[Denial Rides Again: The Revisionist Attack on Rachel Carson (Chapter 7 of *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*, by Naomi Oreskes and Erik M. Conway, Bloomsbury Press, 2011)](http://beforeness.tumblr.com/post/97396882093/denial-rides-again-the-revisionist-attack-on)

Rachel Carson is an american hero—the courageous woman who in the early 1960s called our attention to the harms of indiscriminate pesticide use. In *Silent Spring*, a beautiful book about a dreadful topic, Carson explained how pesticides were accumulating in the food chain, damaging the natural environment, and threatening even the symbol of American freedom: the bald eagle. Although the pesticide industry tried to paint her as a hysterical female, her work was affirmed by the President’s Science Advisory Committee, and in 1972, the EPA concluded that the scientific evidence was sufficient to warrant the banning of the pesticide DDT in America.

Most historians, we included, consider this a success story. A serious problem was brought to public attention by an articulate spokesperson, and, acting on the advice of acknowledged experts, our government took appropriate action. Moreover, the banning of DDT, which took place under a Republican administration, had widespread public and bipartisan political support.[1](http://merchants_of_doubt_split_017.html/#filepos1665562) The policy allowed for exceptions, including the sale of DDT to the World Health Organization for use in countries with endemic malaria, and for public health emergencies here at home. It was sensible policy, based on solid science.

Fast-forward to 2007. The Internet is flooded with the assertion that Carson was a mass murderer, worse than Hitler. Carson killed more people than the Nazis. She had blood on her hands, posthumously. Why? Because *Silent Spring* led to the banning of DDT, without which millions of Africans died of malaria. The Competitive Enterprise Institute—whom we encountered in previous chapters defending tobacco and doubting the reality of global warming—now tells us that “Rachel was wrong.” “Millions of people around the world suffer the painful and often deadly effects of malaria because one person sounded a false alarm,” their site asserts. “That person is Rachel Carson.”[2](http://merchants_of_doubt_split_017.html/#filepos1666938)

Other conservative and Libertarian think tanks sound a similar cry. The American Enterprise Institute argues that DDT was “probably the single most valuable chemical ever synthesized to prevent disease,” but was unnecessarily banned because of hysteria generated by Carson’s influence.[3](http://merchants_of_doubt_split_017.html/#filepos1667264) The Cato Institute tells us that DDT is making a comeback.[4](http://merchants_of_doubt_split_017.html/#filepos1667816) And the Heartland Institute posts an article defending DDT by Bonner Cohen, the man who created EPA Watch for Philip Morris back in the mid-1990s.[5](http://merchants_of_doubt_split_017.html/#filepos1668226) (Heartland also has extensive, continuing programs to challenge climate science.

The stories we’ve told so far in this book involve the creation of doubt and the spread of disinformation by individuals and groups attempting to prevent regulation of tobacco, CFCs, pollution from coal-fired power plants, and greenhouse gases. They involve fighting facts that demonstrate the harms that these products and pollutants induce in order to stave off regulation. At first, the Carson case seems slightly different from these earlier ones, because by 2007 DDT had been banned in the United States for more than thirty years. This horse was long out of the barn, so why try to reopen a thirty-year-old debate?

Sometimes reopening an old debate can serve present purposes. In the 1950s, the tobacco industry realized that they could protect their product by casting doubt on the science and insisting the dangers of smoking were unproven. In the 1990s, they realized that if you could convince people that science in general was unreliable, then you didn’t have to argue the merits of any particular case, particularly one—like the defense of secondhand smoke—that had no scientific merit. In the demonizing of Rachel Carson, free marketeers realized that if you could convince people that an example of successful government regulation wasn’t, in fact, successful—that it was actually a mistake—you could strengthen the argument against regulation in general.

**Silent Spring*and the President’s Science Advisory Committee***

DDT was invented in 1873, but got little attention until 1940, when Swiss chemist Paul Müller, working for a Swiss chemical firm, resynthesized it. Field trials demonstrated its efficacy against numerous pests, including mosquitoes and lice, leading to the realization that DDT could be used to stop the spread of deadly insect-borne diseases like malaria and typhus.[7](http://merchants_of_doubt_split_017.html/#filepos1669482) The timing was fortunate, because supplies of the pesticide conventionally used against lice—pyrethrum, derived from chrysanthemums—were in short supply and wartime demand was great. In the latter part of World War II, DDT was widely used in Italian and African campaigns, as well as in some parts of the Pacific. Military strategists credited it with saving many lives.[8](http://merchants_of_doubt_split_017.html/#filepos1670073)

DDT seemed to be a miracle chemical. It killed insects immediately and almost entirely, yet seemed to have no adverse effects on the troops. It was easy to use: soldiers could apply it to their skin and clothing, or it could be mixed with oils and sprayed from airplanes. And it was cheap. In 1948 Müller was awarded the Nobel Prize for Physiology or Medicine for the value of DDT in disease control.[9](http://merchants_of_doubt_split_017.html/#filepos1670348)

After the war, DDT use expanded, particularly in agriculture. DDT was clearly less immediately toxic than the arsenic-based pesticides that had been previously widely used, and spraying from airplanes was much less expensive than the older methods of disease eradication, such as draining swamps, eliminating sources of open water near buildings, and clearing brush.[10](http://merchants_of_doubt_split_017.html/#filepos1670940) Across America, pest control districts switched to spraying. State and local governments began using it too, and even ordinary homeowners. Farmers began to use DDT as the U.S. government sold surplus warplanes cheaply and farmers turned them into crop dusters.[11](http://merchants_of_doubt_split_017.html/#filepos1671290)

Everyone believed that DDT was safe. One documentary from the period shows schoolchildren happily eating their lunches at picnic benches as DDT is sprayed around them.[12](http://merchants_of_doubt_split_017.html/#filepos1671598) But adverse effects were starting to be noticed. Among the first to recognize damage were biologists at the U.S. Fish and Wildlife Service, where Carson, a biologist, had worked. As she began to investigate, she found that there were numerous case reports of damage to birds and fish after DDT application. There was also some circumstantial evidence that DDT and other widely used pesticides might be doing harm to humans, too. But as with the early evidence of acid rain, most of these descriptions had been published in obscure places, in reports of the Fish and Wildlife Service or specialized journals of wildlife biology. Few people knew about any of this until Carson began to write about it.

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Carson was an eloquent writer who had already achieved success and the respect of the scientific community with her earlier book, *The Sea Around Us*. As *Silent Spring* neared completion, it was serialized in the *New Yorker*, so by the time it was published in 1962, its basic message was already out: DDT, the supposed miracle chemical, was no miracle at all.

Carson documented at great length both the anecdotal and systematic scientific evidence that DDT and other pesticides were doing great harm.[13](http://merchants_of_doubt_split_017.html/#filepos1672172) She reported on death to fish in regions that had been sprayed for pest control, on birds dying on college campuses and in suburban neighborhoods, and on spraying campaigns in Michigan and Illinois that had destroyed squirrel populations and the pets of people unfortunate enough to have been outside during the spraying or that had gone out soon after. The pesticides destroyed beneficial species, too. Spraying DDT in New Brunswick to save evergreens from a budworm infestation destroyed the bugs upon which local salmon relied, and the fish starved. DDT also killed useful insects, vital to pollinating flowers and food crops.

*Silent Spring* wasn’t just about DDT—it was about the indiscriminate use of pesticides in general—but DDT was a particular focus for Carson, as it was for her biology colleagues, because of the evidence of bioaccumulation. Other pesticides broke down quickly in the natural environment, but DDT was very persistent, accumulating up the food chain. Because it was so long lasting, it continued to be concentrated in the tissues of the animals and insects that it didn’t kill—long after spraying campaigns were over—so when those animals were eaten, the effects rippled through the ecosystem. One of its most alarming effects—interference in the reproductive systems of eagles and falcons—occurred not by direct exposure, but by those predators eating small rodents that had eaten things with DDT in or on them.

Precisely because DDT was so effective, it unbalanced ecosystems. During spraying to prevent the spread of Dutch elm disease by beetles, DDT accelerated the beetles’ spread by destroying the natural predators that previously helped to keep those beetles in check.[14](http://merchants_of_doubt_split_017.html/#filepos1672969) Spraying in the Helena National Forest to protect trees from budworms caused an outbreak of the spider mite, which further damaged the trees. (It also hurt birds that depended on the forest’s insect population.)[15](http://merchants_of_doubt_split_017.html/#filepos1673293) Carson remarked that populations recovered in one portion of the region because it was only sprayed once in a single year; other parts of the region had experienced continual spraying, and populations in those areas didn’t recover.

What about people? The two other most commonly sprayed insecticides, aldrin and dieldrin, were already known to be toxic to humans and other mammals at high doses; so it was reasonable to suppose that DDT might show similar effects. Laboratory rats fed DDT had smaller litters and higher infant mortality than control subjects. Even if DDT were perfectly safe to people in the short run, it might not be in the long run.

Historians have suggested that *Silent Spring* was to environmentalism what *Uncle Tom’s Cabin* was to abolitionism: the spark for a new public consciousness.[16](http://merchants_of_doubt_split_017.html/#filepos1673523) Yet almost as soon as *Silent Spring* came out, the pesticide industry went on the attack. They called Carson hysterical and emotional. They claimed that the science behind her work was anecdotal, unproven, inadequate, and wrong. They threatened Carson’s publisher with lawsuits.[17](http://merchants_of_doubt_split_017.html/#filepos1673976)

Of course, not all scientists agreed with Carson, particularly chemists, who tended to believe pesticides were safe if used properly, and food scientists who appreciated the value of DDT in improving agricultural productivity. One of these skeptics was Emil Mrak, chancellor of the University of California, Davis, who testified to the U.S. Congress that Carson’s conclusion that pesticides were “affecting biological systems in nature and may eventually affect human health [was] contrary to the present body of scientific knowledge.”[18](http://merchants_of_doubt_split_017.html/#filepos1674388) Most biologists did not agree with Mrak, however, and the personal attacks on Carson backfired. The publicity and furor caused sales of *Silent Spring* to skyrocket, while the obvious sexism of calling a highly trained biologist and world-class writer “hysterical”—in the age of rising feminist consciousness—led many to rally to her defense. Even President John Kennedy spoke in reverent tones of “Miss Carson’s work.”[19](http://merchants_of_doubt_split_017.html/#filepos1674652)

But what about the science? *Silent Spring* was well written, but did Carson have the science right? To answer that question, President Kennedy turned to the leading group of scientific experts in America at that time—the President’s Science Advisory Committee (PSAC, pronounced pea-sack). Established in the 1950s, and mostly populated by physicists, PSAC had mainly considered issues related to nuclear weapons and warfare, but in 1962 the president asked his advisors to guide him on DDT.

In the early 1960s, few systematic studies of the cumulative environmental effects of DDT had been done, in part because DDT had been used primarily as a military technology under exigent conditions.[20](http://merchants_of_doubt_split_017.html/#filepos1675034) Some government scientists had warned of DDT’s hazards, but their studies were mostly classified or buried in government file cabinets; few people knew of their findings. After the war, safety considerations were largely brushed aside as DDT was lionized and Müller awarded the Nobel Prize.[21](http://merchants_of_doubt_split_017.html/#filepos1675309) In any case, pesticide regulation in the United States was based on assuring efficacy and controlling residues on food, not on environmental impact. Food production in the postwar United States was a great success story—American farmers were producing more food than ever at lower and lower prices—so if DDT had played a role in that as well, it showed how successful the chemical was.

So PSAC had a difficult charge: to contrast the obvious, rapid benefits of pesticide use in disease control and food production with the subtle, long-term, poorly understood risks to humans and nature. They also had to sort out a multitude of acknowledged scientific uncertainties. These gray areas included the gap between data on acute exposure (whose risks were not disputed) and chronic effects; a lack of information on synergistic impacts; the worry that existing data underreported adverse effects (because doctors weren’t trained to recognize low-level pesticide poisoning and rarely did); and the familiar problem of extrapolating from experiments on lab rats to people.[22](http://merchants_of_doubt_split_017.html/#filepos1675630) They also had to address the difficulties of predicting long-term effects based on the few existing clinical studies.[23](http://merchants_of_doubt_split_017.html/#filepos1676139)

Despite these difficulties, PSAC came to a clear conclusion: it was time for immediate action to restrain pesticide use. The evidence of damage to wildlife was clear and compelling, even in cases of “programs carried out exactly as planned,” and these harms would sooner or later spread to humans.[24](http://merchants_of_doubt_split_017.html/#filepos1676709) “Precisely because pesticide chemicals are designed to kill or metabolically upset some living target organism, they are potentially dangerous to other living organisms,” the panel concluded logically enough. “The hazards resulting from their use dictate rapid strengthening of interim measures until such time as we have realized a comprehensive program for controlling environmental pollution.”[25](http://merchants_of_doubt_split_017.html/#filepos1677034)

In the years to come, the U.S. government developed just such a program, as bipartisan majorities in Congress passed the Clean Air and Clean Water Acts and established a number of agencies, such as the National Institute for Environmental Health Sciences, to address environmental issues. This effort culminated in 1970 in the establishment of the U.S. Environmental Protection Agency. In 1972—ten years after the publication of *Silent Spring* and at least three more national-level science assessments—the Environmental Protection Agency under President Richard Nixon banned the use of DDT in the United States.[26](http://merchants_of_doubt_split_017.html/#filepos1677252) There was no rush to judgment against DDT: it took three presidencies to enact the ban. Science was not the cause of that policy—political will was—but the scientific facts supported it.

The Kennedy PSAC report, *Use of Pesticides: A Report of the President’s Science Advisory Committee*, is notable in hindsight as much for what it did not do as for what it did. The scientists did not claim that the hazards of persistent pesticides were “proven,” “demonstrated,” “certain,” or even well understood; they simply concluded that the weight of evidence was sufficient to warrant policy action to control DDT. Environmental concerns other than pesticides might be more serious, they acknowledged, but that was no reason to deflect or distract attention from the issue with which they were charged. They did not dismiss alternatives to pesticide use, such as biological pest control, and they did not accuse Carson of harboring a hidden agenda. Nor did they let a lack of scientific understanding of the mechanisms of pesticide damage stop them from accepting the empirical evidence of it. Most important, while calling for more study, they didn’t stall or hedge; they called for action.

The committee placed the burden of proof—or at least a substantial weight of it—on those who argued that persistent pesticides were safe, and explicitly invoked the standard of reasonable doubt. The legal phrase “reasonable doubt” suggests that they were guided by existing legal frameworks, such as the landmark federal Food, Drug, and Cosmetic Act (1938), which placed the burden of proof on manufacturers to demonstrate the safety of their products, and the Miller Amendment to that act (1954), which extended the act’s reach to pesticides.[27](http://merchants_of_doubt_split_017.html/#filepos1678785) Manufacturers had not demonstrated the safety of DDT, and reasonable people now had reason to doubt it.[28](http://merchants_of_doubt_split_017.html/#filepos1681255)

Both science and democracy worked as they were supposed to. Independent scientific experts summarized the evidence. Polls showed that the public supported strong legislation to protect the environment.[29](http://merchants_of_doubt_split_017.html/#filepos1682367) Gordon MacDonald, a member of President Nixon’s Council on Environmental Quality, recalled that Nixon supported the creation of the EPA not because he was a visionary environmentalist, but because he knew that the environment would be an important issue in the 1972 presidential election.[30](http://merchants_of_doubt_split_017.html/#filepos1683296) Our leaders acted in concert with both science and the will of the people.

Does the story end there? No, for as we began to explain above, Carson has now become the victim of a shrill revisionist attack. “Rachel was wrong,” claims the Web site of the Competitive Enterprise Institute.[31](http://merchants_of_doubt_split_017.html/#filepos1683572) “Fifty million dead,” claims another.”[32](http://merchants_of_doubt_split_017.html/#filepos1683800) “More deaths likely,” insists a third.[33](http://merchants_of_doubt_split_017.html/#filepos1684178) Why? Because malaria has not been eradicated, and it would have been, these critics insist, had the United States not succumbed to environmental hysteria. There was no good scientific evidence to support the DDT ban, they say, and DDT was the only effective means to kill the mosquitoes that carry the malarial parasite.[34](http://merchants_of_doubt_split_017.html/#filepos1684626) Banning it was “the worst crime of the century.”[35](http://merchants_of_doubt_split_017.html/#filepos1684854)

In his bestselling book, *The Skeptical Environmentalist*, Danish economist Bjørn Lomborg (listed by *Time* as one of the one hundred most influential people in 2004) echoed the accusation that Carson’s argument was more emotional than rational, insisting that more lives were saved by disease control and improved food supply than were ever lost to DDT. Thomas Sowell, a conservative writer associated with the Hoover Institution, insists “there has not been a mass murderer executed in the past half-century who has been responsible for as many deaths of human beings as the sainted Rachel Carson.”[36](http://merchants_of_doubt_split_017.html/#filepos1685103) Others have compared Carson to Stalin and Hitler.[37](http://merchants_of_doubt_split_017.html/#filepos1685544)

One might ignore these venomous claims except that they have been repeated in mainstream newspapers. In 2007, the *San Francisco Examiner* ran an op-ed piece alleging that “Carson was wrong, and millions of people continue to pay the price.”[38](http://merchants_of_doubt_split_017.html/#filepos1686242) The *Wall Street Journal* argued that Carson’s work led to the attitude that “environmental controls were more important than the lives of human beings.”[39](http://merchants_of_doubt_split_017.html/#filepos1686924) The *New York Times* has run several articles and op-ed pieces doubting the wisdom of U.S. action on DDT.[40](http://merchants_of_doubt_split_017.html/#filepos1687584) “What the World Needs Now Is DDT” ran the title of a Sunday *New York Times Magazine* piece in 2004. “No one concerned about the environmental damage of DDT set out to kill African children,” the article began, but their deaths happened all the same. “*Silent Spring* is now killing African children because of its persistence in the public mind.”[41](http://merchants_of_doubt_split_017.html/#filepos1688368)

One of the anti-Carson voices at the *New York Times* is the “science” columnist John Tierney, who in 2007 argued that *Silent Spring* was a “hodgepodge of science and junk science” and that the person who actually got the science right in the 1960s was I. L. Baldwin, a professor of agricultural bacteriology at the University of Wisconsin. No one listened to him, Tierney insisted, because Baldwin didn’t scare people. His calm demeanor was no match for Carson’s “rhetoric,” which “still drowns out real science.”[42](http://merchants_of_doubt_split_017.html/#filepos1688636)

Is Tierney right? Was Carson wrong? What does real science—and real history—tell us? It tells us that Carson—and the President’s Science Advisory Committee and the U.S Environmental Protection Agency and President Richard Nixon—were not wrong about DDT.

After DDT’s demonstrated successes in World War II, the United States and the World Health Assembly launched a Global Malaria Eradication Campaign (1955–1969). It was not based on large outdoor spraying campaigns—the principal target of Carson’s indictment—but primarily on indoor spraying of household walls and surfaces with DDT (and dieldrin). The U.S. Centers for Disease Control summarizes the results: “The campaign did not achieve its stated objective.” Endemic malaria was eliminated in developed nations, mainly in Europe and Australia, and sharply reduced in India and parts of Latin America, but the campaign failed in many less developed areas, especially sub-Saharan Africa. It was halted in 1969—four years before the U.S. DDT ban—so whatever happened could not have been the result of the U.S. ban. What did happen?[43](http://merchants_of_doubt_split_017.html/#filepos1689264)

Malaria eradication failed in less developed nations because spraying alone didn’t work. Spraying *along with* good nutrition, reduction of insect breeding grounds, education, and health care did work, which explains why malaria was eradicated in developed nations like Italy and Australia, but not in sub-Saharan Africa. Like nearly all public health initiatives, the program needed people’s cooperation and understanding.

Indoor Residual Spraying—the central technique used—worked by leaving insecticide on the walls and ceilings of dwellings. This meant that people needed not to wash, paint, or replaster their walls, and many people didn’t understand this, as it contradicted most other public health directives. Others just didn’t like the idea, as it seemed to instruct them to have dirty homes. But the most important reason that eradication was only partially successful was that mosquitoes were developing resistance. In the United States, DDT use peaked in 1959—thirteen years before the ban—because it was already starting to fail.

Bugs and bacteria offer the best evidence we have of natural selection. When an insecticide wipes out part of a population, the ones that survive pass on their genes to their offspring, and it is only a matter of time before the population adapts to the insecticide-laden environment. Insect generations last a few days to a few months, so they evolve with enormous speed—far faster than slow-breeding species like humans and most animals. So they show the effects of natural selection in a time frame that we can directly observe—sometimes in as little as a few years.

Insect resistance to DDT was first recognized in 1947, just a few years after DDT’s wartime triumphs. Mosquito control workers in Fort Lauderdale reported that “the normal application of a 5 percent DDT solution had no discernible effect on salt marsh mosquitoes … the miraculous ‘magic dust’ had lost its efficacy against the hordes of salt marsh mosquitoes along Florida’s east coast.”[44](http://merchants_of_doubt_split_017.html/#filepos1689623) Resistance increased rapidly during the 1950s, and soon many pest control districts were abandoning DDT for other alternatives.

Sadly, most of the resistance that insects developed to DDT came from agricultural use, not from disease control. There *is* a tragedy in this story, but it is not the one that the Competitive Enterprise Institute thinks it is. It is that the attempt to grow food cheaply, especially in the United States, was largely responsible for the development of insect resistance. The failure of DDT in disease control is in part the result of its excess use in agriculture. Here’s why.

The most efficient way to use pesticides against disease is through application to the insides of buildings—the Indoor Residual Spraying on which the World Health Organization largely relied. DDT is particularly potent in this use, as an application can last up to a year. Most important, it doesn’t produce resistance very quickly, because most insects don’t wind up in buildings and therefore aren’t subjected to the poison. Indoor Residual Spraying just affects the small percentage of the population that make it indoors, where they are likely to bite people and transmit disease, so the selection pressure on the insect population isn’t very high. It’s a very sensible strategy.

However, when pesticides are sprayed over large agricultural areas, they kill a large fraction of the total insect population, ensuring that the hardy survivors breed only with other hardy survivors; the very next generation may display resistance. The more extensive the agricultural use, the more likely bugs are to evolve resistance rapidly, and the less effective the pesticide is likely to be when you need it for disease control.

We now know that agricultural spraying produced insect immunity in only seven to ten years. This isn’t merely hindsight: Rachel Carson discussed insect resistance in *Silent Spring*.[45](http://merchants_of_doubt_split_017.html/#filepos1690117) DDT was also widely used for agriculture in countries where it was being used for disease control, so it became ineffective for disease control much sooner than it might otherwise have. In the 1950s, we already knew that insects evolved very rapidly, but our political institutions evolved much more slowly than the bugs did.

Events proved that DDT alone was not sufficient to eradicate malaria, but was DDT necessary? Was it essential in the regions where malaria was controlled? The answer here is no, too. Most people have forgotten that in the nineteenth century malaria was endemic in the United States—and a major anxiety for settlers in places like Arkansas, Alabama, and Mississippi.[46](http://merchants_of_doubt_split_017.html/#filepos1690446) Even California struggled with malaria.

By the 1930s mosquito control districts throughout the nation had largely brought malaria under control by drainage, removal of breeding sites, and pesticides other than DDT.[47](http://merchants_of_doubt_split_017.html/#filepos1690894) Malaria infection in Florida, for example, declined every year after 1935, even though DDT was yet to be introduced.[48](http://merchants_of_doubt_split_017.html/#filepos1691570) Urbanization played a role, too, as more Americans lived away from mosquito breeding grounds. After World War II, DDT became an additional tool in the arsenal, helping to eradicate the remaining cases—by then few and far between.

Another case is worth mentioning: the Panama Canal. Led by Ferdinand de Lesseps (who had also led the construction of the Suez Canal) the canal project was started by a French company in 1882, but faltered in part because of the impact of yellow fever and malaria. By 1889, more than twenty-two thousand workers had been felled by these two diseases, and the construction effort collapsed.

In 1904, the U.S. government took over and the new American leadership appointed a medical officer to the post of chief sanitation officer, William Crawford Gorgas. Gorgas believed what was then a radical hypothesis: that these diseases were carried by insects. He drained swamps and wetlands, removed standing pools of water from around buildings, and sent teams of men to destroy mosquito larvae with oil and to fumigate the buildings. He also equipped the buildings, especially the workers’ dormitories, with screens. Between 1906 and the completion of the canal in 1914, there was only a single case of yellow fever, and the death rate in the population declined from 16.21 per thousand in 1906 to 2.58 per thousand in December 1909.[49](http://merchants_of_doubt_split_017.html/#filepos1691906) Yellow fever was completely eradicated—thirty-one years before Müller’s discovery of DDT’s insecticidal properties. While malaria proved more recalcitrant, it too was controlled in many regions by similar techniques. The lesson of history is clear: DDT alone did not eradicate insect-borne diseases, and those diseases have been controlled in places with little or no use of DDT.[50](http://merchants_of_doubt_split_017.html/#filepos1692529)

When the United States took action against DDT in 1971, EPA administrator William Ruckelshaus made clear that the new ban would not apply outside the United States. (How could it? EPA had no authority over other countries.) Ruckelshaus stressed that U.S. manufacturers were free to continue to manufacture and sell the product for disease control overseas, and that his agency would “not presume to regulate the felt necessities of other countries.”[51](http://merchants_of_doubt_split_017.html/#filepos1692916)Whatever subsequently happened in Africa, it was hardly Rachel Carson’s fault—or William Ruckelshaus’s.

As for Baldwin—the scientist whom John Tierney claims got the science right—the work that Tierney quotes wasn’t a piece of scientific research at all, it was a *book review*: a review of *Silent Spring.* Baldwin acknowledged that*Silent Spring* was “superbly written and beautifully illustrated,” and constituted “an exhaustive study of the facts bearing on the problem.”[52](http://merchants_of_doubt_split_017.html/#filepos1694402) He also allowed that Carson’s approach “will undoubtedly result in wider recognition of the fact that [pesticides] are poisons and in a more careful and rigorous control of every step in the pathway that pesticides must travel … There are serious hazards involved in the use of pesticides.”[53](http://merchants_of_doubt_split_017.html/#filepos1694662)

So what was Baldwin’s complaint? That the book was impassioned, rather than balanced, and read as if written by a prosecutor. That was true: Carson *was* trying to make a case. But above all, Baldwin complained that Carson had written the wrong book. He wanted to read a progress story about how the development of chemicals—pesticides included—constituted a “chemical revolution … that has most intimately affected every aspect of our daily life.” He wanted a book that recounted how technology had made life better, emphasizing that “the span of our life has been greatly extended; our clothes are composed of fibers unknown 20 years ago; our machinery and household utensils are made of new and strange materials.”[54](http://merchants_of_doubt_split_017.html/#filepos1694876) He wanted to be told about the benefits that science and technology had brought us, not their frightening unintended consequences. Perhaps John Tierney felt the same way.

Like virtually all of Carson’s critics who followed, Baldwin insisted that pesticides were the key to the productivity of modern agriculture, and that greater use of pesticides was the key to wiping out world hunger (although most social scientists disagree, pointing out that there is plenty of food in the world; the problem we face is one of unequal distribution). Rather than answer Carson’s points and address her evidence, Baldwin changed the subject: focusing on the good that modern technology has brought, and refusing to address her central argument about ecosystem harms. Contrary to Tierney’s claim, Baldwin conceded the science. Like virtually all of Carson’s critics—including Tierney—his faith in technology and anthropocentrism caused him to miss Carson’s most important point.

In 1962, evidence of human deaths from DDT was scant. Carson acknowledged this. While she suggested that DDT was likely to cause cancer, she never claimed that large numbers of people had been killed by it. What she emphasized was the overwhelming evidence of harm to *ecosystems*, harm that she believed would sooner or later reach us. Carson’s argument was that any war on nature was one that we were bound to lose. Fish and birds were killed, while fast-evolving insects came back stronger than ever. Finally—and perhaps above all—it was a mistake to assume that the only harms that counted were *physical.* Even if DDT caused not one human death, humans would be affected: our world would be impoverished if spring came and no birds sang.

If DDT’s defenders have exaggerated its benefits, have its detractors exaggerated the harms? If DDT rarely harms people and sometimes helps, why not reintroduce it? Isn’t Bjørn Lomborg right at least that DDT saved more lives than it cost?

The argument is a red herring. DDT was not banned on the basis of harm to humans; it was banned on the basis of harms to the environment. The scientific evidence of those harms was not only affirmed by PSAC and the EPA; it has been reaffirmed by numerous studies in areas where DDT and its metabolite, DDE, persist.[55](http://merchants_of_doubt_split_017.html/#filepos1695090) DDT kills birds, fish, and beneficial insects, and continues to do so long after spraying has stopped. Even today, birds in the Catalina Islands show signs of DDT poisoning, probably from eating fish that have ingested materials from the sea floor laced with residual DDT, left over from its manufacture in California decades ago.[56](http://merchants_of_doubt_split_017.html/#filepos1695861)

What about humans? Tierney argues that when DDT was banned “there wasn’t evidence that it was carcinogenic.” This is true. But since then we have learned a great deal about the risks of pesticides, and there is now strong scientific evidence that many pesticides carry serious risks to humans. (Recall that *Silent Spring* was not just about DDT; it was about pesticides in general.) Since 1971, the cancer-causing properties of diverse pesticides have been demonstrated by numerous peer-reviewed scientific studies, both in animal models and exposed humans.[57](http://merchants_of_doubt_split_017.html/#filepos1696414) We have also learned much more about the manner in which DDT does, in fact, harm humans.

A recent review in the *Lancet*—the world’s leading medical journal—concluded that when used at levels required for mosquito control, DDT causes significant human impacts, particularly on reproductive health. (This is not surprising, given that some of the earliest evidence against DDT was that it interfered with reproduction in birds and rats.) Abundant scientific evidence reveals DDT’s impact on child development, including preterm birth, low birth weight, and possible birth defects. High concentrations of DDT in breast milk are correlated with shortened duration of lactation and early weaning—itself highly correlated with infant and childhood mortality. The *Lancet* authors conclude that any saving of lives from malaria might well be abrogated by infant and early childhood mortality caused by DDT.[58](http://merchants_of_doubt_split_017.html/#filepos1697536) Some lives might have been saved by continued use of DDT, but others would have been lost.

And what about cancer? A few years ago, medical researchers realized that there was a shocking flaw in previous studies that investigated DDT exposure and breast cancer. Most of them were done *after* DDT use was already on the decline, or even after the ban, so the women being studied had probably been exposed only to low levels (if at all), and exposed later in life when the body is less vulnerable. To really know whether or not DDT had an effect, you’d need to study women who’d been exposed to DDT early in life, at a time when environmental exposures were high.

In a remarkable piece of medical detective work, Dr. Barbara A. Cohn and her colleagues identified women who had been part of medical study of pregnant women in the 1960s, and therefore might have been exposed as children or teenagers when DDT use was widespread in the 1940s and ’50s. These women had given blood samples at the time, samples that could now be reanalyzed for DDT and its metabolites. In 2000–2001, they measured DDT-related compounds in these samples and compared them with breast cancer rates. The average age at the time of the original study was twenty-six; these women were now in their fifties and sixties—an age by which breast cancer might reasonably be expected to appear. The results showed a *fivefold increase* in breast cancer risk among women with high levels of serum DDT or its metabolites.[59](http://merchants_of_doubt_split_017.html/#filepos1698014) DDT *does* cause cancer, it *does* affect human health, and it *does* cost human lives. Rachel Carson was not wrong.

Admittedly, some public health experts think that DDT could play a useful role in malaria control in some places in the world today, but it never was the miracle cure that Lomborg, Sowell, Cohen, and Tierney have made it out to be. There is no scientific evidence to support the claim that millions of lives have been needlessly lost, and there is substantial scientific evidence that a good deal of harm—both to humans and the other species we share this planet with—has been avoided.

So what is going on here? Are these folks just confused? Misinformed? Ignorant? Even hysterical? Would that it were so.

We’ve seen how some people have fought the facts about the hazards of tobacco, acid rain, ozone depletion, secondhand smoke, and global warming. Their denials seemed plausible, at least to some, because they involved matters that were still under scientific investigation, where many of the details were uncertain even if the big picture was becoming clear. But the construction of a revisionist history of DDT gives the game away, because it came so long after the science was settled, far too long to argue that scientists had not come to agreement, that there was still a real scientific debate. The game here, as before, was to defend an extreme free market ideology. But in this case, they didn’t just deny the facts of science. They denied the facts of history.

***Denial as Political Strategy***

Each of the stories we’ve told so far involved a handful of actors attempting to prevent regulation of specific products. But the twenty-first-century attack on Carson had nothing to do with preventing regulation; the regulation was long established. Nor was it an effort to overturn that regulation. It was well understood in American science, government, and agriculture that DDT was no longer effective in the United States. So why does DDT matter? Why attack a woman who has been dead for nearly half a century?

We saw in chapter 3 that as the acid rain story was emerging in the 1960s, the American environmental movement was changing its orientation away from an aesthetic environmentalism toward legal regulation. Carson’s voice was fundamental to that reorientation. After all, what was the value of a national park if no birds sang in it? If Carson was wrong, then the shift in orientation might have been wrong, too. The contemporary environmental movement could be shown to have been based on a fallacy, and the need for government intervention in the marketplace would be refuted.

We see this narrative first emerging from someone we have already met: Dixy Lee Ray. In *Trashing the Planet*, Ray sang the praises of DDT and constructed a set of “facts” that have circulated ever since. She told a story of how DDT was wrongly abandoned in Sri Lanka, where “public health statistics … testify to the effectiveness of the spraying program.” It began like this:

In 1948, before the use of DDT there were 2.8 million cases of malaria [in Sri Lanka]. By 1963, there were only 17. Low levels of infection continued until the late 1960s, when the attacks on DDT in the U.S. convinced officials to suspend spraying. In 1968 there were one million cases of malaria. In 1969, the number reached 2.5 million, back to the pre-DDT levels. Moreover by 1972, the largely unsubstantiated charges against DDT in the United States had a worldwide effect.[60](http://merchants_of_doubt_split_017.html/#filepos1698838)

Is this account true? Partly—the part up to 1963. Between 1948 and 1963, DDT worked, and malaria cases dropped dramatically. Although resistance was seen as early as 1958, eradication appeared to be working overall. In 1963, the small handful of new cases should have made it controllable; indeed, malaria should have been on the path to eradication in Sri Lanka. But then Ray started to leave out key facts.

In 1968, malaria flared up again, and DDT couldn’t control it. Still, the Sri Lankans persisted, using even more DDT over larger areas at more frequent intervals. Still, it didn’t work. In its 1976 study of pesticide resistance, the World Health Organization’s Expert Committee reported:

In Sri Lanka a revised programme started in March 1975 that had been planned in the light of the limited financial resources available … The use of DDT at 1g/m2 at 4 monthly intervals with particular attention to improved coverage did not result in any significant difference in malaria prevalence as compared with an area with normal (lesser) coverage, and no improvement was obtained either by using DDT at the rate of 2g/m2 at 4 monthly intervals.[61](http://merchants_of_doubt_split_017.html/#filepos1699328)

Finally they switched to malathion, a more expensive agent, but one that the region’s insect population hadn’t yet adapted to. This brought the malaria rate down again, although not to the extremely low levels seen in 1963.[62](http://merchants_of_doubt_split_017.html/#filepos1699808)

So Sri Lanka didn’t stop using DDT because of what the United States did, or for any other reason. DDT stopped working, but they kept using it anyway. We can surmise why: since DDT had appeared to work at first, officials were reluctant to give it up, even as malaria became resurgent. It took a long time for people to admit defeat—to accept that tiny mosquitoes were in their own way stronger than us. As a WHO committee concluded in 1976, “It is finally becoming acknowledged that resistance is probably the biggest single obstacle in the struggle against vector-borne disease and is mainly responsible for preventing successful malaria eradication in many countries.”[63](http://merchants_of_doubt_split_017.html/#filepos1700176)

Resistance is never mentioned in Ray’s account, an especially notable omission given that she was a zoologist. In a particularly egregious example of the pot calling the kettle black, Ray accused both environmentalists and William Ruckelshaus of giving credibility to pseudoscience, by creating “an atmosphere in which scientific evidence can be pushed aside by emotion, hysteria, and political pressure.”[64](http://merchants_of_doubt_split_017.html/#filepos1700565) But it was she, not Ruckelshaus, who was spreading hysteria.

Ray had not accused Rachel Carson of mass murder, but others soon did. We met Steve Milloy in chapter 5, as he founded The Advancement of Sound Science Coalition on behalf of Philip Morris in 1993 to defend a product that really *had* caused millions of deaths. Soon thereafter, he began to spread the “millions of deaths” claim about DDT. According to his 1997 annual report, he began working with J. Gordon Edwards, an entomologist at San Jose State University, to help him publish an account of the DDT controversy.[65](http://merchants_of_doubt_split_017.html/#filepos1700901) Edwards’s account finally appeared in 2004 in the *Journal of American Physicians and Surgeons*, published by the Association of American Physicians and Surgeons. This is a Libertarian political group that shares a board member with the Oregon Institute of Science and Medicine—a group that had also promoted skepticism about global warming. Edwards contended that “the worldwide effect of the U.S. ban has been millions of preventable deaths.”[66](http://merchants_of_doubt_split_017.html/#filepos1701332) While suggesting that “the term genocide is used in other contexts to describe such numbers of casualties,” he never mentioned the fact of pesticide resistance—a striking omission for an entomologist.

Milloy continued the antiscientific crusade in his post-TASSC career, and continues it to this day. “It might be easy for some to dismiss the past 43 years of eco-hysteria over DDT with a simple ‘never mind,’” Milloy asserted recently, “except for the blood of millions of people dripping from the hands of the WWF, Greenpeace, Rachel Carson, Environmental Defense Fund, and other junk science–fueled opponents of DDT.”[67](http://merchants_of_doubt_split_017.html/#filepos1701782) Milloy is well-known for his attacks on science related to all kinds of environmental issues, including global warming (which he calls a “swindle”), acid rain (which he notes helps slow global warming—although he doesn’t believe in global warming anyway), and the ozone hole (which he considers to be of no real significance).[68](http://merchants_of_doubt_split_017.html/#filepos1702188) Milloy’s current project is junkscience.com, but, as we saw in chapter 5 “junk science” was a term invented by the tobacco industry to discredit science it didn’t like. Junkscience.com was originally established in a partnership with the Cato Institute, which, after Milloy’s continued tobacco funding came to light, severed its ties.[69](http://merchants_of_doubt_split_017.html/#filepos1703409)

The disinformation campaign continues on the Web, supported by organizations and institutes that are by now familiar. After Rush Limbaugh parroted the “Rachel was wrong” attack, the Competitive Enterprise Institute promoted him for the Nobel Peace Prize.[70](http://merchants_of_doubt_split_017.html/#filepos1704673) The Competitive Enterprise Institute shares philosophical ground with the American Enterprise Institute, which promoted the work of the late fiction writer Michael Crichton. His 2004 novel, *State of Fear*, portrayed global warming as a liberal hoax meant to bring down Western capitalism.[71](http://merchants_of_doubt_split_017.html/#filepos1705036) Crichton also took on the DDT issue, as one character in the novel insists, “Banning DDT killed more people than Hitler … It was so safe you could eat it.”[72](http://merchants_of_doubt_split_017.html/#filepos1705826)

The “Rachel was wrong” chorus is echoed particularly loudly at the Heartland Institute, a group dedicated to “free-market solutions to social and economic problems.”[73](http://merchants_of_doubt_split_017.html/#filepos1706192) Their Web site insists that “some one million African, Asian, and Latin American lives could be saved annually” had DDT not been banned by the U.S. Environmental Protection Agency.[74](http://merchants_of_doubt_split_017.html/#filepos1706506)

The Heartland Institute is known among climate scientists for persistent questioning of climate science, for its promotion of “experts” who have done little, if any, peer-reviewed climate research, and for its sponsorship of a conference in New York City in 2008 alleging that the scientific community’s work on global warming is a fake.[75](http://merchants_of_doubt_split_017.html/#filepos1706977) But Heartland’s activities are far more extensive, and reach back into the 1990s when they, too, were working with Philip Morris.

In 1993, Richard C. Rue, a project director for the Heartland Institute, wrote to Roy E. Marden, manager of Industrial Affairs for Philip Morris Management, to solicit continued support. Rue enclosed a copy of an op-ed piece, evidently an excerpt from a forthcoming book, written by Joseph Bast, the Institute president and CEO.[76](http://merchants_of_doubt_split_017.html/#filepos1707728) He recounted other recent Institute activities, boasting of distributing almost nine thousand copies of a special publication of the Chemical Manufacturers Association, of which eight thousand were sent to “state legislators and constitutional officers and other public opinion leaders.”[77](http://merchants_of_doubt_split_017.html/#filepos1708108)

Philip Morris also used Heartland to distribute reports that they (Philip Morris) had commissioned. In April 1997, Roy Marden wrote to Thomas Borelli (who we met in chapter 5) discussing a task force report they had prepared in conjunction with the Association for Private Enterprise Education. Marden wrote:

… the Heartland Institute, an Illinois-based policy group with whom we work, [will] publish a 24-page summary of the report/paper as a policy study. This will be released late next week, with a distribution of at least 3000 (half journalists, the remainder to state Constitutional officers and business types). Heartland would be willing to do a full run of 10,000 (which would include every state legislator and Member of Congress) if they can get the funding for the 7000 differential. I am getting faxed later what this will cost … and I think we should consider this.[78](http://merchants_of_doubt_split_017.html/#filepos1709179)

Heartland Institute officials also met with members of Congress on behalf of the tobacco industry, organized “off-the record” briefings, wrote and placed op-ed pieces, and organized radio interviews and letters to editors.[79](http://merchants_of_doubt_split_017.html/#filepos1709586)

In 1997, Philip Morris paid $50,000 to the Heartland Institute to support its activities, but this was just the tip of the iceberg of a network of support to supposedly independent and nonpartisan think tanks. The stunning extent of Philip Morris’s reach is encapsulated in a ten-page document from 1997 listing policy payments that were made to various organizations. Besides the $50,000 to the Heartland Institute, there was $200,000 for TASSC, $125,000 for the Competitive Enterprise Institute, $100,000 for the American Enterprise Institute, and scores more.[80](http://merchants_of_doubt_split_017.html/#filepos1710150) Payments were for as little as $1,000 or as much as $300,000, and many went to groups with no evident interest in the tobacco issue, such as the Ludwig von Mises Institute or Americans for Affordable Electricity. Numerous other documents attest to activities designed to undermine the Clinton health care reform plan.[81](http://merchants_of_doubt_split_017.html/#filepos1710530) Often financial contributions were referred to in company documents as “philanthropy,” and because these organizations were all nonprofit and nonpartisan, the donations were all tax deductible.[82](http://merchants_of_doubt_split_017.html/#filepos1710942)

The following image is the first page of this ten-page document listing the “policy” organizations to which the Philip Morris Corporation contributed. Note how nearly all of these were described as having a focus in either “Individual Liberties,” “Regulatory Issues,” or both, and how the Cato Institute, the American Enterprise Institute, and the Competitive Enterprise Institute—all of whom have questioned the scientific evidence of global warming—each received six-figure contributions. Note also the funding to the American Civil Liberties Union. Additional pages document contributions to the Frontiers of Freedom Institute, the Acton Institute, the Alexis de Tocqueville Institute, and the Independent Institute; to seemingly grass-roots organizations—the Citizens Against Government Waste, the Independent Women’s Forum, and the Institute for Youth Development—and to university groups such as the George Mason Law and Economics Center and the University of Kansas Law and Organizational Economics Center.

[*Source: BN: 2078848138, Legacy Tobacco Documents Library*](https://www.dropbox.com/s/tk708gjx73em92x/PolicyPayments.png?dl=0)

***The Orwellian Problem***

The network of right-wing foundations, the corporations that fund them, and the journalists who echo their claims have created a tremendous problem for American science. A recent academic study found that of the fifty-six “environmentally skeptical” books published in the 1990s, 92 percent were linked to these right-wing foundations (only thirteen were published in the 1980s, and 100 percent were linked to the foundations).[83](http://merchants_of_doubt_split_017.html/#filepos1711388) Scientists have faced an ongoing misrepresentation of scientific evidence and historical facts that brands them as public enemies—even mass murderers—on the basis of phony facts.

There is a deep irony here. One of the great heroes of the anti-Communist political right wing—indeed one of the clearest, most reasoned voices against the risks of oppressive government, in general—was George Orwell, whose famous *1984* portrayed a government that manufactured fake histories to support its political program.[84](http://merchants_of_doubt_split_017.html/#filepos1711858) Orwell coined the term “memory hole” to denote a system that destroyed inconvenient facts, and “Newspeak” for a language designed to constrain thought within politically acceptable bounds.

All of us who were children in the Cold War learned in school how the Soviet Union routinely engaged in historical cleansing, erasing real events and real people from their official histories and even official photographs. The right-wing defenders of American liberty have now done the same. The painstaking work of scientists, the reasoned deliberations of the President’s Science Advisory Committee, and the bipartisan American agreement to ban DDT have been flushed down the memory hole, along with the well-documented and easily found (but extremely inconvenient) fact that the most important reason that DDT failed to eliminate malaria was because insects *evolved.* That is the truth—a truth that those with blind faith in free markets and blind trust in technology simply refuse to see.

The rhetoric of “sound science” is similarly Orwellian. Real science—done by scientists and published in scientific journals—is dismissed as “junk,” while misrepresentations and inventions are offered in its place. Orwell’s Newspeak contained no science at all, as the very concept of science had been erased from his dystopia. And not surprisingly, for if science is about studying the world as it actually is—rather than as we wish it to be—then science will always have the potential to unsettle the status quo. As an independent source of authority and knowledge, science has always had the capacity to challenge ruling powers’ ability to control people by controlling their beliefs. Indeed, it has the power to challenge anyone who wishes to preserve, protect, or defend the status quo.

Lately science has shown us that contemporary industrial civilization is not sustainable. Maintaining our standard of living *will* require finding new ways to produce our energy and less ecologically damaging ways to produce our food. Science has shown us that Rachel Carson was not wrong.

This is the crux of the issue, the crux of our story. For the shift in the American environmental movement from aesthetic environmentalism to regulatory environmentalism wasn’t just a change in political strategy. It was the manifestation of a crucial realization: that unrestricted commercial activity was doing damage—real, lasting, pervasive damage. It was the realization that pollution was global, not just local, and the solution to pollution was *not* dilution. This shift began with the understanding that DDT remained in the environment long after its purpose was served. And it grew as acid rain and the ozone hole demonstrated that pollution traveled hundreds or even thousands of kilometers from its source, doing damage to people who did not benefit from the economic activity that produced it. It reached a crescendo when global warming showed that even the most seemingly innocuous by-product of industrial civilization—CO2, the stuff on which plants depend—could produce a very different planet.

To acknowledge this was to acknowledge the soft underbelly of free market capitalism: that free enterprise can bring real costs—profound costs—that the free market does not reflect. Economists have a term for these costs—a less reassuring one than Friedman’s “neighborhood effects.” They are “negative externalities”: negative because they aren’t beneficial and external because they fall outside the market system. Those who find this hard to accept attack the messenger, which is science.

We all expect to pay for the things we buy—to pay a fair cost for goods and services from which we expect to reap benefits—but external costs are unhinged from benefits, often imposed on people who did not choose the good or service, and did not benefit from their use. They are imposed on people who did not benefit from the economic activity that produced them. DDT imposed enormous external costs through the destruction of ecosystems; acid rain, secondhand smoke, the ozone hole, and global warming did the same. This is the common thread that ties these diverse issues together: they were all market failures. They are instances where serious damage was done and the free market seemed unable to account for it, much less prevent it. Government intervention was required. This is why free market ideologues and old Cold Warriors joined together to fight them. Accepting that by-products of industrial civilization were irreparably damaging the global environment was to accept the reality of market failure. It was to acknowledge the limits of free market capitalism.

Orwell understood that those in power will always seek to control history, because whoever controls the past controls the present. So our Cold Warriors—Fred Seitz and Fred Singer, Robert Jastrow and Bill Nierenberg, and later Dixy Lee Ray, too, who had dedicated their lives to fighting Soviet Communism, joined forces with the self-appointed defenders of the free market to blame the messenger, to undermine science, to deny the truth, and to market doubt. People who began their careers as fact finders ended them as fact fighters. Evidently accepting that their ends justified their means, they embraced the tactics of their enemy, the very things they had hated Soviet Communism for: its lies, its deceit, its denial of the very realities it had created.

Why would any scientist participate in such a fraud? We’ve seen that Steve Milloy and John Tierney, the Competitive Enterprise Institute and the Heartland Institute, were late entries in this tournament, echoing arguments that had been first constructed by scientists. Our story began in the 1950s, when the tobacco industry first enlisted scientists to aid its cause, and deepened in the 1970s when Frederick Seitz joined forces with tobacco, and then with Robert Jastrow and Bill Nierenberg to defend the Strategic Defense Initiative. It continued in the early 1980s as Fred Singer planted the idea that acid rain wasn’t worth worrying about, and Nierenberg worked with the Reagan White House to adjust the Executive Summary of his Acid Rain Peer Review Panel. It continued still further, and turned more personal, in the 1990s as the Marshall Institute, with help from Singer and Ray, challenged the evidence of ozone depletion and global warming and personally attacked distinguished scientists like Sherwood Rowland and Ben Santer.

Why did this group of Cold Warriors turn against the very science to which they had previously dedicated their lives? Because they felt—as did Lt. General Daniel O. Graham (one of the original members of Team B and chief advocate of weapons in space) when he invoked the preamble to the U.S. Constitution—they were working to “secure the blessings of liberty.”[85](http://merchants_of_doubt_split_017.html/#filepos1712208) If science was being used against those blessings—in ways that challenged the freedom of free enterprise—then they would fight it as they would fight any enemy. For indeed, science *was* starting to show that certain kinds of liberties are not sustainable—like the liberty to pollute. Science was showing that Isaiah Berlin was right: liberty for wolves does indeed mean death to lambs.

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[6.](http://merchants_of_doubt_split_011.html/#filepos988993) “Global Warming: Was It Ever Really a Crisis?” News, Heartland.org, <http://www.heartland.org/events/NewYork09/news.html;> Global Warming Facts, Heartland Institute, <http://www.globalwarmingheartland.org/;> see also Andrew C. Revkin, “Skeptics Dispute Climate Worries and Each Other,” *New York Times*, March 8, 2009, <http://www.nytimes.com/2009/03/09/science/earth/09climate.html.>

[7.](http://merchants_of_doubt_split_011.html/#filepos991821) Edmund Russell, “The Strange Career of DDT: Experts, Federal Capacity, and Environmentalism in WWII,” *Technology and Culture* 40, no. 4 (October 1999): 770–96; Russell, *War and Nature.*

[8.](http://merchants_of_doubt_split_011.html/#filepos992395) Russell, “The Strange Career of DDT.”

[9.](http://merchants_of_doubt_split_011.html/#filepos993130) “Paul Müller: The Nobel Prize in Physiology or Medicine, 1948,” *Nobel Lectures, Physiology or Medicine 1942–1962* (Amsterdam: Elsevier Publishing Company, 1964), Nobelprize.org, <http://nobelprize.org/nobel_prizes/medicine/laureates/1948/muller-bio.html.>

[10.](http://merchants_of_doubt_split_011.html/#filepos993824) Dunlap, *DDT: Scientists, Citizens, and Public Policy*.

[11.](http://merchants_of_doubt_split_011.html/#filepos994275) Russell, *War and Nature.*

[12.](http://merchants_of_doubt_split_011.html/#filepos994771) *The American Experience: Rachel Carson’s Silent Spring*, DVD, produced by Neil Goodwin (WGBH/PBS, 1992); Russell, “The Strange Career of DDT,” 770–96; Russell, *War and Nature.*

[13.](http://merchants_of_doubt_split_011.html/#filepos997311) *Silent Spring* was first serialized in the *New Yorker*: “Rachel Carson, A Reporter at Large, ‘Silent Spring,’” June 16, 1962, June 23, 1962, June 30, 1962. It was later published as Rachel Carson, *Silent Spring* (Boston, Mass.: Houghton Mifflin, 1962; repr. 1994). Citations are to the 1994 version.

[14.](http://merchants_of_doubt_split_011.html/#filepos999776) Carson, *Silent Spring*, 116.

[15.](http://merchants_of_doubt_split_011.html/#filepos1000185) Ibid., 132–33.

[16.](http://merchants_of_doubt_split_011.html/#filepos1001939) Wang, “Responding to Silent Spring,” 141–163; DDT’s development and relationship to chemical warfare is explained in Russell, *War and Nature.*

[17.](http://merchants_of_doubt_split_011.html/#filepos1002568) Wang, “Responding to Silent Spring,” 141–63; *The American Experience: Rachel Carson’s Silent Spring.*

[18.](http://merchants_of_doubt_split_011.html/#filepos1003453) Wang, “Responding to Silent Spring,” 156.

[19.](http://merchants_of_doubt_split_011.html/#filepos1004264) *CBS Reports: The Silent Spring of Rachel Carson*, first broadcast 3 April 1963 by CBS.

[20.](http://merchants_of_doubt_split_011.html/#filepos1005667) Russell, “The Strange Career of DDT,” 770–96.

[21.](http://merchants_of_doubt_split_011.html/#filepos1006162) Russell, *War and Nature*.

[22.](http://merchants_of_doubt_split_011.html/#filepos1007656) President’s Science Advisory Committee, *Use of Pesticides, A Report of the President’s Science Advisory Committee*, May 15, 1963 (Washington, D.C.: U.S. Government Printing Office, 1963), 1–2.

[23.](http://merchants_of_doubt_split_011.html/#filepos1007964) PSAC, *Use of Pesticides*, 9; a study in 2007 revealed that women exposed to DDT as young girls in the 1950s and 1960s had a higher risk of breast cancer later in life. Most previous studies had found no cancer risk for DDT because they did not focus on the time of exposure.

[24.](http://merchants_of_doubt_split_011.html/#filepos1008604) PSAC, *Use of Pesticides*, 10.

[25.](http://merchants_of_doubt_split_011.html/#filepos1009219) Ibid., 4.

[26.](http://merchants_of_doubt_split_011.html/#filepos1010327) Dunlap, *DDT: Scientists, Citizens, and Public Policy*; Lear, *Rachel Carson*; Wang, “Responding to Silent Spring”; PSAC, *Use of Pesticides*; President’s Science Advisory Committee, *Restoring the Quality of Our Environment, A Report of the Environmental Pollution Panel*, November 1965 (Washington, D.C.: U.S. Government Printing Office, 1965); *Report of Committee on Persistent Pesticides, Division of Biology and Agriculture, National Research Council, to the U.S. Department of Agriculture*, May 1969 (National Academy of Sciences, 1969); E. M. Mrak, *Report of the Secretary’s Commission on Pesticides and Their Relationship to Environmental Health*, U.S. Department of Health, Education and Welfare, December 1969 (Washington, D.C.: U.S. Government Printing Office, 1969).

[27.](http://merchants_of_doubt_split_011.html/#filepos1012937) This is actually a very complex point. Historian of science Zuoyue Wang notes that at the time the PSAC report was written, it was actually not clear who had the burden of proof. There was, for example, the bizarre legal practice of having a pesticide registered “under protest”: a manufacturer could still register and market a pesticide after being refused by the USDA for registration. In its report, PSAC recommended the elimination of “protest” registrations, but it did not shift the burden of proof entirely to the manufacturers (PSAC, *Use of Pesticides*, 15). Rather, it advocated beefed-up resources and research programs on the part of the government to regulate pesticides, primarily to establish a basis for regulation, but implicitly also to meet any challenge in court. Perhaps even more important to PSAC was the *transparency* of the whole regulatory process regardless of the question of burden of proof. Thus it advocated that “all data used as a basis for granting registration and establishing tolerances should be published, thus allowing the hypotheses and the validity and reliability of the data to be subjected to critical review by the public and the scientific community.” Zuoyue Wang, personal communication with Naomi Oreskes, January 19, 2010. Here “data” included both those provided by the manufacturers and the regulatory agencies. So perhaps it is better to suggest not that PSAC shifted the burden of proof from the government to the manufacturers, but rather that it raised the bar of proof, so that reasonable doubt was adequate to deny the registration of a product subject to appeal, and certainly the marketing of any denied product. See also Wang, *In* Sputnik*’s Shadow: The President’s Science Advisory Committee and Cold War America* (New Brunswick, N.J.: Rutgers University Press, 2008), 205–7.

[28.](http://merchants_of_doubt_split_011.html/#filepos1013231) Besides the legal tradition, PSAC may have been influenced by the medical principle of “first do no harm.” Zuoyue Wang notes that the main staff for the PSAC panel were James Hartgering and Peter S. Bing; (both of whom were trained physicians), and the chair of the panel was Colin MacLeod, professor of medicine in NYU’s Medical School (see chapter 5). Moreover, most of the PSAC members had a distrust of expedient technological fixes and their advocates, especially from their long struggle over the questions of nuclear arms race. DDT and other pesticides seemed to fit into the same category of such easy fixes and would have, they instinctively knew, unintended consequences. See Wang, *In* Sputnik*’s Shadow.*

[29.](http://merchants_of_doubt_split_011.html/#filepos1013761) John C. Whitaker, “Earth Day Recollections: What It Was Like When the Movement Took Off,” *EPA Journal* (July–August 1988), U.S. Environmental Protection Agency, <http://www.epa.gov/history/topics/earthday/10.htm;> NASA Glenn Research Center: Earth Day Committee, <http://earthday.grc.nasa.gov/history.html;> Gordon MacDonald, “Environment: The Evolution of a Concept,” in *Yesterday, Today and Tomorrow: The Harvard Class of 1950 Reflects on the Past and Looks to the Future* (Arlington, Mass.: Travers Press, 2000).

[30.](http://merchants_of_doubt_split_011.html/#filepos1014247) MacDonald, “Environment: The Evolution of a Concept.”

[31.](http://merchants_of_doubt_split_011.html/#filepos1014953) Rachelwaswrong.org.

[32.](http://merchants_of_doubt_split_011.html/#filepos1015203) Andrew Kenny by way of Tim Blair, “The Green Terror,” A Stitch in Haste Blog, posted June 9, 2005, <http://kipesquire.powerblogs.com/posts/1118329320.shtml.>

[33.](http://merchants_of_doubt_split_011.html/#filepos1015446) Todd Seavey, “The DDT Ban Turns 30—Millions Dead of Malaria Because of Ban, More Deaths Likely,” June 1, 2003, American Council on Science and Health, <http://www.acsh.org/healthissues/newsID.442/healthissue_detail.asp.>

[34.](http://merchants_of_doubt_split_011.html/#filepos1015957) Rachelwaswrong.org.

[35.](http://merchants_of_doubt_split_011.html/#filepos1016210) Kenny, “The Green Terror.”

[36.](http://merchants_of_doubt_split_011.html/#filepos1017471) Thomas Sowell, “Intended Consequences,” *Jewish World Review*, June 7, 2001, <http://www.jewishworldreview.com/cols/sowell060701.asp.>

[37.](http://merchants_of_doubt_split_011.html/#filepos1017711) “Environmentalists with Blood on Their Hands: Flying Fickle Finger of Fate Award: Rachel Carson,” The Maverick Conservative Blog, comment posted February 29, 2008, <http://the-maverick-conservative.blogspot.com/2008_02_01_archive.html;> Bjørn Lomborg, *The Skeptical Environmentalist: Measuring the Real State of the World* (New York: Cambridge University Press, 2001), 215–16.

[38.](http://merchants_of_doubt_split_011.html/#filepos1018447) Angela Logomasini, “‘Silent Spring’ was Wrong, Sen. Coburn is Right,” Commentary, *Examiner*, May 28, 2007, Examiner.com, <http://www.examiner.com/a-751059~Angela_Logomasini___Silent_Spring__was_wrong__Sen__Coburn_is_right.html.> Logomasini is director of Risk and Environmental Policy at the Competitive Enterprise Institute and manager of Rachelwaswrong.org.

[39.](http://merchants_of_doubt_split_011.html/#filepos1018964) Pete du Pont, “Plus Ça (Climate) Change: The Earth was warming before global warming was cool,” February 21, 2007, from the *WSJ* Opinion Archives: Outside the Box, *Wall Street Journal Online*, <http://www.opinionjournal.com/columnists/pdupont/?id=110009693.>

[40.](http://merchants_of_doubt_split_011.html/#filepos1019412) Tina Rosenberg, “What the World Needs Now Is DDT,” *New York Times Magazine*, April, 11, 2004, <http://www.nytimes.com/2004/04/11/magazine/what-the-world-needs-now-is-ddt.html;> John Tierney, “Fateful Voice of a Generation Still Drowns Out Real Science,” *New York Times*, June 5, 2007, <http://www.nytimes.com/2007/06/05/science/earth/05tier.html?_r=2&8dpc&oref=slogin.>

[41.](http://merchants_of_doubt_split_011.html/#filepos1020296) Rosenberg, “What the World Needs Now Is DDT.”

[42.](http://merchants_of_doubt_split_011.html/#filepos1021514) Tierney, “Fateful Voice of a Generation.” For the original article, see I. L. Baldwin, “Chemicals and Pests,” *Silent Spring* by Rachel Carson (book review), *Science* 137, no. 3535 (September 28, 1962): 1042–43.

[43.](http://merchants_of_doubt_split_011.html/#filepos1023242) Centers for Disease Control and Prevention, “Malaria: Vector Control,” <http://www.cdc.gov/malaria/control_prevention/vector_control.htm.>

[44.](http://merchants_of_doubt_split_011.html/#filepos1026554) Gordon Patterson, *The Mosquito Crusades: A History of the American Anti-Mosquito Movement from the Reed Commission to the First Earth Day* (New Brunswick, N.J.: Rutgers University Press, 2009), 182.

[45.](http://merchants_of_doubt_split_011.html/#filepos1029881) Carson, *Silent Spring*, chap. 16.

[46.](http://merchants_of_doubt_split_011.html/#filepos1030987) Conevery Bolton Valencčius, *The Health of the Country: How American Settlers Understood Themselves and Their Land* (New York: Basic Books, 2002).

[47.](http://merchants_of_doubt_split_011.html/#filepos1031609) Patterson, *The Mosquito Crusaders*, presents a fascinating view of American efforts to destroy the mosquito pest. Also see Margaret Humphreys, “Kicking a Dying Dog: DDT and the Demise of Malaria in the American South, 1942–1950,” *Isis* 87, no. 1 (March 1996), 1–17.

[48.](http://merchants_of_doubt_split_011.html/#filepos1031916) Patterson, *The Mosquito Crusaders*, 156.

[49.](http://merchants_of_doubt_split_011.html/#filepos1033912) Centers for Disease Control and Prevention, “Malaria: The Panama Canal,” <http://www.cdc.gov/malaria/history/panama_canal.htm.> A general history of the canal effort can be found in David McCullough, *The Path Between the Seas: The Creation of the Panama Canal 1870–1914* (New York: Simon and Schuster, 1977).

[50.](http://merchants_of_doubt_split_011.html/#filepos1034510) Centers for Disease Control and Prevention, “Eradication of Malaria in the United States (1947–1951),” <http://www.cdc.gov/malaria/history/eradication_us.htm.>

[51.](http://merchants_of_doubt_split_011.html/#filepos1035511) “Ruckelshaus, Sweeney, and DDT,” Jaworowski 2003: A Cornucopia of Misinformation, part 1, Monday Bristlecone Blogging, <http://www.someareboojums.org/blog/?p=62.> The original source is *In the Matter of Stevens Industries, Inc. et al., I.F&R. Docket Nos. 63 et al*. *(Consolidated DDT Hearings)*, *Opinion of the Administrator, Decided June 2, 1972,* on p. 26, <http://www.someareboojums.org/blog/wp-content/images/ddt/ead.pdf;> later published in *Notices, Environmental Protection Agency,* [I.F&R. Docket Nos. 63 et al.]: Consolidated DDT Hearings, *Opinion and Order of the Administrator,* 30 June 1972, *Federal Register* 37, no. 131 (July 7, 1972): 13369–76, on p. 13373, <http://www.epa.gov/history/topics/ddt/DDT-Ruckelshaus.pdf.>

[52.](http://merchants_of_doubt_split_011.html/#filepos1036921) Baldwin, “Chemicals and Pests,” 1042.

[53.](http://merchants_of_doubt_split_011.html/#filepos1037430) Ibid.

[54.](http://merchants_of_doubt_split_011.html/#filepos1038684) Ibid.

[55.](http://merchants_of_doubt_split_011.html/#filepos1042401) U.S. Environmental Protection Agency, “DDT,” Persistent Bioaccumulative and Toxic (PBT) Chemical Program, <http://www.epa.gov/pbt/pubs/ddt.htm;> United States Geological Survey, “DDT,” Toxic Substances Hydrology Program, <http://toxics.usgs.gov/definitions/ddt.html;> Brenda Eskenazi et al., “The Pine River Statement: Human Health Consequences of DDT Use,” *Environmental Health Perspectives* 117, no. 9 (September 2009): 1359–67.

[56.](http://merchants_of_doubt_split_011.html/#filepos1042922) *California v. Montrose Chemical Corp. of California*, 104 F.3d 1507 (9th Cir. 1997), Lewis and Clark Law School’s Environmental Law Online, <http://www.elawreview.org/summaries/environmental_quality/hazardous_waste/california_v_montrose_chemical.html.>

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[63.](http://merchants_of_doubt_split_011.html/#filepos1057802) World Health Organization, *Resistance of Vectors and Reservoirs of Disease to Pesticides*, 7.

[64.](http://merchants_of_doubt_split_011.html/#filepos1058557) Ray and Guzzo, *Trashing the Planet*, 74.

[65.](http://merchants_of_doubt_split_011.html/#filepos1059710) Steven J. Milloy to TASSC Members, *Re: Annual Report*, 7 January 1998, Bates Number (BN): 2065254885, Legacy Tobacco Documents Library.

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[68.](http://merchants_of_doubt_split_011.html/#filepos1062168) On global warming see “Global Warming/Climate,” JunkScience.com, <http://www.junkscience.com/#GWS;> on acid rain see “Cleaner Air Means a Warmer Europe,” April 15, 2008, <http://junkscience.com/blog_js/2008/04/15/cleaner-air-means-a-warmer-europe.> (He notes that sulphates help cool the air—true, but if he isn’t worried about global warming then why does he care about this?) At present this link is inactive but the article is listed in the JunkScience April 2008 archives: <http://www.junkscience.com/apr08.html;> on ozone see “The ‘Ozone Layer’—What’s Going On?” JunkScience.com, <http://www.junkscience.com/Ozone/ozone_seasonal.html;> see also Chris Mooney, “Some Like It Hot,” Special Reports: As the World Burns, *Mother Jones* 30, no. 3 (May/June 2005): 36–94, <http://www.motherjones.com/environment/2005/05/some-it-hot.>

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[71.](http://merchants_of_doubt_split_011.html/#filepos1063957) On the book and AEI inviting Crichton to speak, see Harold Evans, “Crichton’s Conspiracy Theory,” *BBC News*, <http://news.bbc.co.uk/2/hi/uk_news/magazine/4319574.stm.> Folks associated with CEI have also been strong supporters of Crichton; see, for example, the review by Iain Murray, “Science Fiction: Michael Crichton Takes a Novel Approach to Global Warming Alarmism,” December 20, 2004, Competitive Enterprise Institute, <http://cei.org/gencon/019,04342.cfm.>

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[73.](http://merchants_of_doubt_split_011.html/#filepos1064846) “Welcome to the Heartland Institute,” Heartland Institute, [http://www.heartland.org/about/.](http://www.heartland.org/about/)

[74.](http://merchants_of_doubt_split_011.html/#filepos1065231) Deroy Merdock, “DDT Key to Third World’s War on Malaria,” July 1, 2001, Environment and Climate News, Heartland Institute, <http://www.heartland.org/publications/environment%20climate/article/10415/DDT_Key_to_Third_Worlds_War_on_Malaria.html.>

[75.](http://merchants_of_doubt_split_011.html/#filepos1065918) On Heartland support for Crichton, see Joseph L. Bast, “Michael Crichton Is Right!” January 1, 2005, News Releases, Heartland Institute, <http://www.heartland.org/Article.cfm?artId=16260.> In 2008 they sponsored a conference to continue to insist that climate change is not happening, or if it is, it can be dealt with entirely by letting the free market respond: “The 2008 International Conference on Climate Change, March 2–4, New York, USA,” Heartland.org, <http://www.heartland.org/NewYork08/newyork08.cfm.>

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[79.](http://merchants_of_doubt_split_011.html/#filepos1069260) *Fedsuit Actions/Marden*, 26 October 1999, BN: 2077575920A, Legacy Tobacco Documents Library; see also *FET Update*, 28 January 1994, BN: 2046554465, Legacy Tobacco Documents Library.

[80.](http://merchants_of_doubt_split_011.html/#filepos1070193) *Policy Payments for Slavit*, 1997, BN: 2078848138, Legacy Tobacco Documents Library.

[81.](http://merchants_of_doubt_split_011.html/#filepos1070715) David P. Nicoli to Buffy, 8 March 1994, BN: 2073011685; Merrick Carey, president, Alixis de Tocqueville Institution, to David P. Nicoli, 8 February 1994, BN: 2073011666, Legacy Tobacco Documents Library.

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[83.](http://merchants_of_doubt_split_011.html/#filepos1073892) Jacques et al., “The Organisation of Denial: Conservative Think Tanks and Environmental Sceptism,” *Environmental Politics* 17, no. 3 (June 2008): 349–85.

[84.](http://merchants_of_doubt_split_011.html/#filepos1074986) George Orwell, *1984* (New York: Harcourt Brace, 1949).

[85.](http://merchants_of_doubt_split_011.html/#filepos1084800) Lt. General Daniel O. Graham to William A. Nierenberg, 27 December 1984, William A. Nierenberg papers, MC13, 43: 17, Scripps Institute of Oceanography Archives.