himself will undertake even more ambitious research along the lines he has so well sketched. Scholars, therapists, clergy, and lay persons who need to understand cults or charismatic groups will benefit from Galanter's book, and his own judicious caution will help them avoid taking his word as gospel until research has better established the role that psychopathology plays in cults and determined the degree to which these novel religious movements fit the definition of charismatic group.

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Approaches to Ecology

Perspectives in Ecological Theory. JONATHAN ROUGHGARDEN, ROBERT M. MAY and SIMON A. LEVIN, Eds. Princeton University Press, Princeton, NJ, 1989. viii, 394 pp., illus. $60; paper, $22.50. Based on a meeting, Asilomar, CA, 1987.

It is possible for treatises on theoretical ecology to be written today with little overlap in topics covered. For some investigators, theoretical ecology is ecosystem models. For others, it is theoretical population biology. Even within population biology, some theoreticians emphasize the role of spatial structure, others evolutionary questions. There is no consensus on the correct models. The "marriage" between ecological and genetic approaches to understanding populations is still forced. The dialogue between theoreticians and experimentalists is still limited.

Is there a way for theoretical ecologists to reach a common ground? The use of "scale" as a unifying concept holds some promise, but only if some agreement can be reached on the use and meaning of the term. The recognition that any ecological question, theoretical or experimental, must be approached on the appropriate scale, temporal, spatial, or organizational, is becoming commonplace. Is this enough of a common theme for theoretical ecologists?

This diversity in ecological theory is well represented in *Perspectives in Ecological Theory*. I just used the volume as the focus of a reading group. The students were struck by the lack of common ground among the chapters. From a student's point of view, one important virtue of this work is the emphasis not just on reporting past accomplishments but on laying out directions for future work (possibly thesis topics).

Peter Kareiva addresses the problem of communication between experimentalists and theoreticians. Using his own work on the dynamics of insects and the role of spatial structure, Kareiva asks how to "renew the dialogue between theoreticians and experimentalists" that proved so valuable in relation to the work of Lotka, Volterra, and Gause. Kareiva notes that there is little hope for general theories of population ecology. Coupled with this loss of generality, however, important theoretical insights have emerged concerning the importance of chaos, of spatial structure, of stochasticity, of diseases (as discussed in contributions to the present volume by Hassell and May and Anderson), and of age structure. These concerns have led to detailed models of particular systems such as the rocky intertidal and the interactions between ladybird beetles and aphids.

Kareiva also suggests that this work has led to a list of experiments that need to be done. He calls for more mechanistic models, using parameters that can be measured. Given that ecological (population) theory appears to be a series of special cases exhibiting the importance of different factors such as age structure and spatial structure, theoreticians need to delineate the circumstances in which these various factors are likely to be important. Empiricists need theories to test assumptions.

The need for theories is particularly clear in areas where answers are needed now and experiments cannot always be performed. The success of ecological theory in understanding the dynamics of renewable resources is discussed by Clark. Its value in conservation biology is emphasized in contributions by Ehrlich and by Pimm and Gilpin. As these authors emphasize, ecological theories, though far from perfect, are far superior to complete ignorance. This positive view of theory in conservation biology should be encouraging for theoretical ecologists. The importance of scale, particularly spatial scale, emerges in these discussions of conservation biology.

The question of scale is discussed explicitly in two chapters on aquatic systems, by Powell and Steele, and plays a vital role in many other chapters of the book. In these aquatic systems, scale can be both itself the focus of investigation and a consideration in determining the observations to be made. O'Neill approaches the question of organizational scale explicitly, applying ideas from hierarchy theory. Cohen's contribution on food webs and Levin's on ecosystems emphasize the patterns that emerge and may be theoretically understood at higher levels of organization.

The interface between ecology and genetics is discussed in contributions by Travis and Mueller, Stanley, and Feldman. The approach of the paleontologist is very different from that of the population biologist, and this section shows the importance of temporal scale. Its most interesting parts are the suggestions for future work, since, as Feldman notes, "ecological evolutionary theory is very young." Also, work bridging ecology and genetics is still very difficult.

Not only is ecological evolutionary theory very young, most of the developments described in this book are quite recent, representing not just development of earlier approaches but really new lines of investigation. Until the late 1960s and early 1970s the models of ecology were basically extensions of the work of Lotka and Volterra, using the same framework. The last 15 years have seen an explosion of new approaches ranging from (but not limited to) an emphasis on structure, study of food webs, attempts at integrating ecology and genetics, and recognition of the importance of disease to an attempt at integrating economics and population dynamics. I agree with the editors' statement that some of the excitement of these developments comes across in this volume.

This book well demonstrates the fragmentation of ecological theory. The approaches of theoreticians at one organizational level are vastly different from those at another level. The approaches of plant population dynamics, as discussed by Pacala, are different from those used for animals, as discussed by Kareiva. In the introduction to the book the editors argue that this diversity of approaches is both desirable and necessary. It is impossible to predict which approaches will prove useful in the future.

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Molecular Rigidity

Rigid-Chain Polymers. Hydrodynamic and Optical Properties in Solution. V. N. TSVETKOV. Consultants Bureau (Plenum), New York, 1989. xxii, 490 pp., illus. $115. Macromolecular Compounds. Translated from the Russian by E. A. Korolyova.

One of the key features of chain molecules is their flexibility (or rigidity), which controls a large number of their properties, not only in solution but also in the bulk. Thus the means to characterize the degree of rigidity and the theories to predict it are important.

Molecular rigidity may be evaluated by dilute solution measurements of viscosity, sedimentation, diffusion, light scattering,

and streaming birefringence, which characterize chain conformation. These measurements are already well known for flexible chains, following the work of Flory and many others, but they have been less successful in the case of more rigid polymers (aromatic polyamides, cellulose and cellulose derivatives, polypeptides, polymeric liquid crystals), in part owing to experimental difficulties.

Tsvetkov has devoted much of his life to exploring such solutions, primarily using optical and hydrodynamic techniques. He belongs to the "Leningrad school," which has pioneered studies of polymer chain conformation. This book is a valuable collection of contributions from Tsvetkov and his associates, many of which have not been readily available to non–Russian-speaking readers.

Tsvetkov provides an excellent review of experiments and theory on this topic. He emphasizes the so-called "free-draining" state (as opposed to the non-draining case, where hydrodynamic interaction is important). This approximation, which is not good for coil-like molecules, becomes better with increasing molecular rigidity. In such cases, the Kuhn segment length may exceed that for flexible-coil molecules by an order of magnitude or more, leading to their unique hydrodynamic, electrical, and optical properties. This arises in part from the effects of their rigidity on their equilibrium properties and thermodynamics, but largely from the effects of their dynamics on their motion in solution. The author extensively employs the worm-like–chain model introduced by Kratky, which gives rise to the concept of the persistence length as a measure of rigidity. A strong point of the book is the comparison of the behavior of rigid and flexible molecules.

The book presents a good discussion of translational and rotational motions of molecules and their effects on viscosity, streaming, and electric-field–induced birefringence. The presentation is "classical" and is, for the most part, readily understandable by physical chemists and engineers as well as by physicists. There are extensive references, many from the Russian literature. Relatively few references, however, date from after 1983, and the book misses important recent work in areas like liquid crystal polymers, the non-linear optical properties of such systems, and their employment in devices dependent upon their high molecular anisotropy. It also would have been desirable to include something about the commercial use of rigid-chain polymers in preparing high-performance fibers like Kevlar® and blends with flexible molecules to make "molecular composites."

Overall the presentation is clear, and the translation is good. There is a good mix of theory and experiment accompanied by extensive experimental details, and the book will prove a useful reference. It provides an excellent perspective for more recent developments.

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