"menopause, surgery, 'empty nests,' retirement" (p. 132). At these times people feel detachment, loneliness, and terror; and Myerhoff's remedy would be to construct rituals to subvert such feelings. Would the attempt to celebrate these unfeted moments not belie the meaning of celebration as defined in this volume? Focusing inward on the private world of pain would, of necessity, curtail that spontaneous, joyous, ludic outpouring of the public festive spirit that inspires this communal enterprise.

JOAN BAMBERGER
25 Barnard Avenue,
Watertown, Massachusetts 02172

Ecology in Simple Settings

Cave Life. Evolution and Ecology. DAVID C. CULVER. Harvard University Press, Cambridge, Mass., 1982. x, 190 pp., illus. $25.

Ecology during the past quarter century has been strongly influenced by mathematical models. By developing these models, ecologists hoped to predict and to uncover generalizations about the way species are organized into communities. It was a new brand of natural history, one in which the biological peculiarities of individual species were judged to contribute little to the structure of communities. At the same time, population geneticists continued to develop models of the relative importance of selection and neutral mutation in the evolution of populations.

Many of the models are difficult to test empirically because their underlying assumptions are either violated or unverifiable in most communities. The relative simplicity of cave communities seemed to Culver to make caves ideal settings in which to evaluate the assumptions and predictions of theoretical ecology and population genetics. In this slim volume, which deals chiefly with caves in eastern North America and in Europe, Culver carefully lays out hypotheses and their alternatives based on predictions from general models and evaluates the predictions by reviewing previously published evidence.

The first topics to be discussed are the often grottesque features of cave animals. Are their long appendages, long life-spans, and reduced eyes and pigments adaptations to the rigors of the cave environment (low food supplies, high humidity, and darkness), or are they merely inevitable phenotypic responses to life in a natural dungeon? Culver is correct in pointing out the importance of this question for evolutionary biology, but the evidence from cave animals is equivocal, chiefly because experiments investigating the relative contribution of environment and genotype to phenotype have scarcely been done. Whether the loss of pigment and eyes resulted from selection or from the accumulation of selectively neutral mutations also remains uncertain. Culver's calculations suggest that the neutral-mutation explanation remains a possibility, but these calculations depend fundamentally on the estimation of divergence time of cave animals from their above-ground ancestors. The divergence time, in turn, must be calculated indirectly because of the virtual absence of fossil cave animals. Some of the estimates seem to be based on the degree of "regressive evolution" (pigment and eye loss) and thus add an element of circularity in the calculation of evolutionary rate.

The rest of the book is similarly characterized by the author's inability to decide unequivocally between alternatives. Is competition the chief factor determining patterns of habitat occupation by cave animals, or are predation and physical factors also important? Are large-scale patterns of distribution due chiefly to differences in habitat area between caves, or do such historical factors as glaciation, stream alteration, and richness of the above-ground biota also play a role? Usually there are arguments to be made on both sides of each of these questions, so that in most instances it is less a matter of distinguishing between alternatives than it is of establishing the relative importance of each factor.

Culver tends to blame inadequate data for most of his failures to accept or reject hypotheses definitively, and indeed there are great gaps in our knowledge of the natural history of cave animals. I am inclined to put more of the blame on the underlying models and on the methodology used to test the hypotheses that arise from them. The ecological importance of competition, for example, is inferred by calculating competition coefficients that are based on habitat overlaps between co-occurring species. The assumption is that habitat separation is effected and maintained by competitive exclusion where the two species come into contact. Aside from the likelihood that factors other than competition could bring about such a pattern, the less drastic effects of competition (reduced growth rates and fecundities of individuals, for example) are ignored, and there is no information on the resources being competed for or on the methods used by the species to monopolize these resources. Similar criticisms apply to the section on predation. This interaction may be important in some caves, as is suggested by the limited overlap between salamanders and some of their potential prey, but there is little discussion of methods of predation or of antipredatory characteristics. The extent to which competition, predation, and other biological interactions have influenced the evolution of cave animals is not considered. In short, current theoretical models of competition and predation, which are based on densities and growth rates of interacting populations, yield little insight into the ecological and evolutionary importance of these interactions and steer investigators away from the study of mechanisms.

Culver's thorough treatment of the literature makes it clear that much interesting biological work remains to be done in caves. If models are to guide this work, they will have to incorporate assumptions that are more verifiable, and they should emphasize the nature and consequences of individual interactions. I should like to see studies that compare cave communities with one another and with communities in other environments that are characterized by a chronic scarcity of such resources as food. Only in this way will it be possible to know whether the ecological responses and evolutionary pathways of cave animals are unique or whether they are typical of organisms in marginal environments of all kinds.

GEERAT J. VERMEIJ
Department of Zoology,
University of Maryland,
College Park 20742

Biogeography

Areography. Geographical Strategies of Species. EDUARDO H. RAPOPORT. Translated with revisions from the Spanish edition (1975) by Barbara Drausal. Published on behalf of the Fundación Bariloche by Pergamon, New York, 1982. xvi, 270 pp., illus. $29.50.

Areography is the first in a series of books to be published by the Fundación Bariloche, an Argentinian nonprofit organization devoted to supporting nonconventional creative research in a wide variety of disciplines. The intent of the series is to provide English-speaking readers access to a diversity of current thinking in Latin America.

Rapoport's book treats the study of the geographical ranges of taxa, from subspecies to supraspecific categories. His subject is the mathematical and sta-