reactions of serine proteases. He discusses the strengths and weaknesses of each approach and exposes ambiguities in interpretation. Anyone who thinks that the issue is settled regarding participation of a charge relay in catalysis by serine proteases will find this chapter fascinating. In the second book Kallenbach and Nelson have written an excellent history of the experimental investigation of protein folding, dating back to Anfinsen's experiments on ribonuclease. The authors discuss the structural differences between native and unfolded proteins, emphasizing the compensatory forces that result in small differences in free energy between folded and unfolded states. The authors describe different experimental methods for monitoring refolding and define experimental criteria for a simple two-state model in which no folding intermediates accumulate. The current experimental methods for detection and characterization of folding intermediates are also discussed, and the chapter helps evaluate the extensive and often confusing literature on protein folding.

Overall, these two volumes provide a detailed coverage of the progress in understanding enzyme catalysis and structure, and they document the initial successes and failures in implementing these principles in model systems. I recommend these books highly to the reader interested in the experimental and theoretical bases of these developments.

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Nonlinearities

Order and Chaos in Nonlinear Physical Systems. STIG LUNDQVIST, NORMAN H. MARCH, and MARIO P. TOSI, Eds. Plenum, New York, 1988. xviii, 496 pp., illus. $92.50. Physics of Solids and Liquids. Based on a school, Trieste.

Based on an International Centre for Theoretical Physics school of the same name as the book, the 17 chapters here present introductory and advanced material in chemistry, hydrodynamics, optics, solid-state physics, and mathematical physics. The volume will be a useful gateway into the field for the partially initiated. It is not replete with recent references (there are few after 1987), but they are generally not necessary, given the introductory nature of the material. This will be tough going as a first book for readers wishing to learn about nonlinear dynamics, but for those seeking breadth and a middle ground, it provides a wealth of discussions, introductions, and references.

The book is given unity by an introductory chapter by Lundqvist, in which he reviews terms and principles that are used in the succeeding chapters. Calogero and Degasperis's reprinted 1982 paper on solitons gives an excellent overview, with a wondrously detailed set of references and careful annotations, and it may well be one of the best places to begin for those only vaguely aware of the formal study of nonlinear wave propagation problems.

Chemical oscillators and chemically induced pattern are addressed by De Kepper, who mixes in illustrations and recipes for a few common demonstrations. Haken, Arecchi, and Loudon combine to provide a series of chapters that review much in the way of nonlinear dynamics in optics spanning the discovery of the behavior of lasers near threshold and the modern studies of optical bistability and optical chaos. Such topics as the topologies of attractors, routes to chaos, attractor dimensions, and entropies are addressed rather indirectly or incompletely in this volume, and a beginner will have some difficulty understanding the presentations of results in these chapters.

Mathematical aspects of nonlinear dynamics are covered in chapters on delay equations (maps), fractals, and symbolic dynamics. Indeed, one of the pleasant surprises of working on this review was the discovery of the tandem discussions by Percival and Hao of the use of symbolic dynamics to describe chaotic systems. The "experts" in the business of characterizing nonlinear dynamical time series and patterns have in large part moved to the study of the "complexity" of the signals. Rather than dealing with the extraordinary amount of digital information in numerically precise measurements of the behavior of a system, many now seek to compartmentalize the information so that a limited number of symbols and an associated grammar for symbol sequences can be used to characterize the behavior. The discussions of symbolic dynamics in this volume provide a useful introduction to concepts that have since been refined but that continue to rely on this core of theory. There are few other places where this aspect of the analysis of nonlinear systems is treated at this level.

As a helpful complement to the primary focus on nonlinear dynamics and chaos, Stinchcombe's discussion of phase transitions brings out such matters as criticality, critical exponents, stochastic fluctuations, fractals, and their relation to the dynamics discussed elsewhere.

Berry and Cvitanović contribute only brief chapters that do not convey the full strength of their expertise.

The concluding chapter is an unfortunately brief discussion by Haken and Wunderlin of the "slaving principle," which is the formal justification of "adiabatic elimination" of rapidly relaxing variables that become slaves to the dynamics of their more slowly varying companions. All those considering undertaking such "eliminations" should be cautioned to follow this chapter closely and then perhaps to study even more carefully the recent descriptions of the formal application of center-manifold theory such as those given by Oppo and Politi in *Instabilities and Chaos in Quantum Optics II* (N. B. Abraham, F. T. Arrechi, and L. A. Lugiato, Eds.).

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