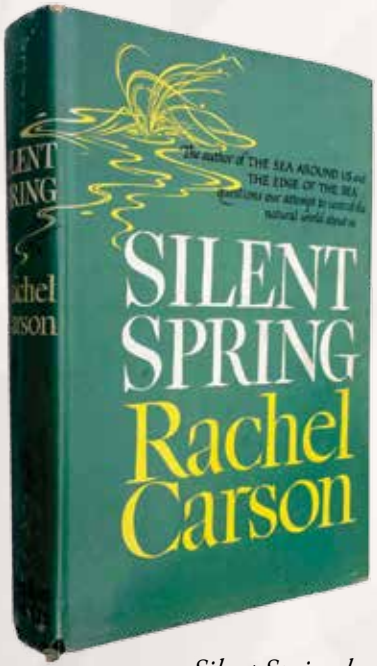
RACHEL CARSON,

Amos Willamovsk

In 1962, American zoologist and marine biologist Rachel Carson published her seminal book, Silent Spring. This work warned us about the indiscriminate use of insecticides to control pests.

Rachel Carson



Silent Spring heralded environmental concerns that last to this day.

An old DDT powder box

THE INSECTICIDE that was particularly disturbing to Rachel Carson and many other researchers, medical professionals, and members of the public was DDT — the initial formulation of the group of chlorinated hydrocarbons, which were developed and first marketed in 1939.

DDT was widely used for many years to address the harmful epidemics transferred to man by insects, in particular the parasite causing malaria. DDT also contributed to an increase of around 50 percent in harvests, which ameliorated the problem of hunger in some parts of the world.

Like DDT, other formulations of chlorinated hydrocarbons were very stable in nature, in both soil and water as well as in the fatty tissues of animals, and resulted in serious contamination of the environment. DDT was very unfriendly to the environment.

Other insecticides from the chlorinated hydrocarbon group were also extremely toxic to birds and mammals. In most countries, by the beginning of the 1960s most of these formulations were no longer authorized for use.

In the early 1940s, organophosphate formulations were first synthesized in Nazi Germany. These formulations are extremely toxic to humans, mammals and birds, but their residuality in nature is relatively short.

The formulation of carbamates was developed in the 1970s. They have an intermediate toxicity, and they break down over a relatively short period of time.

During the 1980s, pyrethroids were developed and marketed and are still widely used today. The toxicity of pyrethroid insecticides is very low to humans and warm-blooded animals, but their toxicity to insects is relatively high. Pyrethroids break down quickly after spraying outdoors.

Steven Martin

Silent Spring, and Changing Pest Management

A DDT ad, circa 1947

Silent Spring Sparked Attitude Changes

Since the commencement of organochemical usage, there have been many far-reaching changes in the public attitude in relation to pest control. This trend must be attributed, among other things, to Rachel Carson.

Her book *Silent Spring* attracted the attention of the world to the potential dangers of chemical pest control. It also initiated a public struggle to protect the environment, which intensified and reached a peak in recent years.

Resistant Pests Made Some Pesticides Obsolete

The change in the trend in the use of chemical insecticides was mainly due to the development of insecticide resistance in pest populations, which were constantly under pressure from these pesticides.

By 1946, only a few years after the first use of DDT, flies resistant to DDT were discovered. One year later a similar phenomenon was recorded for mosquitoes. The hope that we could perhaps eliminate those insects that were pests to humanity, therefore reducing mankind's suffering, dissipated very quickly.

The very high level of resistance of world insect pest populations to these chemical insecticides caused their use to be discontinued. Insecticide resistance by insect populations continues to threaten the use of many other pesticides today.

With the loss of some pesticides, many experts became fearful and anxious that mankind would not have any means to fight dangerous vectors of disease. In contrast to the view and vision of Rachel Carson that the use of insecticides might bring an end to nature, the phenomenon of insect resistance severely threatened humanity with a potential insecticide shortage that could ultimately threaten mankind itself.

Modern Pest Management Emerged from Concerns

Fortunately, neither of these two horrifying visions came to fruition. But they did point to the danger of chemical insecticide misuse on the one hand and the need for research and development of alternative methods of insect control on the other. These two contrasting visions gave rise to major changes in the public attitude toward pest management.

In the mid–1970s, the problem of pests was considered under a new approach: integrated pest management, or IPM. This includes pest prevention, monitoring, identification and then, only when really necessary, implementation of methods of pest control, with the option of using chemical insecticides as the last resort.

Since the beginning of the 1970s, the trend has been to develop insecticides toxic to pests but with low toxicity to humans and other animals, and with short residuals left in nature.

In 1981, formulations of insect growth regulators, or IGRs, appeared. These synthetic substances mimic the activity of normal biological substances in the insect body. These substances are absorbed into the insect system and disrupt natural processes that lead to insect death. IGRs are directed only toward the pest insect, so they are environmentally friendly and do not harm other fauna or mankind.

New formulations have also been incorporated into insect control. Microencapsulated formulations release active ingredients slowly, so the number of applications can be reduced.

Baits are extensively used for control of cockroaches, ants and termites, which reduces the need for widespread spraying. Baits are either used or are under consideration for control of sand flies, mosquitoes and other pests.

Considerable research has been carried out and is ongoing on the biological control of insect pests. Only a few candidates have been

found to be suitable for controlling medical pests. The most impressive success is the use of the bacterium *Bacillus thuringiensis israelensis*, or *Bti*, in the selective control of mosquito larvae in water. This bacterium was discovered in Israel by Professor Joel Margalit in 1977 and is now widely used in many countries around the world.

Another example of the success of biological control is the use of the carnivorous fish gambusia, which can eat a great number of mosquitoes and is widely used by mosquito control districts and other organizations.

THROUGH technological developments, it is now possible to make significant environmental changes in affected areas in order to eliminate pests without any use of chemical insecticides. For example, draining water bodies or clearing rivers blocked by vegetation allows the water to flow freely, preventing the formation of breeding sites for mosquitoes.

Monitoring activities have become an essential element in pest management, and there have been impressive developments in monitoring methods in the last few decades. The goal of monitoring is to locate the focus of an infestation at the lowest possible initial levels. Successful monitoring enables focused, effective and immediate treatment, with a minimal use of insecticide only when absolutely necessary.

The Legacy of Silent Spring

The apocalyptic description envisioned by Rachel Carson of the destruction of fauna and flora through the use of chemical insecticides did not become a reality. Rachel Carson would probably be happy that her predictions did not come true. She wrote: "The concepts and practices of applied entomology, for the most part, date from that Stone Age of science. It is our alarming misfortune that so primitive a science has armed itself with the most modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth."

In fact, entomologists are aware of the dangers raised by Rachel Carson and others. New methods and tools that are more friendly to man and the environment have been developed. Although we still have much to accomplish, pest management professionals have found a "happy medium" way to control pest insects using the minimum amount of insecticides.

The activities and views of Rachel Carson were greatly criticized by scientists and others. But her book was undoubtedly the reason that much of the world took notice of the negative influence of some chemical insecticides. Ms. Carson should be credited with advancing the global movement to improve environmental quality on earth.

Rachel Carson deserved the Presidential Medal of Freedom, one of the highest civilian honors in the United States, awarded to her posthumously in 1980 by then–President Jimmy Carter. Two years after her book was published, Rachel Carson died from a heart attack due to complications of breast cancer.

In 1915 American entomologist Stephen A. Forbes wrote that "since the world began, we have never yet exterminated — we shall probably never exterminate — so much as a single insect species." Unfortunately, unlike Ms. Carson, Mr. Forbes may have been wrong. However, the battle between pest insects and mankind will continue, but it will be fought with a minimal use of chemical insecticides and good dose of the research and development of environmentally friendly solutions. **PP**

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