miles away on which to focus our energies. I was a waverer before Van Dyke reassured me that challenge, achievement, and pride could justify it, and I still waver. But though pride may not be a persuasive additional argument, it is probably an excellent diagnosis. It may better express what people have tried to say (and sometimes to disguise) than prestige, even though the two may not be quite as distinct as Van Dyke tries to make them.

I like Van Dyke's analogy between Sputnik and Pearl Harbor. I grudgingly admire his defense of President Eisenhower's response to Sputnik. I warmly second his proposal that the correct antonym for *military* is *civilian*, not "peaceful." I fully agree with him that technology is not uniquely decisive in the competition with the Soviets or in our security against any other peril, but that "the security and survival of a state depend at least as much on the wisdom of its policies, especially its foreign policies as on technological strategy." I like his warning that "once the seemingly impossible and incredible has been done and once thoughts are drawn towards a realm that is literally out of this world, the usual standards of discernment seem to weaken. Credulity and the inclination to play upon it seem to increase." His two chapters on the military implications of space I found quite sensible, though his enquiry is mainly directed toward the civilian program. I like his book.

My principal disappointment is that he did not give much attention to whether, granted we want to conquer space and spend tens of billions on it, the rather single-minded, manned, lunar-landing program is the best way to spend the money. Will we win the long-distance race to Mars by winning the middle-distance race to the moon? Are some of the military by-products modest because our civilian program is one that happens to be short on by-products? I have heard some argument that the Manned Orbital Laboratory is worth as much as the moon, and also that our booster program concentrates too many resources on the middle-distance event. There is plenty of evidence that glamour dominates research and development: bureaucratically a solid-fuel missile is more "achievable" than a new rifle for the Marines. Is this what the moon program does, or does it carry on its coattail more space activity than it crowds out of the budget? I don't know, but I'd like to. It is worth noting that some of the most articulate belittlers of the manned lunar landing are space advocates who think we are doing not too much but the wrong things. Van Dyke may have been both wise and modest to confine himself to goals and motives, and to stay out of the inherently more "technical" problem of space-program mix; but in doing so he has somewhat neglected a controversy that, though less popular and political, is fairly insistent and may become more so.

I suppose the concluding paragraph of any book receives the author's special attention and reflects his own feelings. "Before Sputnik," Van Dyke says at the end, "there was apathy about space, and afterwards came what some call hysteria; subsequently, the more the United States has achieved in space, the more signs there are of waning enthusiasm. Sputnik called values into our consciousness of which we previously were unaware, and now that the threat to these values is declining there is a tendency to forget about them again." I feel myself properly chided but not wholly repentant. I hope that perpetual enthusiasm is not the price of persistence.

Entomology

An Introduction to the Study of Insects. Donald J. Borror and Dwight M. DeLong. Holt, Rinehart, and Winston, New York, ed. 2, 1964. xii + 819 pp. Illus. $10.75.

The first edition of this book (1954) provided an excellent modern replacement of an old standby of insect classification, Comstock's *An Introduction to Entomology*. The second edition has been considerably improved, especially in the modification of the keys to the families. The authors have aimed at making it possible for beginning students to identify, to the family, almost any insect found in the United States, and the excellent keys make the achievement of this goal possible. At the same time, the completeness of coverage makes it possible for advanced students to use the book in classifying the higher categories of insects. Those who seek more than superficial treatment of insect morphology and physiology will have to look elsewhere, since the treatment of these topics in the first three chapters (45 pages) is only intended to provide the student with a working knowledge of the terms, which will enable him to operate the keys. However, each chapter in which the orders are treated contains excellent general discussion of the peculiarities of structure, behavior, and ecology of the group under consideration, and the illustrations are excellent and abundant. Six hundred and forty-one of the 819 pages are devoted to the classification of insects, and "most of the keys are complete for all the families occurring in the United States." The second edition has returned to the use of long-familiar family names that had suffered change as a result of name changes of the type genera. Since the rule of priority now covers family names, these names no longer change as older names for type genera are discovered. I welcome back such familiar names as Noctuidae (= Phalaenidae), Pyromorphidae (= Zygaenidae), and many others. Although each chapter contains excellent pointers on special means of collecting and preserving the kind of insects treated, the entire chapter devoted to collecting and preserving insects deserves praise. The inclusion of keys to arthropods other than insects makes available to the serious student means of partially identifying almost any arthropod. An opportunity for the beginning student to study living insects and their ways is discussed in a separate chapter.

A new feature of the second edition is the inclusion of footnotes explaining the Latin or Greek meaning of each order name. Names are much more appreciated when one understands them. However, an unfortunate choice of some names seems unnecessary. It may be desirable to have a uniform suffix for all insect orders, such as "-ptera," but tagging this suffix to certain stems makes the name nonsensical. Embioptera, Psocoptera, and Ephemeroptera are examples of nonsense names, of the same sort that would result from doing the same with Odonata, Collembola, Anoplura, Thysanura, and Mallophaga. The authors point out that there is some difference of opinion among entomologists concerning the grouping of families and orders into higher categories, or the splitting of families and groups into lower categories; Borror and DeLong state their stand on the classification they have adopted, and frequently cite the authority they follow. This feature enables the serious student to explore the various alternative classifications. However, there seems little justification other than tradition for combining the

order Aptera (Diplura) with Thysanura, since these two groups of insects are fundamentally more unlike than caddisflies and butterflies and moths, or Homoptera and Hemiptera. Despite the very few reservations I have mentioned, this book will always be handy on my desk, even though I am puzzled by the choice of a male ant (*Formica* sp.) as the illustration to introduce each chapter.

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Quantum Field Theory

PCT, Spin and Statistics, and All That. R. F. Streater and A. S. Wightman. Benjamin, New York, 1964. x + 181 pp. Illus. Paper, $4.95; cloth, $9.

The subject of this book is the rigorous mathematical investigation of the quantum theory of fields. Quantum field theory was until recently the generally accepted language in which the most basic laws of physics were expressed. During the last few years a strong group of physicists has attacked the notion of a quantum field and claimed that local fields should have no place in physics. At the same time a second strong group, led by Arthur Wightman, senior author of this book, has undertaken a fundamental rejuvenation of field theory by deepening its mathematical foundations. The program of the Wightman group is to clarify by exact analysis the nature and scope of field theory, such analysis being an indispensable preliminary to any final judgment of its physical relevance.

Wightman and Streater here summarize the achievements of rigorous field theory since its beginnings, 10 years ago. Three important things have been done: (i) The establishment of field theory as a strict mathematical discipline, conforming to the standards of modern mathematics, in startling contrast to the sloppy mess of inconsistent half-theory that had existed earlier. (ii) The formulation of specific sets of axioms which define in a precise way the physical ideas of "relativity," "field-particle duality," "causality," "permutation symmetry," and so forth, which are directly derived from observations of the real world. (iii) The proof by beautiful and nontrivial mathematics of some substantial theorems, asserting logical connections between the various physical ideas. These three achievements have together created a body of theory which has an air of solidarity and permanence, a body of theory that is growing steadily year by year.

PCT and Spin-and-Statistics are the names of two of the principle theorems of field theory. PCT asserts a symmetry of the world under a simultaneous reflection in space and time and reversal of electric charge. Spin-and-Statistics asserts that precisely those particles which have half-integer spin, and no others, obey the Pauli exclusion principle. Both theorems express facts which are known to be true in the real world. The importance of a proof of such theorems lies in the insight which it provides into the deeper reasons why the world is the way it is.

The exposition in this book is consistently excellent, interspersing formal mathematical argument with informal comment in just the right proportions. The authors know well that the physical reality of quantum field theory has been questioned, and that all the theory contained in this book has not led to the calculation of a single number verifiable by experiment. They defend their subject vigorously, but with modesty and humor.

In the informal remarks that accompany the mathematical deductions, they show a many-sided understanding of the history and purposes of physics, which some of their opponents would do well to emulate.

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American Way of Life?

The Prospect of Immortality. Robert C. W. Ettinger. Doubleday, Garden City, N.Y., 1964. xxii + 190 pp. $3.95.

Science fiction is ordinarily so labeled. A writer assumes some set of physical or biological phenomena (preferably startling and usually in the indefinite future) and then proceeds to build a story around it. When the idea is ingenious and the writing is good, we enjoy the story and forgive the nonsense—besides, who knows whether it will always be nonsense? However, when an author takes his idea seriously enough to write a treatise, the situation is very different.

In his foreword, Robert Ettinger, the author of this book, states that the "argument will attempt to show: first, that immortality (in the sense of indefinitely extended life) is technically attainable, not only for our descendants but for ourselves; second, that it is practically feasible and does not raise any unsurmountable new problems; third, that it is desirable from the standpoint of both the individual and of society." He then devotes 180 pages to the attempt.

The idea is that human beings can be kept for an indefinite period of time at very low temperatures and rewarmed at will without the procedure having produced any irreversible damage. It is only necessary, then, to store people until a method has been devised for repairing the defects which have killed them (yes, indeed, if they are preserved soon enough) or which are about to kill them. The idea is, further, that everyone wants to and ought to live forever. The idea is, still further, that the human race and its individual members will benefit incalculably. Presumably the author himself will be among the first to benefit from the new cold-storage technique.

The arguments for the feasibility of the proposal rest substantially on quotations from the works of a number of people, especially biologists and physicians who have studied the freezing and thawing of cells, tissues, and whole animals. The author's sources also include a number of writings in the popular press. The arguments for the benefits to be derived from universal immortality are not easily identified. They seem to rest largely on emotional and philosophical reflections on man and society, supplemented also by suitable quotations. There are two prefaces, one by Jean Rostand and the other by Gerald Gruman.

To pass from the descriptive to the critical, one may take this kind of thing seriously, or one may not. If one does, the book can only be considered the work of an utterly confused optimist. Only a fervent and naive believer in the imminence of ultimate good would be able to underrate so completely the inertia, complexity, and inconsistency of human thought and behavior, as well as the complications of biological structure. Only such a man could quote people so uncritically and so out of context, or, having noted a few of the semantic and philosophical inconsistencies that plague us all, could imply that their