predatory tendencies, effect mutual arousal, and eliminate or reduce interspecific mating, the male (usually much smaller than the female) initiates an elaborate courtship. When successful, this induces female participation and eventual submission to copulation.

In their monograph the Robinsons present the synthesis of nearly a decade of field studies in the African, American, and Pacific tropics. After describing in detail the courtship, copulatory, and postcopulatory behavior of 53 araneid species belonging to 15 genera, the authors characterize three major patterns of araneid courtship, discuss the origin, modification, and function of constituent behavioral units, and suggest probable evolutionary trends.

At a time when the related problems of araneid phylogeny and classification (both traditionally based largely on morphology) are far from resolved, it is exciting to find ethologists suggesting a credible solution based firmly on analysis of 21 behavioral characters. In testing their hypothesis systematists will be challenged to consider many new kinds of evidence. For example, the Robinsons' description of differences in orientation and insertion of male pedipalpi (copulatory organs) suggests that the functional morphology of these complex appendages should be more carefully investigated.

This study will prove useful both to those interested in spider behavior and evolution and to those concerned with the general topic of animal communication. Although the authors remain true to their major objective of evaluating macrobehavioral differences and trends they provide many useful observations and comments on such topics as postcopulatory cannibalism of males, competition between males for a female, species-specific mating behavior, and the function of courtship. By so doing they offer implicitly and explicitly a number of hypotheses for future ethological and evolutionary studies.

The text is supported by nearly a hundred illustrations, half being close-up photographs of mating sequences and the remainder being drawings and tables depicting components of courtship and copulatory behavior. Despite its technical nature this monograph is both easily read and efficiently used as a reference. Without being anthopomorphic the authors communicate their patient fascination with spider behavior.

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Plant Biochemistry

Secondary Plant Products. E. A. BELL and B. V. CHARLWOOD, Eds. Springer-Verlag, New York, 1980. xvi, 676 pp., illus. $108.90. Encyclopedia of Plant Physiology, New Series, vol. 8.

This volume is a compilation of authoritative reviews of secondary natural products, the aim of which is to present updated accounts of this rapidly expanding field. The book contains a large amount of theoretical and practical material concerning the chemistry, biochemistry, taxonomic significance, and ecological roles of secondary products. The careful organization, systematic approach, and comprehensiveness of the volume make it a valuable resource for both graduate students and investigators in the biological sciences.

Of special interest is the historical introduction by K. Mothes, which gives the reader an understanding of the many roles secondary products play in nature (a protective function, both past and present, may be the raison d'être for most of them) and in applications in such fields as agriculture and medicine. The possible significance of secondary products in plants and the control of secondary metabolism are discussed by E. A. Bell and M. Luckner respectively. Regulatory mechanisms have been studied very little for secondary metabolites, but Luckner has done a thorough job of presenting selected data from bacteria, fungi, and higher plants that show how the formation of different types of secondary products may be controlled. There are, in addition, five chapters each on alkaloids and isoprenoids and single chapters on plant phenolics, nonprotein amino acids, amines, cyanogenic glycosides, glucosinolates, betalaines, carbohydrates, and plant lipids of taxonomic significance—enough to whet the appetite of any plant scientist.

All the chapters are quite readable. Most of the chapters on alkaloids have been written by organic chemists (the one exception is a chapter on isoprenoid alkaloids by J. G. Roddick, who is a biologist). As a result they are chemically oriented, discussing alkaloids as derivatives of a particular amino acid, with emphasis on biosynthetic pathways, and have considerably less treatment of biology than biological scientists would have desired. The other chapters present more general information on such topics as distribution, localization, isolation, characterization, and quantitative measurement and offer some speculation on function. The book could have been improved tremendously if each chapter had had a section on environmental influences and catabolism of secondary natural products. The old belief that secondary natural products are inert end products of plant metabolism is erroneous; they undergo a variety of degradations, some at appreciable rates.

Some 99 of the book's 676 pages are devoted to author, species, and subject indexes. The book is amply illustrated with many structures; unfortunately a few are incorrect. The literature coverage generally extends only through 1977, with the latest references dated 1978.

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Symbiosis

Cellular Interactions in Symbiosis and Parasitism. Papers from a colloquium, Columbus, Ohio, Sept. 1978. CLAYTON B. COOK, PETER W. PAPPAS, and EMANUEL D. RUDOLPH, Eds. Ohio State University Press, Columbus, 1980. xiv, 306 pp., illus. $25. Ohio State University Biosciences Colloquia, No. 5.

Particular aspects of lichens, malaria parasites, cestodes, trypanosomes, mycorrhizas, and algal-invertebrate associations are covered in this book. The individual contributions, which focus on the cellular aspects of symbiotic and parasitic interactions, deal with four general themes: initiation and establishment of relationships, cellular mechanisms for nutrient uptake and translocation, defense mechanisms of host cells, and genetic and metabolic integration. For the most part the papers are written in such a way as to facilitate comparison of the relationships between partners in various host-symbiont or host-parasite systems and comparison of the techniques that have been used to elucidate them. The candor of many of the contributors in describing the limitations of the methodologies and the gaps in present knowledge will make their chapters excellent points of departure for new research.

A number of papers are particularly noteworthy. A paper by Aikawa, for example, is a gem. He assumes that the reader has little or no familiarity with *Plasmodium*, the malaria parasite. After describing the parasite he analyzes the evidence for recognition sites on the parasite and the process of invagination of the erythrocyte membrane, leaving the reader with little doubt that this aspect of malaria is fairly well understood.

The paper is illustrated with high-quality electron micrographs. Though there have been a number of recent reviews on the subject of symbiotic algae and their relationships with invertebrates, a review by Cook of the initial cell recognition events, as deduced largely from experimental studies of *Hydra viridis* and *Paramecium bursaria*, is a welcome addition to the literature. Ahmadjian reviews recent attempts to resynthesize lichens from separately cultured symbionts and concludes that the experimental evidence does not suggest that the algal symbiont influences the kinds of chemical substances that are released or the morphology of the mycobiont. The methods that have been used to examine the structural and functional aspects of the cestode surface are analyzed in a lucid chapter by Lumsden and Murphy. Within a conceptual framework designed to illustrate a parasite's escape mechanisms from host immunological systems, Seed, Bogucki, and Merritt discuss the trypanosome cell surface and its interaction with immunoglobulins. They present evidence that suggests that trypanosomes have evolved on their cell surfaces at least two distinct mechanisms for escaping the host's immune response.

In a paper on enzyme interactions at the host-parasite interface Pappas reviews the evidence concerning the enzymatic mechanisms by which trematodes, cestodes, and acanthocephalans carry out absorptive functions and yet escape the host's digestive enzymes.

Rhodes and Gerdemann review the transport of nutrients in mycorrhizal associations and conclude that the present evidence suggests that the fungi in vesicular-arbuscular mycorrhiza play important roles in the mobilization, absorbtion, and translocation of nutrients (particulary phosphorus) to host roots.

The advantages and disadvantages of various techniques used to study nutrient movement between lichen symbionts are discussed by Smith. He concludes that although there is good evidence that large amounts of carbohydrates flow from algae to fungi there is no evidence to show movement of substances from fungi to algae.

There is a brief review of the experimental evidence for fluxes of nutrients in symbiotic reef corals by Muscatine and one of symbiotic bacteria in *Amoeba proteus* by Jeon. Jeon has developed a model system that may have great utility in the study of partner integration at the subcellular level. His experiments suggest that an amoeba infected with symbiotic bacteria can become dependent on the symbionts in fewer than 200 cell generations.

In separate brief papers, Trench discusses integrative mechanisms in symbioses and Margulis discusses symbiosis as a parasexual phenomenon.

Taken as a whole the book is an important contribution to the literature. I have the feeling that I will reach for it many times in the next few years to gain perspective on various aspects of this field.

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Books Received

Abstract Harmonic Analysis. Vol. 1, Structure of Topological Groups, Integration Theory, Group Representations. Edwin Hewitt and Kenneth A. Ross. Springer-Verlag, New York, ed. 2, 1979. x, 520 pp. $50.60. Grundlehren der mathematischen Wissenschaften 115.

Advances in Applied Microbiology. Vol. 25. D. Perlman, Ed. Academic Press, New York, 1979. xii, 292 pp., illus. $28.

Advances in Energy Systems and Technology. Vol. 2. Peter Auer. Academic Press, New York, 1979. xii, 268 pp., illus. $26.

Advances in Liquid Crystals. Vol. 4. Glenn H. Brown, Ed. Academic Press, New York, 1979. xiv, 210 pp., illus. $25.

Advances in Ophthalmology. Vol. 39. M. J. Roper-Hall, H. Sautter, and E. B. Streiff, Eds. Karger, Basel, 1979. x, 274 pp., illus. $122.75.

Advances in Radiation Biology. Vol. 8. John T. Lett and Howard Adler, Eds. Academic Press, New York, 1979. xvi, 464 pp., illus. $45.

African Christianity. Patterns of Religious Continuity. George Bond, Walton Johnson, and Sheila S. Walker, Eds. Academic Press, New York, 1979. xvi, 176 pp. $19.50. Studies in Anthropology.

Animal Models of Obesity. Papers from a symposium, London, Feb. 1978. Michael F. W. Festing, Ed. Oxford University Press, New York, 1979. x, 258 pp., illus. $32.50.

Annual Review of Genetics. Vol. 13. Herschel L. Roman, Allan Campbell, and Laurence M. Sandler, Eds. Annual Reviews, Palo Alto, Calif., 1979. x, 494 pp., illus. $17.

Annual Review of Nuclear and Particle Science. Vol. 29. J. D. Jackson, Harry E. Gove, and Roy F. Schwitters, Eds. Annual Reviews, Palo Alto, Calif., 1979. viii, 478 pp., illus. $22.50.

Brain and Heart Infarct II. Papers from a symposium. K. J. Zülch, W. Kaufmann, K.-A. Hossmann, and V. Hossman, Eds. Springer-Verlag, New York, 1979. xii, 332 pp., illus. $38.50.

Brain and Mind. Papers from a symposium, London, Dec. 1978. Excerpta Medica, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). x, 426 pp., illus. $51.25. Ciba Foundation Symposium 69 (new series).

Cancer Chemotherapy 1979. The EORTC Cancer Chemotherapy Annual 1. H. M. Pinedo, Ed. Excerpta Medica, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). xiv, 512 pp., illus. $73.

Canonical Gibbs Measures. Some Extensions of de Finetti's Representation Theorem for Ineracting Particle Systems. H. O. Georgii. Springer-Verlag, New York, 1979. vii, 192 pp. Paper, $11.80. Lecture Notes in Mathematics, vol. 760.

Cardiograms. Theory and Applications. D. N. Ghista, E. Van Vollenhove, W.-J. Yang, and H. Reul, Eds. Karger, Basel, 1979. x, 160 pp., illus. $64. Advances in Cardiovascular Physics, vol. 2.

Causes of Postoperative Death in Children. Analysis and Therapeutic Implications. Papers from a symposium, Munich, May 1978. P. P. Rickham, W. Ch. Hecker, and J. Prévot, Eds. Urban & Schwarzenberg, Baltimore, 1979. xii, 314 pp., illus. $34.50. Progress in Pediatric Surgery, vol. 13.

Cell Motility. Molecules and Organization. Papers from a conference, Nagoya, Japan, Sept. 1978. Sadashi Hatano, Harunori Ishikawa, and Hidemi Sato, Eds. University Park Press, Baltimore, 1979. xii, 696 pp., illus. $59.50.

Chemical Diagnosis of Disease. Stanley S. Brown, Frederick L. Mitchell, and Donald S. Young, Eds. Elsevier/North-Holland, New York, 1979. xviii, 1384 pp., illus. $74.75.

Chemistry for the Allied Health Sciences. Roger D. Bauer and Robert L. Loeschen. Prentice-Hall, Englewood Cliffs, N.J., 1980. xvi, 602 pp., illus. $17.95.

Degrees of Unsolvability. Structure and Theory. Richard L. Epstein. Springer-Verlag, New York, 1979. xiv, 242 pp., illus. Paper, $16. Lecture Notes in Mathematics, vol. 759.

Dermatology. Proceedings of a congress, Mexico City, Oct. 1977. Antonio Gonzalez-Ochoa, Luciano Dominguez-Soto, and Yolanda Ortiz, Eds. Excerpta Medica, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). xxxiv, 860 pp., illus. $131.75.

Development and Diffusion of the Nuclear Power Reactor. A Comparative Analysis. Peter deLeon. Ballinger (Harper and Row), Cambridge, Mass., 1979. xviii, 328 pp. $17.50. A Rand Graduate Institute Book.

Diabetes and Obesity. Proceedings of a meeting, Marseilles, June 1978. J. Vague, Ph. Vague, and F. J. G. Ebling, Eds. Excerpta Medica, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). xvi, 400 pp., illus. $78.

Disorders in Higher Education. Papers from a meeting, Harriman, N.Y., Apr. 1979. Prentice-Hall, Englewood Cliffs, N.J., 1979. viii, 216 pp. Paper, $5.95. American Assembly Books.

Early Experiences and Early Behavior. Implications for Social Development. Edward C. Simmel, Ed. Academic Press, New York, 1979. xvi, 218 pp., illus. $18.

Ecological Processes in Coastal and Marine Systems. Proceedings of a conference, Tallahassee, Fla., Apr. 1978. Robert J. Livingston, Ed. Plenum, New York, 1979. xii, 548 pp., illus. $49.50. Marine Science, vol. 10.

Ecology and Coal Resource Development. Papers from a congress, Grand Forks, N.D., June 1978. Mohan K. Wali, Ed. Pergamon, New York, 1979. Two volumes. xxviii, 1092 pp., illus. $135.

Econometrics. Ronald J. Wonnacott and Thomas H. Wonnacott. Wiley, New York, ed. 2, 1979. xxiv, 580 pp., illus. $21.95. Wiley Series in Probability and Mathematical Statistics.