

AN AMERICAN PROPHETESS

Silent Spring

By Rachel Carson. Pp. xxii + 304. (London: Hamish Hamilton, Ltd., 1963.) 25s. net.

RACHEL CARSON has made a frontal assault on powerful vested interests, and "these animals are very cruel; when one attacks them they defend themselves". But they must not do so by impugning her scientific quality. The fact that she writes lucidly, and with a punch that must provoke the envy of the manufacturers' advertising staff, does not mean that she is not a scientist. After graduating in biology and working on genetics at Johns Hopkins, she served for sixteen years in the U.S. Fish and Wildlife Service, retiring with the Distinguished Service Award of the Department of the Interior. Moreover, she rests her case not on vague generalizations but on concrete instances, and authenticates it with forty-eight pages of references to scientific literature.

Her book leaves one with the impression that modern pesticides have too often been used in the United States with the reckless insouciance of a drunken motorist driving a fast car in the dark without lights. For example, in the southern States the fire ant was a mild nuisance. In 1957 the Department of Agriculture "launched one of the most remarkable publicity campaigns in its history. The fire ant suddenly became the target of a barrage of Government releases, motion pictures, and Government-inspired stories portraying it as a despoiler of southern agriculture and a killer of birds, livestock and man". Some 20 million acres were to be heavily sprayed with 'Dieldrin' and 'Heptachlor'. "Pesticide makers appear to have tapped a sales bonanza" . . . cheerfully reported one trade journal in 1958." The ants came back, but the resulting losses ran "all the way up to complete destruction of wildlife in some of the treated areas". Raccoons, opossums, armadillos, half the birds in Alabama, songbirds, woodcock, quail, wild turkeys, cows, pigs, pets and poultry; all suffered death or sterilization in various degrees, amounting in some species to extermination.

These poisons seeped into rivers and underground water, were taken up by the plankton, and so poisoned the fish. They fell on the soil, poisoned the soil fauna, and thence reached birds and mammals which they killed or sterilized. At each stage there is biological amplification; each organism shows a higher concentration of poison than does the source from which this came. Moreover, the chlorinated hydrocarbons are stable and accumulate in the soil.

The most controversial part of the book is probably that which deals with the effects on man. Through water and food the pesticides pass into the human body, and the question is how far they are stored there and how far they are excreted. It appears that the average American is storing from 5.3 to 7.4 parts per million of DDT in his reserves of fat, and the concentration rises to 17.1 p.p.m. in agricultural workers. No figures are given for 'Dieldrin', 'Aldrin' and 'Heptachlor', which are many times more toxic than DDT, and the author predicts dire consequences for human health.

As alternatives to the wholesale spreading of poison she recommends: (1) selective and judicious poisoning as a last resort; (2) biological control of insects by predators, vertebrate and invertebrate, and by specific bacteria and viruses; (3) the male sterilization technique, using radiation or chemosterilants; (4) trapping with chemical or sonic lures.

In Britain the motorist (to keep to the foregoing simile) is not quite drunk, but he is driving in the dark with very dim headlights. The manufacturers have been by no means unco-operative; most Britons have only about 2 parts per million of DDT in their fat; only one agricultural worker has been actually killed by toxic chemi-

cal; arsenites and organophosphorus compounds are no longer used; the Sanders Committee has been appointed to watch the situation; the use of 'Dieldrin', 'Aldrin' and 'Heptachlor' is subject to voluntary restriction. But the fact remains that such substances are on sale without warning to farmers and gardeners; that the destruction of birds and other wild creatures continues on a considerable scale; that conservationists are profoundly disturbed by the danger which threatens; that the symptoms preceding death are extremely distressing; that laboratory research can give only a fraction of the information needed; and that field studies are difficult and at present insufficient, and take so long that their results may arrive too late.

On the other side it can be said that pesticides and weed-killers have substantially increased crop yields at a time when most human beings are undernourished, though in an exploding population freedom from hunger can never be established by simply increasing the food supply.

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THE LIVING BEING AS A CREATOR OF ITS EVOLUTION

Le Vivant, Créateur de Son Évolution

Par Prof. P. Wintrebert. Pp. iv + 416. (Paris: Masson et Cie, 1962), NF30.

"**L**A thèse que je soutiens est celle du vivant . . . Le vivant tout entier réside dans son protoplasme. Le protoplasme est le créateur des adaptations, que les gènes transmettent aux descendants"¹. This overthrow of the classic positions (where the gene determines the protoplasm) appears from the beginning in a Lamarckian perspective. This would not be original had the author not put forward a precise system of the relations between gene and protoplasm, which is founded on the most recent discoveries. Its worth is not demonstrated, but is at least demonstrable.

Within the limits of its normal life, the organism meets every change resulting from its environment with an appropriate reaction of the protoplasm; immunization is the pattern of such a reaction: formation of a specific antibody, of an "adaptative hormone", probably a deoxyribonucleic acid. (Psychic reactions are not included in this scheme.)

In every cell, including the germ cells, this acid and the nucleoprotein substance of the gene concerned may combine in a purely chemical way. This combination may also come into being temporarily (transitory mutations, neoteny) or not at all (classic immunization). If it does occur, it alters the inheritance of species additively.

The gene thus formed is not the agent, but the instrument—the sole instrument—of heredity. During its individual development, it is directly used by the protoplasm, the structure of which it adjusts, when and where it is determined by their reciprocal affinity.

Evolution is accordingly a series of additive and immediately adaptative transformations which are initiated by the protoplasm in response to stimulations of environment and are chemically fixed by the genes. The 'law of recapitulation' means that the organism, when being built, shall necessarily pass through the same main stages, in the very sequence of complexity, as they have been registered by history inside the genome.

This view differs but little from the conception of the Michurinians or of some French Lamarckians; it has a claim to be termed 'chemical Lamarckism', a term chosen by the author.

It meets with the following difficulties:

The process to which it is referred draws its inspiration from the recent theories of the 'dual gene' and from the experiments called 'orientated mutations' (Boivin on bacteria, Benoît on ducks) but it is still, in spite of all, just hypothesis: except for the Protista, we do not know