cepted dogmas of protein evolution. The trouble is, of course, as Ambler points out, that our concepts of protein evolution are so much tied up with the supposition that more ancient extant organisms have "perpetuated themselves unchanged since early times" that we tend to ignore the high probability that macromolecular similarities between different prokaryotes are due to a continual but sporadic natural genetic transfer of information. This is suggested by R. R. Eady in a chapter on the structure and evolution of nitrogenase in which he discusses the artificial construction of new N_2-fixing bacteria by episomal transfer of the *nif* genes from *Klebsiella pneumoniae* to several other bacteria and the ability of the two proteins (Mo-Fe protein and Fe protein) responsible for overall nitrogenase activity from different sources to cross-react. Unfortunately we know little of the amino acid sequence homology of these moieties, or of the required oxygen depletion systems, without which both proteins are quickly inactivated.

The fourth chapter on proteins, on homology in protein structures by J. Williams, is somewhat idiosyncratic, for it discusses the subject in the light of the old ideas of protein families based on considerations of structure rather than sequence. The author also appears to be somewhat confused about homology and analogy in the evolutionary sense. Nevertheless, the questions he raises about the wisdom of assuming that evolution is always parsimonious are valid and should not be overlooked.

The other two chapters, on the evolution of metal-binding sites in proteins by T. G. Blundell and on the structure and evolution of superoxide dismutases by C. J. Brock and J. I. Harris, address the subject of metal binding in proteins. Blundell deals with zinc binding by most insulins to give hexamers and with its probable importance in the storage of these peptides in pancreatic B cells. Changes in the amino acid sequences in certain insulins (guinea pig) and related proteins, insulin-like growth factors and relaxins, which have similar confirmations to the zinc-binding moieties, prevent the formation of such hexamers. Brock and Harris draw attention to the overall evaluation of the two diverse superoxide dismutases, those containing either manganese or iron and those having both copper and zinc. The latter enzymes are only present in higher eukaryotes (animals, fungi, and plants). Here again, the authors suggest that the unexpected occurrence of superoxide dismutase in anaerobes could be a result of genetic transfer, but it seems equally likely that the enzymes could act as a guard against any superoxide in the environment.

All in all, this is a useful collection of work in progress, with enough information to give food for thought but little really new. It is reasonably well produced, but there are many spelling mistakes (none of them "fatal"), and pp. 111 and 112 are in the wrong order. My only real quibble is that most of the authors refer to details published elsewhere, often in rather difficult-to-obtain reports of other symposia. I hope that in the future they will be encouraged to include essential data in the chapters they write even if it means some repetition.

TONY SWAIN
Department of Biology,
Boston University,
Boston, Massachusetts 02215

Ecology of the Carabidae

Carabid Beetles in Their Environments. A Study on Habitat Selection by Adaptations in Physiology and Behaviour. HANS-ULRICH THIELE. Translated from the German. Springer-Verlag, New York, 1977. xviii, 372 pp., illus. $44.20. Zoophysiology and Ecology, vol. 10.

The holometabolous insect family Carabidae includes about 40,000 described species, with more being described almost daily. The group probably originated in the early Mesozoic, and in the course of time it has managed to occupy most of the ice-free areas of the world. Structural differences within the family are numerous, but not striking: it is easy to recognize a carabid as such, and difficult to identify taxa of less inclusive rank. This moderate structural divergence and marked diversity are accompanied by striking ecological divergence. Because of these features, along with the ease of sampling carabid faunas of fields and forests by means of pitfall trapping and the potential usefulness of carabids in biological control of noxious insects and as indicators of environmental quality, the group has attracted a substantial amount of work. Nonetheless, fewer than 100 species have been studied in detail, and most of these are western European.

Foremost among those investigating the ecological aspects of carabids is the author of this book. The book was written because the author believed it was time to integrate the information that has accumulated about the way of life of carabids. (His bibliography includes 595 publications, 88 percent of which were written during the past 18 years, mostly in German and English.) Because the book is comparative both in method and interpretation, it is a contribution to systematics as well as to ecology.

The objectives of the book are to describe how species are adapted to their environments and how the adaptations have evolved; to determine what factors limit species to particular microhabitats; to document the principle that the first step in the differentiation of a species is physiological; and to show to what extent the study of carabids can contribute to the more inclusive fields of ecology, ethology, and evolutionary biology.

By examining genetically determined responses to environmental factors, which he classifies as abiotic (temperature, humidity, light, and chemical and physical attributes of the substrate) and biotic (competition, parasites, predators, and so on), and behavioral—that is, endogenous—factors (especially circadian and annual rhythms), the author demonstrates the varied ways of life of carabid beetles and establishes that these basically structurally generalized animals as a group are highly adaptable. Further, he suggests that the basis for their adaptability is threefold: a generally flexible system of response to abiotic factors (for example, of 47 central European species studied in detail for preference with respect to light, humidity, and temperature, more than half were eurytopic for at least one of these parameters; only 36 percent were stenotopic for all three); a generally omnivorous diet; and a combination of marked dispersal capability in adults of many species with the tendency to form populations that remain for extended periods following colonization of new areas.

On the basis of field observations and limited laboratory experiments, Thiele concludes that abiotic factors determine the microhabitat a given species occupies and that competition is not a limiting factor. His analyses of adaptations form the basis for consideration of evolutionary processes.

Thiele's pragmatic approach to the latter topic produces only a very general model, and no group of species is fitted to it in detail. Simply described, Thiele's model is based on allopatric speciation, with a recently dispersed isolate in a new area facing new environmental conditions and undergoing physiological change to meet the new circumstances. Survival in the new area is made possible by the flexibility of physiological responses to abiotic factors. Eventually change takes place, and with it speci-

ation. Subsequently, a new wave of dispersal brings a segment of the new species into contact with other, similarly adapted species. Although the author does not so state, the model implies that communities of carabids are built up by random accumulation of species with similar tolerances for the abiotic factors that are prevalent in their particular environment.

Thiele is unable to fit his model to a group of carabids because he does not make use of other powerful explanatory models provided by phylogenetic analysis, with its emphasis on identification of sister groups and reconstructions of hypothetical ancestral character combinations. Without such reconstructions, one cannot postulate directions of change or formulate a very satisfactory notion of the pathways of evolution.

Another model that Thiele could have used to good advantage is the taxon cycle, as applied by P. J. Darlington, Jr., to the evolution of carabids and their communities. In essence the model calls for the origin of dominant, freely dispersing species in tropical lowlands, with spread from these areas made possible by local adaptations. Later, other dominant groups arise in the same centers and follow and displace the surviving stocks of the earlier waves, which either become extinct or withdraw from lowlands to other habitats. This model is consistent with the general orderliness seen in patterns of diversity of carabid communities and associated ecological and morphological divergence. In not discussing the model—perhaps because it postulates competition as one of the main driving forces, or perhaps because it seems too speculative—Thiele forgoes the use of a set of principles with the potential to unify his ecological data.

Another difficulty is that in his enthusiasm for what has been accomplished, Thiele has not emphasized sufficiently how restricted a base of data underlies our conceptions of environmental relationships of Carabidae. For example, knowledge of responses of carabids to chemicals is fragmentary, and the adaptive significance of slight differences in body form between closely related but ecologically different carabid species is not understood. By not accentuating such deficiencies the author overlooks some promising questions for further research. For example, the ecological significance of body size classes in different communities, environmental partitioning, and r and K selection are not mentioned, and the possibility of sympatric speciation by differentiation in response to abiotic factors is not considered. Carabids would be excellent for study of such matters.

In short, the book would be of more value to biologists in general if more serious consideration had been given to recently developed ecological-evolutionary theory, and it would be of more use to carabid specialists if the author had pointed out some directions for future research.

Overall, however, the book is a fine synthesis of current knowledge of homeostatic aspects of ecological relationships of carabids, and it is a fitting tribute to the man to whom it is dedicated: Carl H. Lindroth, who was instrumental in formulating the approaches and techniques that are commonly used in ecological research on these fine beetles. The material is well organized and the text is easily readable, thanks to the clarity of thought and expression of the author and to the skill of an able translator.

GEORGE E. BALL
Department of Entomology,
University of Alberta,
Edmonton, Alberta T6G 2E3, Canada

Books Received and Book Order Service

Books Received and the Book Order Service will be continued in issues in which there is a Readers' Service Card. To order any of the Book Order Service books, circle the corresponding number on the Readers' Service Card (pages 678A and 758A); the participating publisher(s) will ship the title(s) ordered and send you a bill. Where no Readers' Service number is given, the publisher is not participating in the Book Order Service; send your order and check directly to the publisher.

Advances in Biological and Medical Physics. Vol. 16. John H. Lawrence, John W. Gofman, Thomas L. Hayes, and Howard C. Mel, Eds. Academic Press, New York, 1977. xiv, 382 pp., illus. $39.50.

Advances in Botanical Research. Vol. 4. R. D. Preston and H. W. Woolhouse, Eds. Academic Press, New York, 1977. xii, 440 pp., illus. $32.85.

Advances in Steroid Biochemistry and Pharmacology. Vol. 6. M. H. Briggs and G. A. Christie, Eds. Academic Press, New York, 1977. xx, 174 pp., illus. $18.50.

Agricultural Efficiency. Proceedings of a meeting, Nov. 1976. The Royal Society, London, 1977. vi, 228 pp., illus. £16.30. Also published as *Philosophical Transactions of the Royal Society of London*, series B, vol. 281, no. 980.

AIC Color 77/AIC Couleur 77/AIC Farbe 77. Proceedings of a congress, Troy, N.Y., July 1977. Fred W. Billmeyer, Jr., and Gunter Wyszecki, Eds. Adam Hilger, Bristol, England, 1978 (U.S. distributor, S. L. Davidson, c/o N L Industries, Hightown, N.J.). xx, 564 pp., illus. $45.

Alcohol and Aldehyde Metabolizing Systems. Vol. 2, Enzymology and Subcellular Organelles. Papers from a symposium, Philadelphia, Oct. 1976. Ronald G. Thurman, John R. Williamson, Henry R. Drott, and Britton Chance, Eds. Academic Press, New York, 1977. xviii, 454 pp., illus. $29. Johnson Research Foundation Colloquia.

The Anatomy of Change. A Menninger Foundation Report on Testing the Effects of Psychotherapy. Stephen A. Appelbaum. Plenum, New York, 1977. xxvi, 308 pp. $24.50.

Applications of Ion-Selective Membrane Electrodes in Organic Analysis. George E. Baiulescu and Vasile V. Coşofreţ. R. A. Chalmers and Mary R. Masson, Transl. Eds. Horwood, Chichester, England, and Halsted (Wiley), New York, 1977. xii, 236 pp., illus. $37.50. Ellis Horwood Series in Analytical Chemistry.

Applying the Assessment Center Method. Joseph L. Moses and William C. Byham, Eds. Pergamon, New York, 1977. xii, 312 pp. $20. Pergamon General Psychology Series, vol. 71. *To order this book circle No. 415 on Readers' Service Card.*

Aquaculture in Southeast Asia. A Historical Overview. Shao-Wen Ling. Laura Mumaw, Ed. Washington Sea Grant Program, Seattle, 1978 (distributor, University of Washington Press, Seattle). xvi, 108 pp., illus. Cloth, $19.50; paper, $7.50.

The Arthropoda. Habits, Functional Morphology, and Evolution. S. M. Manton. Clarendon (Oxford University Press), New York, 1977. xxii, 528 pp., illus. + plates. $46.

Aspects of Degradation and Stabilization of Polymers. H. H. G. Jellinek, Ed. Elsevier, New York, 1978. x, 690 pp., illus. $124.50.

Aspects of Ecology and Zoogeography of Recent and Fossil Ostracoda. Proceedings of a symposium, Saalfelden, Austria, July 1976. Heinz Löffler and Dan Danielopol, Eds. Junk, The Hague, 1977. xii, 522 pp., illus. Dfl. 150.

Aspects of Homogeneous Catalysis. A Series of Advances. Vol. 3. Renato Ugo, Ed. Reidel, Boston, 1977. x, 240 pp., illus. $39.50.

Assessing Language Skills in Infancy. A Handbook for the Multidimensional Analysis of Emergent Language. Kenneth R. Bzoch and Richard League. University Park Press, Baltimore, 1978. 66 pp. Spiral bound, $9.75. Reprint of the 1971 edition.

Atlas of the Textural Patterns of Basalts and Their Genetic Significance. S. S. Augustithis. Elsevier, New York, 1978. x, 324 pp. $73.95.

Atmosphere and Ocean. Our Fluid Environments. John G. Harvey. Artemis Press, Sussex, England, 1976 (U.S. distributor, Crane, Russak, New York). 144 pp., illus. Cloth, $13.50; paper, $8.95.

Basic Immunogenetics. H. Hugh Fudenberg, J. R. L. Pink, An-Chuan Wang, and Steven D. Douglas. Oxford University Press, New York, ed. 2, 1978. x, 262 pp., illus. Cloth, $11.95; paper, $7.95.

Basic Processes in Reading. Perception and Comprehension. Papers from an institute, Minneapolis, June 1975. David Laberge and S. Jay Samuels, Eds. Erlbaum, Hillsdale, N.J., 1977 (distributor, Halsted [Wiley], New York). xiv, 370 pp., illus. $19.95.

Basic Statistics for Health Science Students. David S. Phillips. Freeman, San Francisco, 1978. xvi, 186 pp., illus. Cloth, $10; paper, $5.50. A Series of Books in Psychology.

Basketry Technology. A Guide to Identification and Analysis. J. M. Adovasio. Drawings by Edward Schumacher and Rhonda Andrews. Aldine, Chicago, 1977, x, 182