

crucial questions from study of the natural behavior and then seeking answers by experimentation, under controlled conditions. Brown analyzes the localizability of different call types, with signal bandwidth as the most relevant property. His findings relate in turn to the physical structure of calls used in different functional contexts, especially in forest habitats where localizability is at a premium. Sound transmission in different environments is also an issue, although, as Waser shows in a comparison of baboon and mangabey calls, the demands of social organization can override environmental influences. These demands sometimes result in intriguing levels of acoustic complexity, as Deputte and Robinson each demonstrate, one in the intricacies of vocal duetting between paired white-cheeked gibbons and the other in vocal exchanges responsible for spacing in the wedge-capped capuchin.

For this reader the climactic sections of the book are those by Petersen and Snowdon. Both derive inspiration from psycholinguistics, dwelling on such questions as whether monkeys demonstrate categorical perception of their vocalizations, as we do with the sounds of speech. Petersen uses as a springboard a seminal ethological field study by Green on the Japanese macaque that set new standards for the quantitative analysis of complex vocalizations. Green's "linguistic" analysis was used as a way of asking Japanese monkeys in the laboratory whether they process the "auditory" (= "non-linguistic") and "phonetic" (= "linguistic") components of their vocalizations differently in their perception of them. The answer was affirmative, as in human processing of speech. Among other results are evidence of categorical processing and the first behavioral demonstration of the hemispheric lateralization of processing of conspecific signals by a monkey. Japanese macaques display a right-ear advantage for their calls just as we do for speech. Similarly, Snowdon used his understanding of the ethology of marmosets and tamarins to demonstrate categorical perception, in this case employing synthetic as well as natural calls. He presents evidence of phonological syntax and perhaps even primitive cases of lexical syntax. Most intriguing of all is the occurrence of something equivalent to "babbling," inviting investigation of the possibility of vocal learning in these species.

This volume succeeds admirably in highlighting the current frontiers in research on primate communication and in pointing up the dramatic advances made

since 1967. I recommend it to comparative psychologists in particular, who are suffering something of an identity crisis at the moment, as a message for the future. All three editors, each a member of a department of psychology, owe some of their success as researchers to their readiness to step over interdepartmental boundaries and combine forces with field ethologists, neurobiologists, and linguists. In the preface to his book, Altmann took singular pride in the wide array of disciplines represented and encouraged still further exchanges. His exhortations were heard and are now bearing fruit, as the present volume demonstrates.

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## Mechanisms of Food Finding

**Herbivorous Insects.** Host-Seeking Behavior and Mechanisms. SAMI AHMAD, Ed. Academic Press, New York, 1983. xvi, 257 pp., illus. \$34.50.

The interaction between herbivorous insects and their food plants has been the topic of a number of recent books and has even caught the attention of the popular press, which over the last year has published a flurry of articles on anti-herbivore defenses in plants. Missing in most current discussion of herbivorous insects, however, is information on the complex behaviors and sensory physiology that bring insects in contact with their food plants. This volume aims to fill that gap by providing a series of papers on the host-seeking behavior and mechanisms of herbivorous insects.

The papers in the book range in subject from the neurophysiological basis of food plant selection (Hanson) through chemical oviposition cues (Feeny, Rosenberry, and Carter) up to the evolution of diets and host races (Futuyma). Instead of presenting thorough reviews of their subjects, most of the authors dwell on idiosyncratic case histories from their own research. This case history approach works best when diverse lines of inquiry are brought together, as when Feeny *et al.* draw upon phylogeny, insect phylogeny, chemistry, and butterfly natural history in their attempt to understand oviposition in swallowtails.

Examples in the book involve mainly butterflies and beetles, with Hemiptera and Homoptera rarely mentioned. Even

among the beetles and butterflies the taxonomic coverage is limited; but the authors are not solely at fault for this taxonomic parochialism. Basic research in entomology has generally been restricted to a handful of species, often because those species are economically important or experimentally convenient. As a result, it should not be surprising that there is too small a data base for any of the contributors to document general patterns of host-seeking behavior.

The book represents a strikingly mechanistic viewpoint. Evolutionary strategies or tactics are scarcely mentioned (except by Papaj and Rausher and by Futuyma—but even then the focus is on mechanisms of evolution). Consequently, this book stands apart, in a good way I think, from many of the other recent volumes on plant-herbivore interactions. Virtually every author argues that our understanding of plant-insect dynamics awaits a better understanding of the mechanisms leading up to the actual consumption of plants by herbivores. Unfortunately, sometimes this affection for mechanism leads to papers that go on endlessly about chemical extractions and the search for an "attractant molecule" or "attractant spectrum." The best papers in this volume rise above the bewildering details of mechanisms by pointing out key questions or suggesting organizing principles for future research on host-seeking behavior. Thus, for example, Stanton exposes the limitations of short-term plot experiments on the effects of spatial pattern in host plants and skillfully promotes experimentation on the interplay of plant dispersion, odor plumes, and colonization by herbivores. Futuyma suggests that the central process in host specialization involves shifts in host-seeking behavior that are prompted by changes in the local abundance of plants. My favorite paper, that by Papaj and Rausher, is on individual variation in herbivore host location and should be read by all researchers and students interested in plant-herbivore interactions. In their thorough reviews, Papaj and Rausher suggest intriguing connections between investigations of insect learning and experiments on host selection, point out flaws haunting many host induction studies, reanalyze (correctly) Wellington's data on tent caterpillars to show that they demonstrate no relationship between parental nutrition and offspring activity, and review the insights they have derived from their own studies of *Battus philenor* host selection. Their paper includes a wealth of positive sugges-

tions for future research as well as incisive criticisms of conventional wisdom and interpretations of past experiments. Most effectively, Papaj and Rausher point out that many misunderstandings about herbivore host selection occur because researchers overemphasize the behavior that occurs after an insect has discovered its host plant and downplay the behavior that leads to host plant discovery.

Overall, this volume should be an especially useful reference to ecologists and evolutionary biologists lacking knowledge of insect behavior and sensory physiology but nonetheless pursuing research in insect ecology. Its primary merit is that it addresses a neglected topic and, in some selections, focuses attention on new ways of thinking or new avenues for research. Because a substantial number of the contributions in this volume are shallow or pedantic, there remains a large gap in the literature concerning host-seeking processes in herbivorous insects. At least this book ably points out why that gap needs to be filled before we can understand plant-insect dynamics.

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## The Parity Story

**Selected Papers, 1945–1980, with Commentary.** CHEN NING YANG. Freeman, New York, 1983. xiv, 596 pp., illus. Cloth, \$39.95; paper, \$19.95.

In 1957, Chen Ning Yang and Tsung Dao Lee were awarded the Nobel Prize in Physics for proposing the law of parity nonconservation in weak interactions, that is, the violation of right-left symmetry among the elementary particles. Their work was done in the United States, but they were nonetheless the first Chinese scientists to be so honored. Now Yang has taken the occasion of his 60th birthday to provide, in place of festschrift, his own selection from his first 35 years of scientific writings (74 items out of about 200), together with some 80 pages of his own commentaries and a dozen pages of photographs. The book is a pleasure to read from start to finish, thanks to Yang's taste, style, and aesthetic sensitivity, coupled with his warmth and common touch. Few will want to read it in sequence, however; instead, one is drawn back and forth among the "commentaries" (which in-

clude biographical and historical notes, opinions, and personal encounters), the beguiling photographs (family portraits from China, scenes at the Institute for Advanced Study, and so on), and the scientific papers, many of them familiar, but still stunning classics of theoretical physics.

Aside from the great works with Lee (and one with Reinhard Oehme) on symmetry violations in the weak interactions, there are many papers throughout Yang's career that are based on symmetry notions and are so "geometrical" that one immediately grasps both the truth and the beauty of the argument, such as the 1950 work on "dematerialization into two photons." The most important of these papers is probably the famous work with Robert L. Mills, which is the model for the non-Abelian gauge theories that currently dominate theoretical physics. That recalls also Yang's work with his teacher, Enrico Fermi, called "Are Mesons Elementary Particles?," which is the forerunner of the Sakata model and thus of the quark model of elementary particles. Both the Fermi-Yang and the Yang-Mills papers were considered little more than curiosities in their day.

In his commentaries, Yang also pays his debts to his parents, to his teachers, to his co-workers, and to his native land, as well as to his scientific homeland, the United States. His taste and style in physics, he says, were formed from 1938 to 1944, when he was a student in Kunming. His undergraduate thesis was on group theory and molecular spectra, and group theoretical ideas (the mathematical expression of symmetry) have ruled his subsequent career. His master's thesis in Kunming dealt with statistical mechanics, the other major part of his work. Since 1971 Yang's voice has been influential in China, urging that increased attention be paid to basic research, a policy apparently approved by Chou En-lai and Mao but frustrated by the "gang of four" until 1977.

There are many other good things in this volume, but not space enough here to deal with them. The "parity" story will be read with great attention by all who experienced that dramatic turning point in physics. While regretting the sad controversy it engendered, they will welcome yet another personal view. Yang's decision to make his own festschrift was a risky one, but it could not have succeeded better.

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## Books Received

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**Atomistics of Fracture.** Proceedings of an institute, Calcatoggio, Corsica, France, May 1981. R. M. Latanision and J. R. Pickens, Eds. Plenum, New York, 1983. xvi, 1074 pp., illus. \$115. NATO Conference Series VI, vol. 5.

**The Auditory Psychobiology of the Mouse.** James F. Willott, Ed. Thomas, Springfield, Ill., 1983. x, 508 pp., illus. \$56.50.

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**Avoiding Liability in Architecture, Design and Construction.** An Authoritative and Practical Guide for Design Professionals. Robert F. Cushman, Ed. Wiley-Interscience, New York, 1983. xxvi, 416 pp., illus. \$45.

**Biology. A Human Approach.** Irwin W. Sherman and Vilia G. Sherman. Oxford University Press, New York, ed. 3, 1983. xiv, 682 pp., illus. \$25.95.

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**Depositional Systems.** A Genetic Approach to Sedimentary Geology. Richard A. Davis, Jr. Prentice-Hall, Englewood Cliffs, N.J., 1983. xviii, 670 pp., illus. \$33.95.

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**Introduction to Marine Engineering.** D. A. Taylor. Butterworths, Boston, 1983. viii, 360 pp., illus. \$29.95.

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**The Molecular Biology of Enzyme Synthesis.** Regu-

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