Population Ecology

Insect Abundance. Fourth symposium of the Royal Entomological Society of London, Sept. 1967. T. R. E. SOUTHWOOD, Ed. Published for the Society by Blackwell Scientific Publications, Oxford, England, 1968. viii + 160 pp., illus. $9.

It is claimed that the 18 contributors to this symposium provide "an authoritative analysis of current studies" of "insect population . . . in their respective fields of research." This they do with highly variable breadth, depth, perception, and foresight. Their accounts will be most useful to the advanced graduate student in applied or "pure" population ecology. This student must have mastered the jargon and be acquainted with the conceptual spaghetti that is the chronic state of the art. The reviews are remarkably unpolemic for this subject; both sides of the many arguments are discussed fairly, if not always in depth.

The refreshing central theme is the need for new approaches and philosophies; it is regrettable that more of the papers were not entirely focused on them. Several authors feel that the fringes of pest populations, either as edges or as centrally located holes in the species' range, are deserving of much more intensive study; only there are readily observed the patterns and processes of natural extinction and rapid increase. This symposium favors the view that the often obscure and transitory intraspecific competition among phytophages is an important factor in pest dispersal, food shortages, and general viability at low as well as high population density. I agree most heartily. There is a well-founded plea for the study of the population dynamics of pest species in areas where they are not pests, and of the gradients between outbreak areas and areas where the species merely occurs. A consideration of the actual ways in which particular vegetation structures may influence the presence or absence of tsetse flies is a refreshing approach to one tired of seeing vegetation treated as a large green blob on which insects are randomly distributed. This symposium alludes to selective processes and evolutionary strategies more than is usual among economically oriented population biologists; it also makes a definite advance in stressing that pest populations are for the most part not living in the habitats where their genotypes evolved and that this may present many pitfalls in understanding and predicting their population dynamics. The use of the egg-adult segment of the insect life cycle as the unit of measurement in population biology is long overdue critical reevaluation. Here several authors imply that there may be better ways to partition and group the segments of the life cycle for predictive and heuristic purposes. The next step should be to ask why *numbers* of insects are the units of population dynamics.

Being an exposition of many views, the book of course presents some to which I take exception. The objectivity which *Insect Abundance* exhibits gives, in my opinion, a false sense of calm, unity of purpose, and agreement on the ground rules of the population dynamics game. I wish to comment briefly on some problems that are evident from the text but that were only touched lightly or were ignored in the symposium. There is clearly much room for adjustment among the views of those who see the study of insect populations from a resource-management viewpoint and those who investigate population density for more esoteric reasons. This dichotomy is obvious at the practical level, where it must be decided whether investigations of pests or of biologically more interesting species chosen for their potential in elucidating population theory should receive the limited research resources. I hope that the fact that this book lacks a discussion of the abundance of other organisms, and especially plants, as contrasted with insects, is not evidence that the pest-oriented faction is going to dominate the scene.

In a multitude of ways and contexts in the book such key words and phrases as *pest*, *insect population*, *regulate*, *control*, *natural control*, *abundance*, *harsh environment*, *primary determinant*, and *shortage* are used without definition. These words mean many things to many people, however, and to arrive at some standard definition is perhaps too large a chore for an editor with such diverse contributors. The nearly total absence of the word *niche* was most refreshing.

A disappointingly large part of field population dynamics theory is based on correlative rather than direct evidence. I have little quarrel with the findings expressed here, but the strong reliance on correlations of density changes with observed changes in other parameters carries the inherent failing of not attempting really to see the environment from the insect's viewpoint. This becomes evident through the repeated inference that "population density" and "population regulation" are somehow traits of the species' genotype; this is to descend unnecessarily into the morass of group selection. Virtually all the dispersal behavior, starvation responses, physiological changes, and other such phenomena described in the book can readily be conceptualized in terms of adaptive value to the individual.

The short time to publication, the very clean editing (the one goof is the phrase "density-dependent factors, such as weather," p. 95), and the shortness, clarity, and relevance of the papers to the topic of the volume are to be commended. The almost complete lack of discussion is unfortunate; the authors in general employed an unusual open-mindedness on the subject which leads me to believe that their discussions of the papers at the time of presentation might have been very worthwhile.

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Separation and Analysis

Progress in Gas Chromatography. J. H. PURNELL, Ed. Interscience (Wiley), New York, 1968. x + 392 pp., illus. $14.95. Advances in Analytical Chemistry and Instrumentation, vol. 6.

Although gas chromatography is primarily a method of separating a complex mixture into its individual components, in addition three pieces of information can be obtained for each component: retention volume, peak area, and peak shape (width, height, and skew). From these data and the several operational parameters, the modern chromatographer has a relatively simple approach to quantitative and qualitative analysis as well as means of obtaining a wealth of physical chemical data describing the properties of gaseous mixtures, solutions, and adsorption phenomena (now some 1800 papers annually). One of a series of Advances in Analytical Chemistry and Instrumentation, this volume describes in a critical fashion most of the important advances since 1962, when three general monographs were published (Dal Nogare and Juvet, Littlewood, and Purnell).

Most "annual reviews" or "advances" volumes contain a collection of papers by a variety of authors. This book is dominated by Purnell and is a tribute to his worldwide influence on gas chromatography almost since its beginning. Five of the eight chapters are written

by former students and postdoctoral fellows of Purnell, another chapter was rewritten by him, and the remaining two are by British fellow workers. The result is a comprehensive but cohesive review of progress during the past several years, highlighting those areas in which we may expect future developments.

By now we have retention data compiled for many thousands of compounds, yet the identification of unknown peaks continues to plague the chromatographer. In the first chapter Leathard and Shurlock emphasize the danger of the usual reliance on peak coincidence (known and unknown), and have compiled and evaluated techniques based on retention data alone, and also on precolumn and postcolumn operations or modifications. No other single source gives as much information on what is perhaps the most important remaining problem in gas chromatography.

Each year new types of columns are introduced and hailed for their unique advantages to the point of confusion. Halász and Heine bring order to this chaos and tell us not only how to choose which type of column to use but how to operate it under optimum conditions depending on whether the objective is speed, resolution, or throughput.

The choice of the best liquid phase is the most critical decision the operator has to make. For the most part we have come to rely on empirical "polarity scales" as an aid in choosing the stationary phase. Although this procedure is adequate for easy separations, it overlooks the many selective interactions which can be exploited. Langer and Sheehan suggest that simple solution theory and our present knowledge of molecular interactions make it possible to choose or design a liquid phase for the most difficult of separations—for example, of diastereoisomers.

Purnell is, of course, well known as a physical chemist, and his theoretical interests are represented by chapters on liquid surface effects and physical measurements. In fact, sound theory pervades the entire work, yet, as Halász reminds us, "Gas chromatographic analysis is today partly a science but, to a greater degree, an art." This statement is amplified by a wealth of practical information in each chapter. Like Purnell's *Gas Chromatography*, this volume will be indispensable to gas chromatographers for years to come.

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The Bistable Model

Dielectric Relaxation. VERA V. DANIEL. Academic Press, New York, 1967. xiv + 281 pp., illus. $13.

This monograph, as the author calls it, is addressed primarily to the applied physicists, chemists, and engineers who wish to gain a physical picture of the nature and sources of dielectric loss at radio frequencies; microwave, infrared, and optical frequencies are mentioned only in passing. The author disclaims any attempt at a comprehensive review of the broad area of dielectric relaxation but instead aims to cover a number of selected topics from a particular point of view.

Dielectric loss is, of course, something to be avoided in most applications, and a thorough understanding of its microscopic sources should lead to insulating materials superior to those found by empirical methods. The truth is that these microscopic mechanisms are not well understood today even in elementary substances, let alone in practical insulators. In this situation one must be content with simple models. The author considers only the widely applicable bistable model, which describes the polarizable system by a symmetrical potential function with two minima. The extension to multiwell potential functions is straightforward. When a particle receives sufficient thermal activation energy it hops the barrier and contributes to the polarization fluctuations that appear as damping in nonequilibrium situations. The author enlarges upon the model throughout the book in connection with experimental results on a variety of materials. No mention is made of tunneling through the barrier, nor is anharmonic damping of resonant systems considered. The bistable model leads to a Debye susceptibility function which, however, can also represent the low-frequency behavior of a damped harmonic oscillator. The first half of the book takes up several other topics of theoretical interest in addition to the bistable model, such as equivalent circuit representations, thermodynamics and dielectric fluctuations, distributed relaxation times, and phenomenological representations of the dielectric function, including the Cole-Cole diagram. The author does a good job of providing the physical insights welcomed by experimentalists and often found lacking in sophisticated theoretical treatments. Most of the discussion is developed from basic classical principles and is within the grasp of first-year graduate students.

The second half of the book is meant to serve as a guide to some of the literature on relaxation in gases, liquids, and solids and requires considerable background of the reader. The solids include molecular crystals, glassy insulators, heterogeneous materials, hydrogen-bonded solids (such as ice), and ferroelectrics. Occasionally critical discussions are provided, but too often the coverage is sketchy and incomplete.

Anyone interested in dielectrics will find an examination of the book well worthwhile, for it contains a great deal of material not readily available elsewhere. The monograph also serves to underline the need for further reviews of other aspects of the dielectric relaxation problem.

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Books Received

American Locomotives. An Engineering History, 1830–1880. John H. White, Jr. Johns Hopkins Press, Baltimore, 1968. xxiv + 504 pp., illus. $20.

Analyse von Mineral- und Syntheseölen mit Radiometrischen Methoden. Gerhard Bunner, Erwin Dahn, and Martin Geisler. Akademie-Verlag, Berlin, 1968. xiv + 225 pp., illus. Paper, DM 21.

Analysis and Characterization of Oils, Fats, and Fat Products. Vol. 2. H. A. Boekenoogen, Ed. Interscience (Wiley), New York, 1968. x + 681 pp., illus. $26.50.

An Annotated List of Seed-Borne Diseases. Mary Noble and M. J. Richardson. Commonwealth Mycological Institute, Kew, Surrey, England; International Seed Testing Association, Wageningen, Netherlands, ed. 2, 1968. viii + 194 pp. Paper, 30 s. Commonwealth Mycological Institute Phytopathological Papers, No. 8.

A Century of Chemistry. Ernst Bäumler, with contributions by Gustav Ehrhart and Volkmar Muthesius. Econ, Dusseldorf, 1968. xi + 365 pp., illus.

Chemistry of Amino Acids, Peptides, and Proteins. A Programmed Text. Terrell C. Myers and Jerome S. Allender. Harper and Row, New York, 1968. x + 384 pp., illus. $10.50.

Collective Models of the Nucleus. J. P. Davidson. Academic Press, New York, 1968. xiv + 238 pp., illus. $12. Pure and Applied Physics series.

The Elements of Digital Computer Programming. E. D. Reilly, Jr., and F. D. Federighi. Holden-Day, San Francisco, 1968. x + 221 pp., illus. $8.75. Holden-Day Series in Computer Science.

Energy. Proceedings of the 7th Biennial Gas Dynamics Symposium, Evanston, Ill., Aug. 1967. Lawrence B. Holmes, Ed.

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