BOOK REVIEW

SILENT SPRING. Rachel Carson. 297 + 67 pages, Houghton Mifflin Co., Boston, 1962. $5.95. Reviewed by J. Marshall, Canada Agriculture, Research Station, Summerland, B.C.

In Silent Spring Miss Carson flays the misuse of pesticides; and in so doing she says much that badly needs saying. It is a grisly book; and like its more cheerful predecessor, The Sea Around Us, it is exceedingly well done.

To have dealt in a strictly factual way with pesticides, with equal prominence to their good features as well as their bad, would have given us a book for scientists. But a book for scientists was not what Miss Carson or her publishers had in mind. Silent Spring is aimed at the general public, so it emphasizes only one aspect of pest control, that is, the possibility of the wholesale poisoning of man, and other animals, through the thoughtless and indiscriminate use of physiologically potent pesticidal chemicals.

Miss Carson gives the public a very dim view of the applied entomologist. "The concepts and practices of applied entomology," she says, "for the most part date from the stone age of science. It is an 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." That is her parting blast.

Despite all the work that has gone into this book the author cannot have learned a great deal about applied entomology. Presumably she has not understood that applied entomology includes the application of the principles of biological control, a procedure to which she gives highest praise. To refer to applied entomology as a stone age science might presuppose an immensely erudite critic. Admitting her undoubted skill as a writer, Miss Carson has erected no notable landmarks in science. Her background in research hardly qualifies her to launch a sweeping indictment of a branch of science that is patently foreign to her.

But the end may justify the means. Certainly, if Silent Spring fails to arouse the public, and bring about a change of emphasis in pest control procedures, it will be no fault of Rachel Carson. If the book puts an end to massive, ill-conceived campaigns to wipe out insects over wide areas by the wholesale application of chemicals, or if it discourages the blind reliance on chemical control that is only too obvious in some parts of North America, it will serve well indeed.

Back of the current pesticide scare there are faddists. On the one hand are the food faddists who harbour the neurotic suspicion of insidious poisoning from almost any food that is not "naturally" grown. On the other hand are the eradication faddists who have an urge to rid the world, or bits of it, of any organism that might be labelled "pest." Despite public shock following the tragedy of thalidomide, if we had no faddists doubtless we would have no pesticide scare.

Silent Spring deplores the widespread and, in a sense, indiscriminate operations of the professional eradicator, as well it might. But it does not differentiate sufficiently between campaigns aimed at the eradication of an insect over a wide area, and the operations of a farmer or fruit grower aimed at the control of an insect on his own property. To eradicate an insect with pesticides is an exceedingly difficult, in fact almost impossible, job. But merely to control an insect over a modest area is usually a routine operation. In the first case the use of pesticides generally is prodigal, and failure is soon forgotten; those responsible are financially

unaffected. In the second case the individual has to pay for the pesticides, and failure can mean serious financial loss.

Although Miss Carson is not opposed to the use of pesticides—"It is not my contention that chemical insecticides must never be used. I do contend that we have put poisonous and biologically potent chemicals into the hands of persons largely or wholly ignorant of their potential for harm"—she does not tell us how to reconcile the two statements. It is difficult to imagine how more than a handful of people could qualify as pesticide applicators if qualification meant adequate schooling in the intricacies of toxicology and biological control. As long as pesticides are used they will, in all likelihood, be used by people who know little or nothing of their side effects. The problem is to develop pesticides so specific that harmful effects will not overshadow beneficial effects. Substantial progress has already been made in that direction. That is contrary to Miss Carson's opinion that all pesticides should be called biocides.

An obvious reply to Silent Spring is that serious curtailment of pesticide usage would mean more human hunger. The author has foreseen the criticism. She maintains that the real food problem nowadays is, in fact over-production. It is costing the United States about one billion dollars a year to carry surplus food supplies. She does not mention that over two-thirds of the world's population is undernourished. Nor does she mention that the surplus would vanish overnight if pests and diseases were uncontrolled. Nor does she mention that the stock piled foods do not by any means cover the United States dietary.

Here is an example of a curious blind spot in Miss Carson's approach; the belief that there is something particularly stealthy and baleful about chemicals that are synthesized around carbon. She notes that in Nova Scotia, where pest control she believes, is on a highly enlightened plane, synthetic insecticides are avoided. The recommended ones are Ryania, nicotine sulphate and lead arsenate. On several occasions she refers approvingly to Ryania. Her assumption appears to be that because Ryania is derived from a plant it has special virtues as a pesticide, i.e., toxic to pests yet innocuous to plants, or to the higher animals. But experiments conducted in British Columbia apple orchards have shown Ryania to be highly phytotoxic. And if it had been given a fraction of the toxicological study that has been accorded DDT who knows what other doubtful qualities might have come to light.

As for nicotine sulphate, the fact that it too is derived from a plant makes it no less toxic to mammals. Of 61 currently listed insecticides nicotine sulphate is the seventh most lethal to humans, and its residue persists longer than is generally believed.

In one chapter of Silent Spring mention is made of the high mammalian toxicity of the arsenicals. But the third insecticide that apparently meets with the author's approval (perhaps because it does not have a bad record against birds) is the worst of the arsenicals. Lead arsenate, in fact, is perhaps the most sinister pesticide that has ever been in common use. During the 17 years since lead arsenate was banished from British Columbia orchards, spray poisoning of orchard workers has dropped from a commonplace to a rarity. And the wholesale poisoning of orchard soils has been halted. Yet the substitutes are synthetic organic compounds held in special horror by Silent Spring.

Since agriculture is strange territory for Miss Carson it is to be expected that she will lose her way from time to time in that most complex of sciences. Here is an example of a seemingly minor lapse that leads to a notable misconception. In Eastern apple growing districts where forested areas often adjoin orchards the codling moth may be greatly reduced during the winter by woodpeckers. Since in those areas the insect has but one generation a year, birds may thus play a measurable or even a decisive role in controlling it. Silent Spring implies that woodpeckers are effective agents of codling moth control everywhere. That may not be so. In the drier areas of Western North America the apple orchards are generally well removed from forested areas, and the codling moth may have three generations a year. Even in neglected orchards, near woodlands in which woodpeckers are active during the winter, there are always codling moth survivors. In two or three generations, over the course of four or five months, the progeny of those survivors increase to such numbers that the fruit is invariably a total loss.

Silent Spring has particularly bitter words for the chlorinated hydrocarbons. In one chapter Miss Carson has them leaching out the soil and contaminating underground water, with incalculable potential for harm. In another chapter she emphasizes that their prolonged persistence in the soil is a hazard to the complex web of life that maintains soil fertility. These are versatile compounds indeed.

Silent Spring contends that new chemicals introduced to combat the development of pesticide resistance will necessarily be more and more poisonous to higher animals. The reasoning is unclear. As time passes more and more of the new pesticides have low rather than high mammalian toxicity. An example is Sevin, a new compound used to combat certain insects that have become resistant to DDT. Sevin is even less toxic to the higher animals than DDT. Another example is the acaricide Tedion, of which 2 pounds is the estimated lethal dose for an adult human. Pity the adult human who, at one sitting, downs even one pound of ordinary table salt!

In her preoccupation with biological control Miss Carson overlooks the fact that the great majority of applied entomologists are far from wedded to the use of pesticides. (Admittedly there are exceptions.) Indeed, few applied entomologists would not cheerfully bury all pesticidal chemicals if that were feasible. Silent Spring conveys a different thought. Referring to biological control there is this: "It had its period of drought, when workers in applied entomology, dazzled by the spectacular new insecticides, of the 1940's, turned their backs on all biological methods and set foot on the treadmill of chemical control." Tut tut, Miss Carson!

Few entomologists would disagree with Silent Spring's approving quote from the Director of the Plant Protection Service of Holland. "Practical advice should be: 'Spray as little as you possibly can'." Although there have been some lapses, certainly that broadly summarizes Canadian policy. It is a far cry from the picture painted by Miss Carson.

If Silent Spring succeeds in bringing about a more rational use of pesticides it will do what it sets out to do, and will be for the general good. The danger is that it may do more than it sets out to do. If the book leads to unreasoning fear, and hence to unnecessarily restrictive pesticide legislation, the cost of food production will assuredly rise. Then the consumer will suffer; and the poorer the consumer the more the suffering.

Phaeoura mexicanaria (Grote) in British Columbia (Lepidoptera: Geometridae)

J. GRANT[1]

Rindge (1961) gives the range of the geometrid moth, **Phaeoura mexicanaria** (Grote), as the western United States. Although there are no published records for this species in British Columbia, larvae have been taken in Forest Insect Survey collections on a few occasions in the southern Interior: Kettle Valley, 28 August, 1953; Salmon Arm, 17 July, 1958; Grand Forks, 12 August, 1959; and Oliver, 24 August, 1961. Larvae were obtained by beating the branches of ponderosa pine trees over a sheet laid on the ground, and were fed ponderosa pine foliage in the insectary for periods up to 26 days before they pupated. The only members of the genus for which the food plants were previously known were two deciduous feeders: **P. quernaria** (J. E. Smith) on oak and cherry, and **P. cristifera** Hulst on willow.

The larva of **P. mexicanaria** resembles a rough twig of the host tree. A description of an ultimate-instar larva from Grand Forks follows: head 4.56 mm. wide, pale brown, notched, with brown patches suggesting a herring-bone pattern; body 44 mm. long, 6.4 mm. wide, pale brown, covered with fine brown granules; conspicuous tubercles bearing setae D-2 on abdominal segments 1 to 5 and setae D-1 on segment 8. Tubercles largest on A2, gradually diminishing in size to A5; those on A8 about equal in size to those on A3. An adult reared from this larva was identified by Dr. E. Munroe of the Entomology Research Institute, Ottawa, as **P. magnificans** Dyar; since reduced in Rindge's revision to synonymy with **mexicanaria.**

An adult male, also identified by Dr. Munroe, was collected at Rock Creek on 10 July, 1958. It was flying in a lighted garage about 10 p.m.

Acknowledgment

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References

Rindge, F. H. 1961. A Revision of the Nacophorini (Lepidoptera, Geometridae). **Bull. Am. Mus. Nat. Hist.** 123: 91-153.

[1] Forest Entomology Laboratory, Vernon, B.C.

EDITOR'S NOTE

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BOOK REVIEW

A Handbook of Biological Illustration, by F. W. Zweifel. University of Chicago Press, 1961. Pp. 131. $1.95.

This paper-back fills a need. Here, in simple terms are clear instructions and up-to-date information "for the biologist who is not an artist and the artist who is not a biologist." The author is both. She holds a B.A. in zoology, and from the University of Arizona an M.A. in art. The book is an expansion of her thesis.

Although not exhaustive the coverage appears to be adequate, and the rather brief treatment is well planned, as the chapter headings show: Printing Processes, Size and Reduction of Illustrations for Publication, Materials, Drawing, Preparation of Graphs and Maps, Lettering, Illustrations from Photographs, Mounting and Handling Illustrations. The chapters on drawing and graphs take up more than half of the book.

One illustration is worth special mention. In describing the use of scratchboard (cardboard surfaced with chalk) the author shows 3 stages in drawing the ventral view of a bandicoot's skull. The finished product (p. 60) is a classic, having an almost three-dimensional quality.

The printing, paper, and of course the illustrations are of high quality, which may account for the rather high price. Fifteen different references are given at the ends of the chapters, but are not cited in the text. There are sub-headings within the chapters, and an index.

—*H. R. MacCarthy.*

BOOK REVIEW

Observations and Experiments in Natural History, by Alan Dale. New York. Doubleday - American Museum of Natural History, 1962. Pp. x and 148. $.95.

For anyone concerned with instructing young people in biology or research this attractive little book could be a good starting point. Its English author, who died in 1960 at 44, was a teacher who must have had a flair for generating curiosity and excitement. He was influential in revising the curriculum in High School biology in the U.K., and was the author of 3 textbooks and 'Patterns of Life' and 'Introduction to Social Biology.' The current edition of this book has been adapted for North American use from the 1960 original.

First of the 6 chapters is an introduction in which Dale illustrates research methods and pitfalls. Then follow observations and experiments on invertebrates, insects (45 pages), vertebrates, lower plants, and higher plants. There are simple experiments on snails (homing, use of oxygen), flukes, crustaceans, earthworms (light reactions, regeneration, burrows), spiders, hydra, centipedes, and millipedes.

In the insects there are experiments on pupation and hibernation, phototaxis and feeding, light-compass reactions, color and sex recognition by Lepidoptera, selection of food by caterpillars, pollination by various bees, olfaction in ants, and so on. The subjects are common, e.g.: beetles (water, click, burying, ground, and *Geotrupes*); water striders and water boatmen; lacewings, grasshoppers, gall makers, cabbage butterflies and aphids.

But there is more than just experiments and observations. On every page the author poses questions and leaves problems dangling, perhaps with a hint as to how answers might be found. He sees groups of 5 or 6 water striders in mid-winter. Are they feeding? On what? How long can they go without food? If males play no part in rearing larvae are over-wintering adults always female? Try with bumblebees, mosquitoes and earwigs. How fast do aphids reproduce? Which end of an aphid is born first? Do blowflies arrive at rotting meat in succession or at random? Dale thinks *Calliphora* come first and *Lucilia* a day or so later. The same fertility of ideas runs through the chapters on vertebrates and plants.

The style is easy and appropriate with no undue use of the first person. There are 28 sketches in the text and 8 original halftone plates illustrating 13 or 14 of the phenomena dealt with. In short, here is a book to stimulate the latent biologist in most young people.

—*H. R. MacCarthy.*

BOOK REVIEW

Insects, a Guide to Familiar American Insects. H. S. Zim and C. Cottam. New York, Simon & Schuster, 1956. Pp. 160. $1.00.

One of the avowed aims of our society is to encourage amateur entomology. Members who are asked to suggest a book for beginners need look no further than this really pocket-sized Golden Nature Guide. The authors are the ubiquitous Dr. H. S. Zim, Professor of Education at the University of Illinois, and Dr. Clarence Cottam, Director of the Welder Wildlife Foundation, Formerly Assistant Director of the U.S. Fish and Wildlife Service. The all-important illustrations are by James Gordon Irving. These are all in color, mostly showing food plants or other background. It is surprising that the book is not better known for this is the revised second edition; the first edition appeared in 1951.

To save space there is no table of contents, but there is an index. The book opens with directions and a short descriptive key to 15 orders with typical specimens illustrated. Then comes a 10-page outline, giving one or 2 paragraphs each on: what insects are; insect relatives; numbers; insects and man; insects in their place; control; family tree; structure; when and where to look; and how to set about collecting and studying. Later 2 pages of text describe and distinguish between butterflies and moths. These pages are enlivened by marginal and text pictures. Most of the 225 species on 135 pages have their ranges shown on small maps, covering North America from just south of the Mexican border to about 200 miles into Canada. Naturally, the species include some not found in Canada, nevertheless all the insects are common but showy or striking in some way. Scientific names of all the species illustrated, are given in a second index by page numbers. There is also an annotated list of 6 books to cover the next stage of study or inquiry. These are: *Comstock, J. H., An Introduction to Entomology; Jaques, H. E., How to know the Insects; Klots, A. B., A Field Guide to the Butterflies; Lutz, F. E., Field Book of Insects; Swain, R., The Insect Guide; and Urquhart, F. A., Introducing the Insect.*

In sum, this little book is a miracle of compression. For price, coverage, and sheer attractiveness it has no peer.

—*H. R. MacCarthy.*

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