oxygen at higher temperatures. But so does a bit of hamburger, and that does not tell much about a cow.

What I mean is that only an uncertain view can be obtained from conventional respirometry, osmotic, and temperature measurements. From my own experience, the critical factor in the success of an organism can be some unpredictable event such as a hurricane, a cold snap at maximum low tide, or a couple of weeks of cloudy weather just as a spring phytoplankton bloom is starting. These may have their cause in some remote factor such as sunspots. But in the real world one must treat the ensuing results as random.

When we look at the kind of data this book presents, we find most animals sitting in the middle of their tolerance regime. Limiting physiological stresses are usually not apparent. Without considering the unexpected cataclysms one can miss the key.

This is important to understand amid the increasing demand for advice on environmental matters. Usually we don't understand a situation well enough to predict the result of a given action. The proper response of "no comment" is not always forthcoming, particularly when ecologists get into the act with their plausible but unsubstantiated theories.

So the Vernbergs' book, which is presented as an aid in environmental questions, can only give a partial view. They have done a creditable job with what is available. But understanding bits of nature as a unit (ecology) is difficult and we have barely begun to crawl.

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Chemical Attractants

Insect Sex Pheromones. MARTIN JACOBSON. Academic Press, New York, 1972. xii, 382 pp., illus. $22.50.

Insects of many species have evolved visual or sonic signals for communication between potential mating partners. However, the most common means for such transfer of information in the class Insecta is by odors or tastes. The chemicals involved, which may be used to attract individuals of the opposite sex or to stimulate them to copulate, are called sex pheromones.

Scientific man tends to be anthropocentric in assigning research priorities. Thus, insect communication by vision and by sound, with which we can readily identify, has been comparatively well researched. We have little intuitive feel for communication by sex pheromones, and the study of this important aspect of insect life has lagged accordingly.

Developments during the past 15 years, however, have caused a shift in research interests, and this previously neglected subject is now among the most active in biology. One such development has been the realization that manipulation of insect behavior by means of sex pheromones offers an alternative to the use of conventional chemical insecticides. No practical system for insect control based on sex pheromones has yet been developed, but some breakthroughs seem imminent.

The fact that amounts of sex pheromone contained in an individual insect are extremely small, generally less than 1 microgram, has been one of the sources of difficulty. With modern chemical instrumentation, however, it is possible, in some cases, to identify a pheromone when less than 1 milligram has been obtained. The first insect sex pheromone, that of the silkworm moth female, was identified in 1959. Today, such identifications are becoming commonplace.

Martin Jacobson has been prominent among the chemists specializing in the identification of sex pheromones. His earlier book, *Insect Sex Attractants*, published in 1965 by Wiley, was the first monograph surveying the literature in this field. A number of symposium volumes and isolated reviews have appeared since then, but no other monograph on the subject has been published until this new contribution by Jacobson. The work is essentially an expansion and updating of his previous book.

My only disappointment with the book arises from its lack of critical analysis and integration of the information presented. The work consists mainly of a collection of summaries, ranging from a sentence to a paragraph in length, of the findings reported in individual research articles. This lack of criticalness is balanced by the comprehensiveness of the coverage. The bibliography consists of about 1400 entries, and most of them are mentioned in the text. All aspects of the subject are included. Jacobson has reviewed literature on the structure of known sex pheromones and on the means by which they are identified. He has considered the glands that produce the chemicals and the sensory structures that perceive them. He has included the ways in which sex pheromones are used in insect behavior and, finally, the ways in which man might use the pheromones to his advantage, to "outwit" and control the insects. Thus the general reader is given a view of the scope of the field and the specialist is provided with the most complete available entry into its literature.

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Evolutionary Biology

Problemy Evolyutsii (Problems of Evolution). Vol. 2. N. N. VORONTSOV, Ed. Nauka, Novosibirsk, 1972. 300 pp., illus. 2 rubles, 30 kopeks.

This is the second volume (the first was published in 1968) of a Russian equivalent of *Evolutionary Biology* (edited by M. K. Hecht, W. C. Steere, and myself). It contains 23 papers by 18 authors, most of them generalizing reviews of various topics and problems and some of them accounts of original investigations which could as well have been published in specialized journals. Since most biologists are at least to some extent interested in evolutionary problems, and since almost all biological disciplines are of some interest to evolutionists, the series includes a great range of topics: molecular biology, physiology, comparative anatomy, biogeography, variation and natural selection, species formation and reproductive isolation, and (in volume 1) anthropology. Only a few of the highlights of the present volume can be mentioned. V. A. Ratner gives a review of comparative studies of amino acid sequences in proteins of different organisms; O. Y. Orlov discusses the evolution of color vision in vertebrates; Y. I. Novozhenov analyzes the geographic variability of the cockchafer beetle; V. A. Zaslavsky treats of reproductive isolation of closely related species (or semispecies) of weevils; S. D. Matveev gives an interesting but controversial analysis of genetic phenomena observed at the boundaries of distribution areas where closely related forms come together. A serious drawback of the volume is that all pa-