



SPRAYING GRASSHOPPERS IN MONTANA
A Biblical plague banished.

BIOLOGY

Pesticides: The Price for Progress

"There was once a town in the heart of America where all life seemed to be in harmony with its surroundings." It had fertile farms, prosperous farmers, birds in the trees, fish in the streams, and flowers blooming gaily along the roadsides. Then a white powder fell from the sky like snow, and a fearful blight crept over the land. Cattle and sheep sickened; hens could not hatch their eggs. Strange illnesses appeared among the people; children were stricken at play and died within a few hours. The birds sang no more, the fish in the streams died, and the roadsides were lined with browned vegetation as if swept by fire.

Such is the picture drawn of the future in *Silent Spring*, a new book by Rachel Carson, whose *The Sea Around Us* earned her a reputation not only as a competent marine biologist but as a graceful writer. Miss Carson's deadly white powder is not radioactive fallout, as many readers will at first assume. The villains in *Silent Spring* are chemical pesticides, against which Miss Carson has taken up her pen in alarm and anger, putting literary skill second to the task of frightening and arousing her readers. Published this week, the book has already raised a swirl of controversy about the danger to man and wildlife of those modern chemical compounds that have vastly increased agricultural production, banished some diseases, and kept at bay the most bothersome and harmful of insects and rodents.

As Miss Carson sees it, the accomplishments are not worth the price. She explains that no single town has suffered all the misfortunes from spraying and dusting that she describes; "yet every one of these disasters has actually happened somewhere, and many real communities have already suffered a substantial number of them. A grim specter has crept upon us, and this imagined tragedy may easily become a stark reality."

As Bad as the Borgias. The bulk of Miss Carson's book is support for this nightmare curtain raiser. In a chapter titled "Elixirs of Death," she lists the synthetic insecticides, beginning with DDT, that came into use at the end of World War II. All of them are dangerous, she says without reservation. Already they are everywhere: in soil, rivers, ground water, even in the bodies of living animals and humans. "They occur in mother's milk," she says, using emotion-fanning words, "and probably in the tissues of the unborn child." And worse is to come. "This birth-to-death contact," she warns, "contributes to the progressive buildup of chemicals in our bodies and so to cumulative poisoning. We are in little better position than the guests of the Borgias."

There is no doubt about the impact of *Silent Spring*; it is a real shocker. Many unwary readers will be firmly convinced that most of the U.S.—with its animals, plants, soil, water and people—is already laced with poison that will soon start taking a dreadful toll, and that the only hope is, to stop using chemical pesticides and let the age-old "balance of nature" take care of obnoxious insects.

Scientists, physicians, and other technically informed people will also be shocked by *Silent Spring*—but for a different reason. They recognize Miss Carson's skill in building her frightening case; but they consider that case unfair, one-sided, and hysterically overemphatic. Many of the scary generalizations—and there are lots of them—are patently unsound. "It is not possible," says Miss Carson, "to add pesticides to water anywhere without threatening the purity of water everywhere." It takes only a moment of reflection to show that this is nonsense. Again she says: "Each insecticide is used for the simple reason that it is a deadly poison. It therefore poisons all life with which it comes in contact." Any housewife who has sprayed flies with a bug bomb and managed to survive without poisoning should spot at least part of the error in that statement.

But Author Carson's oversimplifications and downright errors only serve to highlight a question that has bothered many Americans: Just how dangerous are insecticides? Experts of the Department of Agriculture and the U.S. Public Health Service readily admit that some of them are extremely poisonous to humans as well as to insects and other pests. Parathion, an organic phosphate used against mites and other highly resistant insects, is so deadly that men who spray it must wear respirators and protective clothing.

A few related chemicals are almost as dangerous, but luckily they break down quickly into harmless substances and so leave no poisonous residue on fruits and vegetables or in the soil. Their disadvantage is that they can poison farm workers who handle them carelessly. Miss Carson describes these very rare accidents and gets shock effect out of them, but they are comparable to accidents caused by careless handling of such violent industrial chemicals as sulfuric acid. The highly toxic phosphates are no menace to the general public, which seldom comes in contact with them.

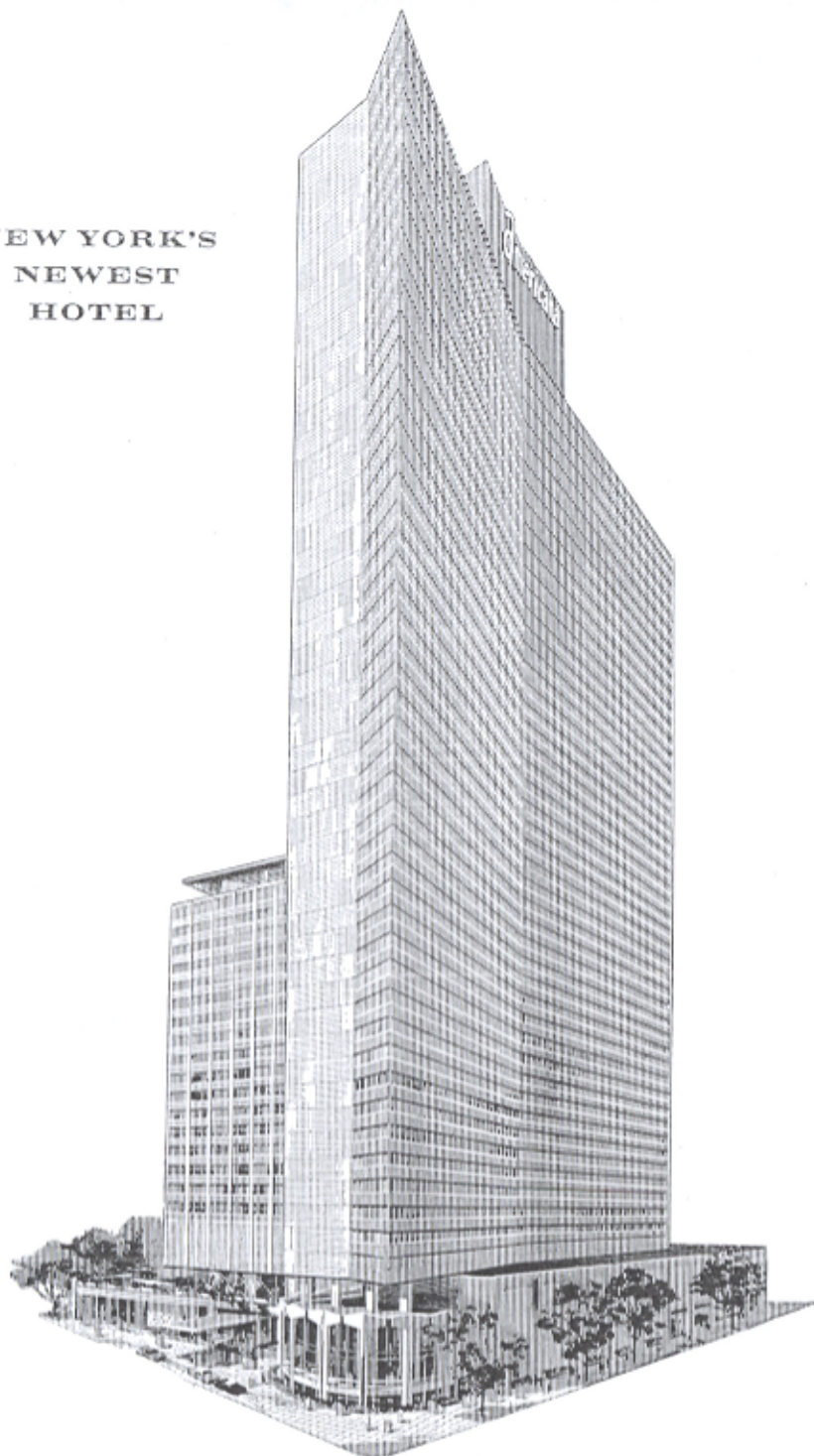
DDT in Every Meal. The chlorinated hydrocarbons, on the other hand (including the familiar DDT), are used in enormous quantities by almost everyone. Much of Miss Carson's case against spraying depends on her contention that DDT and its near chemical relatives are poisonous to humans, especially since they tend to accumulate in fatty tissues. Experts do not agree. A mere trace of DDT kills insects, but humans and other mammals can absorb large doses without damage. Dr. Wayland J. Hayes, chief of the toxicology section of the U.S. Public Health Service in Atlanta says that every meal served in the U.S. probably contains a trace of DDT, but that this is nothing to worry about. He and his co-workers fed 200 times the normal amount to 51 convict volunteers. The insecticide accumulated in their bodies for about one year and then was excreted as fast as it



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arrived. The human guinea pigs felt no ill effects, and doctors pronounced them as healthy as a control group that got the same diet without extra DDT.

Exaggerated Importance. While many insecticides are roughly as harmless as DDT, others are considerably more poisonous to humans. But in the opinion of respected experts of the U.S. Public Health Service, none have done appreciable damage to the U.S. public or are likely to do so. In heavily sprayed cotton-growing areas of the Mississippi Delta, says Assistant Surgeon General Dr. D. E. Price, health is as good as in sparingly sprayed neighboring areas. The same report comes from California, where insecticides are heavily sprayed on orchards and fields. Says Robert Z. Rollins, chief of the division of chemistry of the California department of agriculture: "Pesticides used properly present no threat to people, no matter how widespread their use becomes."

Humans generally protect their domestic animals from any ill effects; wildlife does not fare as well. Wild animals, birds, fish, and friendly insects are among the valued inhabitants of the U.S., and a good part of Miss Carson's book tells about the deadly effect of wholesale spraying on these pleasant and harmless creatures. In vivid language, she tells how DDT spraying to protect elm trees from Dutch elm disease nearly wiped out the bird populations of many Midwestern cities, how fruitless attempts to exterminate the imported fire ant of the South by airplane dusting with dieldrin had dire effects on many kinds of wildlife.

Even scientist defenders of pesticides admit that these things have happened, but they maintain that their importance is exaggerated. According to the Entomological Society of America, only 0.28% of the 640 million acres of U.S. forest land is treated annually, and 613 million acres have never been treated. Insecticides are used mostly on crop lands, which have little wildlife, and on human residential areas to protect shade trees—the use that causes the most conspicuous damage to wildlife.

One result is the wholesale death of robins, which form a large part of suburban bird populations. The robins live on earthworms (that is why they are plentiful in the suburbs, where worm-bearing lawns abound), which concentrate insecticides without being damaged themselves. When the robins eat these insecticide-full worms, they die. The slaughter may continue for several years, until the DDT in the soil has disintegrated.

Elms v. Robins. Death chains of this sort are fortunately not common. A report published by the Wilson Ornithological Society says that most spraying does little damage to most birds, and still less to wild mammals. Fish are more sensitive; when certain insecticides are washed into streams or lakes, they are apt to kill everything that moves on fins. Perhaps the worst effect on birds is the reduction of edible insects, which are important food for many species. But the damage is

not complete; not even Miss Carson can point to a single sizable sprayed area where "no birds sing."

To answer insistent complaints, the National Academy of Sciences sponsored a careful study of pesticide damage to wildlife. Its conclusion: the damage, though always regrettable, is not disastrous, and the damaged wildlife population generally recovers in a few years. Sometimes it may be necessary, remarks the Academy, to choose between elms and robins, both of which have their partisans.

Insect Paradise. Lovers of wildlife often rhapsodize about the "balance of nature that keeps all living creatures in harmony," but scientists realistically point out that the balance was upset thousands of years ago when man's invention of weapons made him the king of beasts. The balance has never recovered its equilibrium; man is the dominant species on his planet, and as his fields, pastures and cities spread across the land, lesser species are extirpated, pushed into refuge areas, or domesticated.

Some species, most of them insects, benefit increasingly from man's activities. Their attacks on his toothsome crops are as old as recorded history—the Bible often refers to plagues of locusts, cankerworms, lice and flies—but their damage was only sporadically serious when population was small and scattered. Modern, large-scale agriculture offers a paradise for plant-eating insects. Crops are grown year after year in the same or nearby fields, helping insect populations to build up. Many of the worst pests are insect invaders from foreign countries that have left their natural enemies behind and so are as free as man himself from the check of nature's balance.

Agricultural scientists try hard to find ways to check insect pests by tricks of cultivation. They import the ancient enemies of invading foreign insects and foster the resident enemies of native pests. They are developing bacterial diseases to spread pestilence among insect populations. Because these tactics alone are seldom enough to protect the tender plants of modern, high-yield farms, the use of insecticides is economically necessary. Tests run by the Department of Agriculture show that failure to use pesticides would cost a major part of many crops; a 20-year study proved that cotton yields would be cut by 40%. Production of many kinds of fruit and vegetables would be impossible; unsprayed apple trees, for instance, no longer yield fruit that is sound enough to be marketed.* Potato fields swept by the Colorado beetle or late blight (the fungus that caused the great Irish potato famine of 1846) yield hardly any crop.

A Quandary of Surpluses. Chemical insecticides are now a necessary part of modern U.S. agriculture, whose near-miraculous efficiency has turned the an-

cient tragedy of recurrent famine into the biologically happy problem of what to do with food surpluses. Says Entomologist George C. Decker of the Illinois Agricultural Experiment Station: "If we in North America were to adopt a policy of 'Let nature take its course,' as some individuals thoughtlessly advocate, it is possible that these would-be experts would find disposing of the 200 million surplus human beings even more perplexing than the disposition of America's current corn, cotton and wheat surpluses."

Many scientists sympathize with Miss Carson's love of wildlife, and even with her mystical attachment to the balance of nature. But they fear that her emotional and inaccurate outburst in *Silent Spring* may do harm by alarming the nontechnical public, while doing no good for the things that she loves.

SPACE

Nine More Astronauts

As the U.S. space program raises its horizons, new and younger men are needed to perform the difficult tasks that deeper space exploration demands. Last week in Houston the National Aeronautics and Space Administration unveiled its second batch of astronauts—nine young space-men on whose shoulders will ride much of the success of the U.S. race to the moon. Since they will be national heroes as well as hard-working technicians, it is only fitting that all are handsome, married (average: two children), and with good backgrounds and college educations. They are slightly younger than the first batch (32.5 v. 34.5 for the older group when selected) and for the first time include civilians—two of them.

Behind their pleasant façades are

impressive records of experience and achievement. All were test pilots with an average of 2,800 flying hours each, 1,900 of them in jets. Four are Air Force pilots, three Navy; the two civilians came from NASA and General Electric. They were selected from 253 applicants over a period of many months. Sixty-three lasted through the initial screening, and 32 of those were selected for elaborate mental and physical testing. One was eliminated at this stage as too tall (maximum allowable height: 6 ft.), and 31 went to Houston for the finals.

The new astronauts will begin their training on Oct. 1. The first phase will be catching up with the Mercury program, but they will not be trained as pilots of the Mercury capsule. As potential Gemini and Apollo pilots, who may rendezvous around the moon or even land on it, they must learn esoteric subjects—including computer theory and celestial mechanics—that have to do with active space navigation. Their capsules will maneuver more or less freely, changing their orbits and trying to join other orbiting objects. The new astronauts will carry along their own propulsion systems and navigation instruments, and will wrestle with the strange and complicated forces that govern the motion of bodies in space. Thus, the brains of the nine young spacemen will have to contain knowledge and skills that have never before been crammed into a human skull.

* Left, rear: Neil A. Armstrong; Lieut. Commander John W. Young, U.S.N.; Captain James McDivitt, U.S.A.F. Second row: Elliot M. See Jr.; Captain Thomas P. Stafford, U.S.A.F.; Captain Edward H. White II, U.S.A.F. Foreground: Lieut. Commander James A. Lovell Jr., U.S.N.; Lieut. Charles Conrad Jr., U.S.N.; Major Frank Borman, U.S.A.F.



APOLLO SPACEMEN*

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