Rachel Carson
Biologist, Writer, Ecologist
1907-1964

SILENT SPRING

"The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction."

– Rachel Carson © 1954

Disturbed by the reckless use of synthetic chemical pesticides after World War II, Rachel Carson reluctantly changed her focus in order to warn the public about the long-term effects of misusing pesticides. In *Silent Spring* (1962) she challenged the practices of agricultural scientists and the US Government, and called for a change in the way humankind viewed the natural world.

Carson was attacked by the chemical industry and some in government, as an alarmist, but courageously spoke out to remind us that we are a vulnerable part of the natural world, subject to the same damage as the rest of the ecosystem. Testifying before Congress in 1963, Carson called for new policies to protect human health and the environment.

Rachel Carson died in 1964 after a long battle against breast cancer. Her legacy for the beauty and integrity of life continues to inspire new generations to protect the living world and all its creatures.

Rachel Carson's *Silent Spring*, which in 1962 exposed the hazards of the pesticide DDD, eloquently questioned humanity's faith in technological progress and helped set the stage for the environmental movement.

Anyone reading *Silent Spring* will be moved by Carson's revelation of the deadly effects of exposure to seemingly harmless synthetic chemicals through bio-accumulation (1), bio-concentration (2) and bio-magnification (3).

While pesticides ("-icide" is Latin for "to murder or kill" as in "homicide") had existed for centuries, World Wars I and II served as a watershed for the modern agri-chemical industry. Chemicals and technologies developed for warfare, were later adapted for use in agriculture and pest control.

Over the past 40 years many scientific studies have verified Carson's findings regarding the adverse effects of agricultural synthetic chemicals, including those used on plants for medicinal and cosmetic purposes, which led to known carcinogens such as DDT, Dieldrin and a host of others being banned. The unfortunate thing is that it took decades (up to the 1990s for some) for this to happen.

One of Carson's most important discoveries was what is known today as bio-magnification. An example of this process is the case of Clear Lake, California.

In order to "control" an insect called a gnat (a relative of the mosquito) at Clear Lake, north of San Francisco, the authorities used the chlorinated hydrocarbon insecticide dichloro diphenyl dichloroethane (DDD – a relative of DDT), in a diluted form of one part DDD to 70 million parts water. At first the gnats were brought under control, but soon their numbers increased. So the authorities again sprayed one part DDD to 50 million parts water.

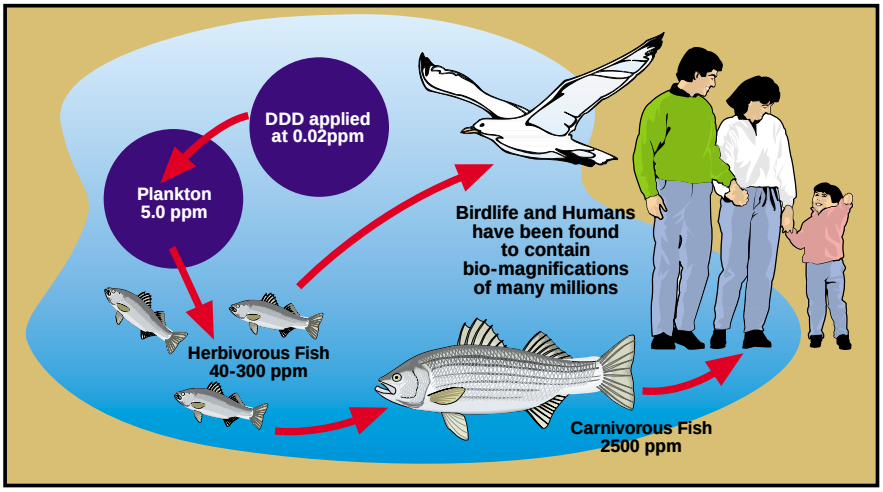
In the winter after the first treatment, many hundreds of birds were discovered dead. And again, in the winter following the second treatment, many more birds were found dead. After examination of the fatty tissue of the birds, extraordinarily high levels of DDD were found, much higher than was ever put into the water. Researchers realised that the chemical had been taken in by the smallest life form, concentrated and then passed on to the next life form until its concentrations reached the phenomenal levels found in the birds.

No trace of DDD was found in the water. Why? Did it biodegrade? No! It had been absorbed into the bodies of life that the lake supported. Worse still, the poison had been passed up the food chain. That is why we still find these chemicals in our food today, particularly in root vegetables and fish. After 23 months, the plankton from the lake still had the chemicals in it. All the birds, fish and frogs examined also had the chemical in them.

DDD was added to the water in very low concentrations (0.02ppm), yet it was found that plankton organisms were found to contain 5ppm, a multiplication (bio-magnification) of 250. Plant-eating fish had been found to contain 40-300ppm, and carnivorous species of fish stored a massive 2,500ppm, a bio-magnification of 125,000! It has been established since this original work that some compounds can bio-magnify through the food chain many millions of times, and we are at the top of most food-chains.

Bio-accumulation, bio-concentration and bio-magnification will take place with practically all substances our bodies are exposed to. Understanding this concept is very important in protecting us from the adverse effects of synthetic chemical exposure. The sad truth is that when we introduce synthetic chemicals into our environment, it takes many years for us to "discover" what really happens. This is not a scientific approach that benefits society, but a science that uses society for profit and experimentation. Given the recent introduction of GMOs (genetically modified organisms) into the agricultural supply chain, Carson's book is just as relevant today as when it was written in 1962.

BIO-MAGNIFICATION THROUGH THE FOOD CHAIN



1. Bio-accumulation:
Compounds accumulate in living things any time they are taken up and stored faster than they are broken down (metabolised) and excreted. Daily we bio-accumulate many vital nutrients such as vitamin A, D and K, trace minerals, essential fats and amino acids. This is a normal process for our well-being. The downside, however, is that this also happens with substances that are harmful.

2. Bio-concentration:
The process by which living organisms can collect and concentrate chemicals from the surrounding environment.

3. Bio-magnification:
The process that results in the accumulation of a substance in an organism at higher levels than are found in its own food ie it becomes more concentrated as it moves through the food chain.