ultimate resolution—by Richard M. Nixon, the politician to whom environmentalists ought to award the title "greatest environmental president" for his role in creating EPA, the Clean Air Act of 1970, the Clean Water Act of 1973, and the Endangered Species Act of 1973—largely disadvantaged poor malaria victims in Africa and had relatively little impact on American farmers.

At the risk of mixing metaphors, the future "Baptists" were still wandering in the wilderness in the 1950s. As we have shown here, it was the FDA and its congressional allies' efforts to expand their authority that helped bring the dispersed interests opposed to pesticide use together around DDT as an issue. There is no doubt that policy entrepreneurs in Washington saw *Silent Spring's* publication as an opportunity. For example, Interior Secretary Stewart Udall, soon to author his own environmental classic, *The Quiet Crisis*,[193] "assigned a member of his staff to track the book's reception and report ideas for future policy initiatives."[194] Continuing Yandle's metaphor, Rep. Delaney and his general counsel played the roles of Roger Williams and John Clarke, the originators of the Baptist denomination in America.[195] Their work prepared the way for Carson and *Silent Spring*, whose impact on environmentalism can be analogized to the religious Great Awakenings of the 18th and 19th centuries. And no doubt policy entrepreneurs in Washington saw *Silent Spring*'s publication as an opportunity. We thus offer an addition to Yandle's theory, illustrating how regulatory "Baptists" can come into being as a result of policy entrepreneurs' efforts.

Silent Spring is properly credited with a major role in changing Americans' attitudes toward the environment. But the context of the changing nature of American agriculture and the conflict for regulatory authority between USDA and the FDA also suggests that *Silent Spring* was as much an expression of those changes and struggles as it was an innovation.