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Editor's Note: The essay below is adapted from Robert Zubrin's *Merchants of Despair: Radical Environmentalists, Criminal Pseudo-Scientists, and the Fatal Cult of Antihumanism*, the latest in our New Atlantis Books series.



The Truth About DDT and *Silent Spring*

Robert Zubrin

We have discovered many preventives against tropical diseases, and often against the onslaught of insects of all kinds, from lice to mosquitoes and back again. The excellent DDT powder which had been fully experimented with and found to yield astonishing results will henceforth be used on a great scale by the British forces in Burma and by the American and Australian forces in the Pacific and India in all theatres.

—Winston Churchill, September 24, 1944^[1]

My own doubts came when DDT was introduced for civilian use. In Guyana, within two years it had almost eliminated malaria, but at the same time the birth rate had doubled. So my chief quarrel with DDT in hindsight is that it has greatly added to the population problem.

—Alexander King, cofounder of the Club of Rome, 1990^[2]

In the last days of September 1943, as the U.S. Army advanced to the rescue of Italian partisans — some as young as nine — battling the Germans in

Rachel Carson's *Silent Spring* at Fifty

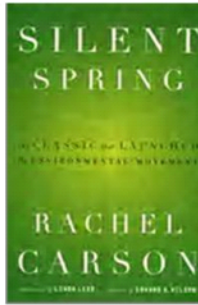
The Truth About DDT and *Silent Spring*

by Robert Zubrin

Reading Rachel Carson

by Charles T. Rubin

the streets of Naples, the enraged Nazis, in a criminal act of revenge against their erstwhile allies, deployed sappers to systematically destroy the city's aqueducts, reservoirs, and sewer system. This done, the supermen, pausing only



to burn irreplaceable libraries, including hundreds of thousands of volumes and artifacts at the University of Naples – where Thomas Aquinas once taught – showed their youthful Neapolitan opponents their backs, and on October 1, to the delirious cheers of the Naples populace, Allied forces entered the town in triumph.

But a city of over a million people had been left without sanitation, and within weeks, as the Germans had intended, epidemics broke out. By November, thousands of Neapolitans were infected with typhus, with one in four of those contracting it dying of the lice-transmitted disease.^[3]

The dead were so numerous that, as in the dark time of the Black Death, bodies were put out into the street by the hundreds to be hauled away by carts. Alarmed, General Eisenhower contacted Washington and made a desperate plea for help to contain the disaster.

Fortunately, the brass had a new secret weapon ready just in time to deal with the emergency. It was called DDT,^[4]

a pesticide of unprecedented effectiveness. First synthesized by a graduate student in 1874, DDT went unnoticed until its potential application as an insecticide was discovered by chemist Paul H. Müller while working for the Swiss company Geigy during the late 1930s. Acquainted with Müller's work, Victor Froelicher, Geigy's New York representative, disclosed it to the American military's Office of Scientific Research and Development (OSRD) in October 1942. Examining Müller's data, the OSRD's experts immediately realized its importance. On Guadalcanal, and elsewhere in the South Pacific, the Marines were losing more men to malaria than they were to the Japanese, with the entire 1st Marine Division rendered unfit for combat by the insect-borne disease. Without delay, first Geigy's Cincinnati factory and then the giant DuPont chemical company were given contracts to produce the new pesticide in quantity.^[5]

By January 1, 1944, the first shipments of what would eventually amount to sixty tons of DDT reached Italy. Stations were set up in the palazzos of Naples, and as the people walked by in lines, military police officers with spray guns dusted them with DDT. Other spray teams prowled the town, dusting public buildings and shelters. The effects were little short of miraculous. Within days, the city's vast population of typhus-transmitting lice was virtually exterminated; by month's end, the epidemic was over.^[6]

The retreating Germans, however, did not give up so easily on the use of insects as vectors of death. As the Allied forces advanced north from Naples toward Rome, they neared the Pontine Marshes, which for thousands of years had been rendered nearly uninhabitable by their enormous infestation of virulently malarial mosquitoes. In his most noteworthy accomplishment before the war, Mussolini had drained these marshes, making them potentially suitable for human settlement. The Germans demolished Mussolini's dikes, quickly transforming the area back into the mosquito-infested malarial hellhole it had

been for millennia. This promised to be very effective. In the brief Sicilian campaign of early summer 1943, malaria had struck 22,000 Allied troops – a greater casualty toll than that inflicted by the Axis forces themselves.^[7]

The malarial losses inflicted by the deadly Pontine Marshes were poised to be far worse.

But the Nazis had not reckoned on DDT. In coordination with their ground forces, the Americans deployed airborne crop dusters, as well as truck dusters and infantry DDT spray teams. Success was total. The Pontine mosquitoes were wiped out. With negligible losses to malaria, the GIs pushed on to Rome, liberating the Eternal City in the early morning of June 5.^[8]



January 1944. The U.S. Army uses DDT to end the typhus epidemic in Naples.

From now on, “DDT marches with the troops,” declared the Allied high command.^[9]

The order could not have come at a better time. As British and American forces advanced in Europe, they encountered millions of victims of Nazi oppression – civilians under occupation, slave laborers, prisoners of war, concentration camp inmates – dying in droves from insect-borne diseases. But with the armies of liberation came squads spraying DDT, and with it life for millions otherwise doomed to destruction. The same story was repeated in the Philippines, Burma, China, and elsewhere in the Asia-Pacific theater. Never before in history had a single chemical saved so many lives in such a short amount of time.

A Civilian Success

In recognition for his role in this public health miracle, Paul Müller was given the Nobel Prize for Medicine in 1948. Presenting the award, the Nobel Committee said: “DDT has been used in large quantities in the evacuation of concentration camps, of prisoners and deportees. Without any doubt, the material has already preserved the life and health of hundreds of thousands.”^[10]

With the coming of peace, DDT became available to civilian public health agencies around the world. They had good reason to put it to use immediately, since over 80 percent of all infectious diseases afflicting humans are carried by insects or other small arthropods.^[11]

These scourges, which have killed billions of people, include bubonic plague, yellow fever, typhus, dengue, Chagas disease, African sleeping sickness, elephantiasis, trypanosomiasis, viral encephalitis, leishmaniasis, filariasis, and, most deadly of all, malaria. Insects have also caused or contributed to mass death by starvation or malnutrition, by consuming up to 40 percent of the food crop and destroying much of the livestock in many developing countries.

One of the first countries to benefit from the use of DDT for civilian purposes was the United States. In the years immediately preceding World War II, between one and six million Americans, mostly drawn from the rural South, contracted malaria annually. In 1946, the U.S. Public Health Service initiated a campaign to wipe out malaria through the application of DDT to the interior walls of homes. The results

were dramatic. In the first half of 1952, there were only two confirmed cases of malaria contracted within the United States.^[12]

Other countries were quick to take note of the American success, and those that could afford it swiftly put DDT into action. In Europe, malaria was virtually eradicated by the mid-1950s. South African cases of malaria quickly dropped by 80 percent; Ceylon (now Sri Lanka) reduced its malaria incidence from 2.8 million in 1946 to 17 in 1963; and India cut its malaria death rate almost to zero. In 1955, with financial backing from the United States, the U.N. World Health Organization launched a global campaign to use DDT to eradicate malaria. Implemented successfully across large areas of the developing world, this effort soon cut malaria rates in numerous countries in Latin America and Asia by 99 percent or better. Even for Africa, hope that the age-old scourge would be brought to an end appeared to be in sight.^[13]

A Bestseller Begins a Movement

But events took another turn with the appearance of Rachel Carson's book *Silent Spring*. A former marine biologist and accomplished nature writer, Carson in 1958 contacted E. B. White, a contributor to *The New Yorker*, suggesting someone should write about DDT. White declined, but the magazine's editor, William Shawn, suggested that Carson herself write it. The ensuing articles, supplemented by additional material, became *Silent Spring*, for which Carson signed a contract with Houghton Mifflin in August 1958.^[14]

Carson based her passionate argument against pesticides on the desire to protect wildlife. Using evocative language, Carson told a powerful fable of a town whose people had been poisoned, and whose spring had been silenced of birdsong, because all life had been extinguished by pesticides.^[15]

Published in September 1962, *Silent Spring* was a phenomenal success. As a literary work, it was a masterpiece, and as such, received rave reviews everywhere. Deeply moved by Carson's poignant depiction of a lifeless future, millions of well-meaning people rallied to her banner. Virtually at a stroke, environmentalism grew from a narrow aristocratic cult into a crusading liberal mass movement.

While excellent literature, however, *Silent Spring* was very poor science. Carson claimed that DDT was threatening many avian species with imminent extinction. Her evidence for this, however, was anecdotal and unfounded. In fact, during the period of widespread DDT use preceding the publication of *Silent Spring*, bird populations in the United States increased significantly, probably as a result of the pesticide's suppression of their insect disease vectors and parasites. In her chapter "Elixirs of Death," Carson wrote that synthetic insecticides can affect the human body in "sinister and often deadly ways," so that cumulatively, the "threat of chronic poisoning and degenerative changes of the liver and other organs is very real." In terms of DDT specifically, in her chapter on cancer she reported that one expert "now gives DDT the definite rating of a 'chemical carcinogen.'"^[16]

These alarming assertions were false as well.^[17] (Carson's claims about the supposed pernicious effects of DDT are examined more fully below.)

The Banning of DDT

The panic raised by Carson's book spread far beyond American borders. Responding to its warning, the governments of a number of developing countries called a halt to their DDT-based anti-malaria programs. The results were catastrophic. In Ceylon, for example, where, as noted, DDT use had cut malaria cases from millions per year in the 1940s down to just 17 by 1963, its banning in 1964 led to a resurgence of half a million victims per year by 1969.^[18]

In many other countries, the effects were even worse.

Attempting to head off a hysteria-induced global health disaster, in 1970 the National Academy of Sciences issued a report praising the beleaguered pesticide:

To only a few chemicals does man owe as great a debt as to DDT. It has contributed to the great increase in agricultural productivity, while sparing countless humanity from a host of diseases, most notably, perhaps, scrub typhus and malaria. Indeed, it is estimated that, in little more than two decades, DDT has prevented 500 million deaths due to malaria that would otherwise have been inevitable. Abandonment of this valuable insecticide should be undertaken only at such time and in such places as it is evident that the prospective gain to humanity exceeds the consequent losses. At this writing, all available substitutes for DDT are both more expensive per crop-year and decidedly more hazardous.^[19]

To some, however, five hundred million human lives were irrelevant. Disregarding the NAS findings, environmentalists continued to demand that DDT be banned. Responding to their pressure, in 1971 the newly-formed Environmental Protection Agency (EPA) launched an investigation of the pesticide. Lasting seven months, the investigative hearings led by Judge Edmund Sweeney gathered testimony from 125 expert witnesses with 365 exhibits. The conclusion of the inquest, however, was exactly the opposite of what the environmentalists had hoped for. After assessing all the evidence, Judge Sweeney found: "The uses of DDT under the registration involved here do not have a deleterious effect on freshwater fish, estuarine organisms, wild birds, or other wildlife.... DDT is not a carcinogenic hazard to man.... DDT is not a mutagenic or teratogenic hazard to man."^[20]

Accordingly, Judge Sweeney ruled that DDT should remain available for use.

Unfortunately, however, the administrator of the EPA was William D. Ruckelshaus, who reportedly did not attend a single hour of the investigative hearings, and according to his chief of staff, did not even read Judge Sweeney's report.^[21]

Instead, he apparently chose to ignore the science: overruling Sweeney, in 1972 Ruckelshaus banned the use of DDT in the United States except under conditions of medical emergencies.^[22]

Initially, the ban only affected the United States. But the U.S. Agency for International Development (USAID) soon adopted strict environmental regulations that effectively prohibited it from funding international projects that used DDT.^[23]

Around the globe, Third World governments were told that if they wanted USAID or other foreign aid money to play with, they needed to stop using the most effective weapon against malaria.^[24] Given the corrupt nature of many of the

recipient regimes, it is not surprising that many chose lucre over life. And even for those that did not, the halting of American DDT exports (since U.S. producers slowed and then stopped manufacturing it) made DDT much more expensive, and thus effectively unavailable for poor countries in desperate need of the substance.^[25] As a result, insect-borne diseases returned to the tropics with a vengeance. By some estimates, the death toll in Africa alone from unnecessary malaria resulting from the restrictions on DDT has exceeded 100 million people.^[26]

Debunking False Claims About DDT

While critics of *Silent Spring* have tended to focus on the one-sidedness of Rachel Carson's case or on those of her claims that have not held up over time, the fraudulence of *Silent Spring* goes beyond mere cherry-picking or discredited data: Carson abused, twisted, and distorted many of the studies that she cited, in a brazen act of scientific dishonesty.^[27]

So the real tragic irony of the millions of deaths to malaria in the past several decades is that the three central anti-DDT claims made by Carson and other activists are all false. We shall examine each in turn.

Claim #1: DDT Causes Cancer in Humans. In the late 1960s and early 1970s, the average American could be expected to ingest DDT in food and drink at levels of around 30 micrograms per day.^[28]

(Note: 1 gram = 1,000 milligrams = 1,000,000 micrograms.) Numerous studies of workers with intense exposure to DDT in the workplace, sometimes by factors of thousands more than the average dose — either in factories or in the field using DDT to combat malaria — have failed to show any “convincing evidence of patterns of associations between DDT and cancer incidence or mortality,” according to the World Health Organization.^[29] The thousands of individuals in these studies were regularly exposed to hundreds or perhaps thousands of times the amount of DDT that the average American would have been exposed to, but cancer rates seem not to have been elevated.^[30] A great many studies of specific cancers — breast cancer, lung cancer, testicular cancer, liver cancer, prostate cancer, and more — over many decades have failed to show significant evidence of cancer as a result of exposure to DDT.^[31]

There is scientific evidence that ingesting DDT or its byproduct DDE can cause mice to develop tumors, but only if they are fed at least ten times the amount per day (by body weight) that a person would normally expect to ingest.^[32]

Cancer studies of other mammals have been less conclusive.^[33] In other studies of the effects of DDT on mammals, rats fed with large doses of the substance were found to have their reproductive lifespans increased by 65 percent (from 8.91 months to 14.55 months).^[34] Heavily dosed dogs also experienced no ill effects, and in fact were found to be healthier than the control group, as DDT freed them of infestation by roundworms.^[35]

Summarizing all of the relevant research, the U.S. government reported in 2002 that “there is no clear evidence that exposure to DDT/DDE causes cancer in humans.”^[36]

That assessment is a vindication of the legal conclusion of Judge Edmund Sweeney's 1972 report on DDT for the EPA: “DDT is not a carcinogenic hazard to man.”^[37]

Claim #2: DDT Endangered U.S. Birds with Extinction. According to Rachel Carson, DDT was so harmful to birds that someday America's springs would be silent, as all the birds that might enliven



As a result of the ban on DDT, millions of African children continue to die every year from malaria.

[© Cris Bouroncle / AFP / Getty Images]

them with song would be dead. Indeed, it was from this poignant image that she drew the title for her book.^[38]

As evidence for this claim, Carson maintained that since the introduction of DDT to the United States shortly after World War II, the nation's bird populations had fallen into rapid decline, with even the robin threatened with extinction.

An examination of actual data, however, thoroughly debunks Carson's claim. This can be seen in Table 1, which compares the Audubon Society's Christmas Bird Count data for 1941 (before DDT) to that of 1960 (the height of DDT, shortly before the publication of *Silent Spring*).^[39]

It can be seen that far from declining, the number of birds encountered by each observer nearly quadrupled over the period in question. In the case of the robin, singled out by Carson as "the tragic symbol of the fate of the birds,"^[40]

the population count increased twelvefold.

Many other studies show the same pattern of sharp increase of some bird populations during the DDT years. For example, a bird sanctuary that has been counting birds over Hawk Mountain, Pennsylvania since the 1930s reported an increase in sightings of ospreys from less than 200 in 1945 to over 600 by 1970, and an increase in sightings of migrating raptors from 9,291 in 1946 to 29,765 in 1968.^[41]

The herring gull population on Tern Island, Massachusetts grew from 2,000 pairs in 1940 to 35,000 pairs in 1970 (at which point the Audubon Society displayed its concern for the birds' wellbeing by poisoning 30,000 of them, a procedure it said was "kind of like weeding a garden").^[42] And the annual data from the North American Breeding Bird Survey from 1966 (the year the survey was launched, in response to the public fear Carson had created about the effects of DDT on birds) through the end of the 1970s shows no obvious pattern of overall increasing bird populations as would be expected to follow the 1972 banning of DDT if it were truly harming bird populations.^[43]

Table 1. Audubon Society Christmas Bird Count: Counts per Observer
1941 (2,331 observers) compared with 1960 (8,928 observers)

Species	Counts per Observer		
	1941	1960	Ratio 1960/1941
Eagle	0.08	0.10	1.25
Gull	53.40	72.00	1.33
Raven	0.29	0.30	1.03
Crow	79.59	28.04	0.35
Pheasant	0.88	1.15	1.31
Mourning dove	2.83	2.21	0.75
Swallow	3.18	8.17	2.57
Grebe	6.15	27.14	4.41
Pelican	1.07	3.12	2.92
Cormorant	1.91	1.18	0.62
Heron	0.97	1.82	1.88
Egret	0.63	1.88	2.98
Swan	7.96	3.81	0.48
Goose	78.43	78.04	0.99
Duck	916.81	306.85	0.33
Blackbird	58.99	2,302.01	39.02
Grackle	10.70	1,407.98	131.59
Cowbird	17.17	368.09	21.44
Chickadee	9.15	6.26	0.68
Titmouse	2.16	2.05	0.95
Nuthatch	1.81	1.50	0.83
Robin	8.41	104.01	12.37
English sparrow	22.80	40.19	1.76
Bluebird	1.60	0.77	0.48
Starling	90.88	971.45	10.69
Total	1,480	5,860	3.96

Although many of Carson's key claims about how DDT affects the health of birds have been disproven in the years since her book was published, there is now evidence, both from field studies and laboratory experiments, that DDT does have an effect on birds that Carson did not know about when she wrote *Silent Spring*: it can cause many bird species to produce eggshells that are thinner and therefore more fragile. This effect has been linked to reduced populations of certain bird species, especially "raptors, waterfowl, passerines, and nonpasserine ground birds."^[44]

Eggshell thinning is a potential problem, but it should not be overstated. The levels of DDT required for malaria control are much less than those required for crop dusting as practiced in the 1950s. Furthermore, the problem does not affect every bird species – indeed, for some species, there is reason to believe that DDT has an overall beneficial effect, by protecting them from the insect-borne diseases that are a primary cause of bird mortality. For example, some marsh bird populations grew so dramatically during the DDT years that they emerged from their marshes in millions to cause significant damage to crops in the American Midwest.^[45]

Ultimately, the effects of DDT on bird populations are not nearly as dire as Carson depicted – and offer no justification for the millions of human deaths caused by the unwarranted prohibition of DDT.

Claim #3: DDT Threatened the Life of the Oceans. The most egregious lie put forth by the anti-DDT crusaders was launched after Carson's death, by Charles Wurster, a cofounder of the Environmental Defense Fund. In a note published in *Science* magazine in 1968, Wurster claimed to have shown that the presence of 500 parts per billion (ppb) of DDT in seawater would stop photosynthesis by phytoplankton.^[46]

Since phytoplankton are the productive foundation that supports all higher marine organisms, their suppression by DDT seemed to threaten the very existence of all life in the ocean, and possibly on the planet.

This was truly an alarming result. However, the maximum solubility of DDT in seawater is only 1.2 ppb, nowhere near 500 ppb, so the scenario Wurster reported was physically impossible.^[47]

In fact, in order to get so much DDT to dissolve, Wurster had been forced to use not seawater, but a saltwater/alcohol mixture as the medium for his experiment. It is hardly surprising that marine algae stopped functioning when thrown into such stuff. In contrast, other scientists found no harm or loss of activity of the same species of marine algae that Wurster used when immersed in actual seawater saturated to the limit with DDT.^[48]

The Wurster experiment was thus meaningless as science. But as a propaganda tool for those seeking to ban the life-saving chemical, it was quite useful. In 1969, Paul Ehrlich, otherwise famous as the author of the antihumanist bible *The Population Bomb*, set alarm bells ringing everywhere with a screed entitled "Eco-Catastrophe!" in *Ramparts* magazine.^[49]

Reporting the history of the world as seen with undisputable authority from the standpoint of the future, Ehrlich wrote:

The end of the ocean came late in the summer of 1979, and it came even more rapidly than the biologists had expected. There had been signs for more than a decade, commencing with the discovery in 1968 that DDT slows down photosynthesis in marine plant life. It was announced in a short paper in the technical journal, *Science*, but to ecologists it smacked of doomsday. They knew that all life in the sea depends on photosynthesis, the chemical process by which green plants bind the sun's energy and

make it available to living things. And they knew that DDT and similar chlorinated hydrocarbons had polluted the entire surface of the earth, including the sea.

For the record, 1979 has come and gone, and life in the world's oceans has continued to flourish gloriously. But, as a result of the mendacity and actions of Carson, Ruckelshaus, Wurster, Ehrlich, and their allies, DDT has been banned, and hundreds of millions of people who might have lived to enjoy those oceans, to sail on them, fish in them, surf in them, or swim in them, to play on their beaches or write poems about their sunsets, are dead.

Notes

[1] Winston Churchill, radio broadcast, September 28, 1944, quoted in T. F. West and G. A. Campbell, *DDT: The Synthetic Insecticide* (London: Chapman and Hall, 1946), 11.

[2] Juurd Eijvoogel, "Alexander King, the Activist: The Human Lemmings," in Janny Groen, Eefke Smit, Juurd Eijvoogel, ed., *The Discipline of Curiosity: Science in the World* (New York: Elsevier, 1990), 43.

[3] Rick Atkinson, *The Day of Battle: The War in Sicily and Italy, 1943-1944* (New York: Henry Holt, 2007), 448.

[4] DDT stands for dichlorodiphenyltrichloroethane.

[5] Darwin Stapleton, "The Short-Lived Miracle of DDT," *American Heritage Invention and Technology Magazine* 15, no. 3 (2000): 34-41.

[6] Stapleton, "The Short-Lived Miracle of DDT"; Atkinson, *The Day of Battle*, 448.

[7] Atkinson, *The Day of Battle*, 146.

[8] *Ibid.*, 572.

[9] Stapleton, "The Short Lived Miracle of DDT."

[10] G. Fischer, "The Nobel Prize in Physiology or Medicine 1948 Presentation Speech," in *Nobel Lectures: Physiology or Medicine 1942-1962* (Amsterdam: Elsevier, 1964).

[11] E. J. L. Soulsby and William R. Harvey, "Disease Transmission by Arthropods," *Science* 176, no. 4039 (1972): 1153-1155.

[12] Roger Bate, "The Rise, Fall, Rise, and Imminent Fall of DDT," AEI Health Policy Outlook Series, no. 14 (November 2007).

[13] Bate, "The Rise, Fall, Rise, and Imminent Fall of DDT"; Amir Attaran *et al.*, "Balancing Risks on the Backs of the Poor," *Nature Medicine* 6, no. 7 (2000): 729.

[14] Linda Lear, *Rachel Carson: Witness for Nature* (New York: Henry Holt, 1997), 316-326.

[15] Rachel Carson, *Silent Spring* (New York: Houghton Mifflin, 1962; New York: Mariner Books 40th Anniversary Edition, 2002), 1-3. Citations are to the Mariner edition.

[16] Carson, *Silent Spring*, 16, 22, 225.

[17] J. Gordon Edwards, "DDT: A Case Study in Scientific Fraud," *Journal of American Physicians and Surgeons* 9, no. 3 (2004): 86.

[18] Attaran *et al.*, "Balancing Risks on the Backs of the Poor," 729.

[19] National Academy of Sciences, Committee on Research in the Life Sciences of the Committee on Science and Public Policy, *The Life Sciences: Recent Progress and Application to Human Affairs, The World of Biological Research, Requirements for the Future* (Washington, D.C.: GPO, 1970), 432.

[20] Edmund M. Sweeney, "Consolidated DDT Hearing: Hearing Examiner's Recommended Findings, Conclusions, and Orders (40 CFR 164.32)," Environmental Protection Agency (April 25, 1972), 12, 93-94.

[21] Bate, "The Rise, Fall, Rise, and Imminent Fall of DDT," 4.

[22] Edwards, "DDT: A Case Study in Scientific Fraud," 86; Environmental Protection Agency, William Ruckelshaus, "Environmental Protection Agency: Consolidated DDT Hearings, Opinion and Order of the Administrator," *Federal Register* 37, no. 131, July 7, 1972: 13369-13376. As it happened, in August 1970, while Ruckelshaus was still assistant attorney general, he had stated in a brief filed with the U.S. Court of Appeals for the District of Columbia Circuit that "DDT is not endangering the Public Health. To the contrary, DDT is an indispensable weapon in the arsenal of substances used to protect human health and has an amazing and exemplary record of safe use... DDT, when properly used at recommended concentrations, does not cause a toxic response in man or other mammals and is not harmful." Brief for

the Respondents, William D. Ruckelshaus and Environmental Protection Agency, *Environmental Defense Fund, Inc. v. Ruckelshaus*, No 23813 (D.C. App filed August 31, 1970).

[23] USAID's environmental procedures are laid out in USAID, "Agency Environmental Procedures," 22 CFR 216, October 9, 1980. In a statement on the USAID website, undated but apparently from the last decade, the agency takes great pains to explain that it has no regulation formally forbidding funding of DDT projects in other countries – but not once does it explicitly mention any DDT projects that it has funded since the 1970s. See USAID, "USAID Support for Malaria Control in Countries Using DDT." An apparently more recent USAID statement, also undated, does acknowledge a new interest in funding projects that use DDT on a small scale and indoors only. See USAID, "USAID and Malaria."

[24] See, for example, the 1986 statement by Secretary of State George Schultz: "The U.S. cannot, repeat cannot ... participate in programs using any of the following: (1) lindane, (2) BHC, (3) DDT, or (4) dieldrin." Edwards, "DDT: A Case Study in Scientific Fraud," 87. As recently as 2004, one USAID official admitted that the reason her agency "doesn't finance DDT is that doing so would require a battle for public opinion. 'You'd have to explain to everybody why this is really O.K. and safe every time you do it,' she said." In short, public perception has been allowed to trump scientific fact in the debate over this life-saving chemical. Tina Rosenberg, "What the World Needs Now Is DDT," *New York Times Magazine*, April 11, 2004, 41.

[25] Agency for Toxic Substances and Disease Registry (ATSDR), "Toxicological Profile for DDT, DDE, and DDD," 2002, 222.

[26] In Africa alone, numerous studies suggest a figure of one million malaria deaths per year since the 1960s. See Robert W. Snow and Judy A. Omumbo, "Malaria," in *Disease and Mortality in Sub-Saharan Africa*, D. T. Jamison *et al.*, eds. (Washington, D.C.: World Bank, 2006). Other estimates are higher; one World Health Organization researcher estimated in the 1990s that there were "1.5 to 2.7 million deaths" from malaria per year in Africa. Thomas C. Nchinda, "Malaria: A Reemerging Disease," *Emerging Infectious Diseases* 4, no. 3 (1998). Although malaria deaths have begun to decline in recent years – see the World Health Organization's annual *World Malaria Report* for estimates – the total global death toll from malaria since the publication of *Silent Spring* is probably between 60 and 150 million.

[27] Charles T. Rubin, *The Green Crusade* (Lanham, Md.: Rowman & Littlefield, 1994), 38-44. Rubin, unlike other critics of *Silent Spring*, closely compares some of Carson's claims to the original studies she cites as sources for her information. He finds a pattern in which she misrepresents the studies or takes claims out of context so as to make "the harm of pesticides seem greater, more certain, or more unprecedented than the original source indicates." *Ibid.*, 39-40.

[28] R. E. Duggan and P. E. Corneliusen, "Dietary Intake of Pesticide Chemicals in the United States (III), June 1969-April 1970," *Pesticides Monitoring Journal* 5, no. 4 (1972): 331-341. This comprehensive multi-year study, conducted by scientists working for the Food and Drug Administration, was cited by EPA reports well into the 1970s. My figure of 30 micrograms per day is an extrapolation from their data, assuming an average weight of around 68 kg (150 pounds) and working from the fact that the study assumed a diet "almost twice the 'average' intake of the 'average' individual."

[29] World Health Organization, *DDT in Indoor Residual Spraying: Human Health Aspects* (Geneva: WHO, 2011), 71.

[30] D. Ditraglia *et al.*, "Mortality Study of Workers Employed at Organochlorine Pesticide Manufacturing Plants," *Scandinavian Journal of Work, Environment & Health* 7, no. 4 (1981): 140-146; Wong *et al.*, "Mortality of Workers Potentially Exposed to Organic and Inorganic Brominated Chemicals, DBCP, TRIS, PBB, and DDT," *British Journal of Industrial Medicine* 41, no. 1 (1984): 15-24; H. Austin *et al.*, "A Prospective Follow-Up Study of Cancer Mortality in Relation to Serum DDT," *American Journal of Public Health* 79, no. 1 (1989): 43-46; Cocco *et al.*, "Proportional Mortality of Dichloro-Diphenyl-Trichloroethane (DDT) Workers: A Preliminary Report," *Archives of Environmental Health* 52, no. 4 (1997): 299-303; P. Cocco *et al.*, "Cancer Mortality and Environmental Exposure to DDE in the United States," *Environmental Health Perspectives* 108, no. 1 (2000): 1-4; Cocco *et al.*, "Cancer Mortality Among Men Occupationally Exposed to Dichlorodiphenyltrichloroethane," *Cancer Research* 65, no. 20 (2005): 9588-9594; Purdue *et al.*, "Occupational Exposure to Organochlorine Insecticide and Cancer Incidence in the Agricultural Health Study," *International Journal of Cancer* 120, no. 3 (2007): 642-649.

[31] World Health Organization, *DDT in Indoor Residual Spraying*, 71-83. There is, however, some evidence that exposure to DDT before puberty may be linked to breast cancer later in life; see *ibid.*, 71-75.

[32] *Ibid.*, 52-61.

[33] *Ibid.*, 61-64.

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[36] ATSDR, "Toxicological Profile for DDT, DDE, and DDD," 2002, 25.

[37] Sweeney, "Hearing Examiner's Recommended Findings, Conclusions, and Orders," 93.

[38] Carson, *Silent Spring*, 103-127.

[39] National Audubon Society, 1942, The 42nd Christmas Bird Count, *Audubon Magazine*; National Audubon Society, 1961, The 61st Christmas Bird Count, *Audubon Field Notes* 15, no. 2. The Audubon Society keeps its data freely available online at <http://birds.audubon.org/historical-results>.

[40] Carson, *Silent Spring*, 104.

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- [43] J. R. Sauer et al., *The North American Breeding Bird Survey, Results and Analysis 1966-2009*, version 3.23.2011, USGS Patuxent Wildlife Research Center, Laurel, Md.
- [44] ATSDR, "Toxicological Profile for DDT, DDE, and DDD," 134, D24-D26.
- [45] J. Gordon Edwards, "The Lies of Rachel Carson," *21st Century Science and Technology*, Summer 1992
- [46] Charles F. Wurster, Jr., "DDT Reduces Photosynthesis by Marine Phytoplankton," *Science* 159, no. 3822 (1968): 1474-75.
- [47] DDT can be dissolved in seawater at concentrations higher than 1.2 ppb if the water contains other components, and of course DDT that is not dissolved can still be carried in suspension. But even so, Wurster was unable to find any examples in nature of water with DDT levels at 500 ppb, even though he took samples from locations that had very recently been treated with DDT, and the highest concentrations he found were short-lived and very localized – hardly sufficient to pose a serious threat to the world's oceans. Wurster, "DDT Reduces Photosynthesis by Marine Phytoplankton," 1475.
- [48] Thomas H. Jukes, "Silent Spring and the Betrayal of Environmentalism," *21st Century Science and Technology* 7, no. 3 (Fall 1994).
- [49] Paul Ehrlich, "Eco-Catastrophe!" *Ramparts*, September 1969, 24-28.

Robert Zubrin is a New Atlantis contributing editor. This essay is adapted from his new book – the latest volume in our New Atlantis Books series – Merchants of Despair: Radical Environmentalists, Criminal Pseudo-Scientists, and the Fatal Cult of Antihumanism.

Robert Zubrin, "The Truth About DDT and *Silent Spring*," *TheNewAtlantis.com*, September 27, 2012.

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