The author has organized the book on the principle of decreasing symmetry and—consequently—of increasing importance for application to astronomical problems. The book is divided into four parts: homogeneous systems, infinite inhomogeneous systems, finite spherical systems, and flattened systems. The first part treats fundamental gravitational processes such as collisional relaxation, dynamical friction, collective scattering, and Landau damping as well as formalisms such as the Boltzmann, Liouville, and Fokker-Planck equations and the BBGKY hierarchy and various techniques for their solution. The second part describes gravitational instabilities in an expanding universe, the use of correlation functions, an analysis of voids, and an attempt to explain the observed clustering of galaxies by means of thermodynamics. The third part discusses violent relaxation to equilibrium and the construction of quasi-equilibrium models as well as the evolution of finite spherical systems as a result of collisionless relaxation and binary formation. The discussion covers evaporation, mass and orbit segregation, and the role of a central singularity. The results are applied to globular clusters, galactic nuclei, and clusters of galaxies. The final part briefly describes some of the complications that arise when the assumption of spherical symmetry is relaxed. The discussion covers bar and spiral instabilities, the importance of integrals of motion, the occurrence of ergodic orbits, and gravitational shocks. Each part concludes with a short section of problems that are intended as a connection to the literature and to current research.

Unfortunately, the discussion of the different topics in the book is rather uneven and seems more correlated with the author's own research interests than with their astronomical importance. The first part contains some lengthy and detailed derivations, in particular for Landau damping and collective scattering, that are of minor interest. By contrast, the second half of the book sometimes deals in a rather cursory manner with important subjects of active research. Among these are equilibrium models and their stability, both for spherical and for flattened systems, the theory of orbits, adiabatic invariants, and mergers of galaxies.

This state of affairs is probably nearly unavoidable in a book with such a wide scope, but it makes it difficult to ascertain to which audience the book is addressed. It would not be an easy task to give a graduate-level course on the basis of it.

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Oceanography

Turbulence in the Ocean. A. S. MONIN and R. V. OZMIDOV. Reidel, Dordrecht, 1985 (U.S. distributor, Kluwer, Hingham, MA). xvi, 247 pp., illus. $44.50. Environmental Fluid Mechanics. Translated from the Russian edition. H. Tennekes, Transl. Ed.

This short monograph by two distinguished Soviet oceanographers is a welcome addition to the literature. It is written with authority and translated with grace; its perspective of this extremely active field is somewhat (and interestingly) different from that of most work done by oceanographers in the United States.

The book opens with a brief description of simple ideas concerning strange attractors, but, as the authors confess, these ideas still provide only a vague image of turbulence. The conventional equations of turbulent flow are developed, and the particular mechanisms of turbulence generation in the stratified ocean are listed. Similarity methods, developed for atmospheric turbulence by Monin and Obukhov, are extended to the more intermittent and transient turbulent events in the ocean and give both scaling relations and spectra. This long opening chapter, written by Monin, gives a lucid though fairly conventional overview of things every oceanographer ought to know, but this reviewer wonders whether it is sufficient. Turbulent patches in the thermocline are intermittent; we conjecture that they arise from a local instability of some kind, and that the turbulence develops, modifies the basic state locally, transfers energy to smaller scales, loses its energy supply, collapses, and decays. Samples taken by falling probes will include representatives of all these stages of evolution, but conventionally they are lumped together, analyzed by means of Fourier analysis, and averaged. One has the feeling that much is to be learned, not only by the use of overall similarity statistics but by trying to unravel in some way the natural history of these events.

The second chapter, by Ozmidov, presents a clear and comprehensive account of sensors, instruments, measurement, and analysis techniques. It is, overall, the best of its kind that this reviewer has seen—it should be the observational physical oceanographer's bible. How one makes inferences from small samples, what reliability one can attribute to estimates, whether variations are physically significant or an artifact of sampling—these are discussed in detail with typical results from various parts of the world's oceans. The final chapter, on large-scale horizontal turbulence (with length scales of the order of the Rossby radius, about 100 kilometers), places small-scale observations in their larger context, the link between the small eddies themselves and the planetary scales of ocean circulation.

This is a very interesting book. One is drawn to compare the style of the science it describes with that of the science done in the United States. Characterized by a firmer reliance on theory and similarity techniques in the analysis of data, the former is perhaps limited in the questions it is asking, with the result that possibly new phenomena are interpreted in old terms. American oceanographers are sometimes quite naive about these theoretical approaches, when they are useful, and where their limitations lie but have displayed much greater ingenuity in the development of new sensors, new vehicles, and new kinds of measurement. Individual communications among U.S. and Soviet oceanographers have usually been easy, but each group still has something to learn from the other.

The translation and Tennekes's editing are excellent, the language is colloquial and accurate, and the book itself is cleanly produced. Physical oceanographers, whether studying or doing research on this subject, will find it a pleasure to use.

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Some Other Books of Interest

Species and Speciation. E. S. VRBA, Ed. Transvaal Museum, Pretoria, South Africa, 1985. xviii, 176 pp., illus. $30. Transvaal Museum Monograph no. 4. From a symposium, Pretoria, Sept. 1982.

The contributors to this volume are characterized by the editor as "a diverse assortment of systematists. . ., ecologists, population geneticists, developmental biologists, palaeontologists and anthropologists." All but one of the 24 are or have been affiliated with institutions in South Africa. The volume opens with a general discussion by Vrba of species and speciation. A section headed Species Concepts contains further general discussions by N. Eldredge, H. E. H. Paterson, M. J. Scoble, and D. J. Brothers. Under the heading Development and Speciation B. Fabian discusses evolutionary change from the point of view of an embryologist and E. Holm attempts to apply a "structurally integrated" approach to the evolution of generalist and specialist species. The remaining sections of the volume—Climate, Population Structure and Speciation; Faunal Case Histories; Speciation in