BOOK REVIEWS

Turbulence and Random Processes in Fluid Mechanics

By M. T. Landahl and E. Mollo-Christensen, Cambridge University Press, 154 + vi pp., 1986, $34.00 cloth.

This little book does not do justice to the subject of turbulence, but it is very different from other turbulence texts and deserves to be read. It evolved from a set of class notes for an introductory turbulence course given at MIT to graduate students from such diverse areas as engineering, applied math, oceanography, and physiology. It is not a comprehensive treatment but instead reflects the interests of the authors: MTL in waves and transition, and EMC (well known for his NCFMF film on "Flow Instabilities") in surface waves and sound. In a course or even with self study, it is necessary to supplement the text with a more substantial one such as Hinze, Tennekes & Lumley, or Davies, and also with the area's literature. Because the text is so short, maybe enough engineers will look at the figures in Chapter 8 to learn once and for all that the laminar sublayer is a fiction; for this alone the text is worth reading.

A list of the chapter titles gives an idea of the content: Chapter 1. Introduction with Historical Notes, Chapter 2. Characteristic Scales and Nondimensional Parameters, Chapter 3. Basic Equations, Chapter 4. Statistical Tools for Description of Turbulence, Chapter 5. Examples of Homogeneous Turbulent Flows, Chapter 6. Waves, Chapter 7. Instability and Transition to Turbulence, Chapter 8. Shear Flow Turbulence Structure, Chapter 9. Turbulence Modeling and Closure Schemes, Chapter 10. Aerodynamic Noise, and Chapter 11. Convective Transport. Included in the book are several concepts arising from geophysical fluid dynamics, e.g. density stratification, thermal convection, and gravity waves. Because the text is short, most topics are really just sketches done in an attractive and readable manner. In this respect one might think of the book as a child's guide to the subject of turbulence and transition to turbulence. Such topics as statistical closure theory and coherent structures, certainly central to any modern treatment of turbulence, are hardly developed in this introductory text.

The best feature of the book is the inclusion of or at least mention of a number of modern concepts that appear in the literature but not in most other introductory texts. These include solitons, bifurcation theory, and Runstadler streaks. The worst feature, aside from the light treatment of statistical theory and coherent structures, is the classification of turbulent boundary layers and fully developed channel flows as examples of homogeneous turbulent flows.

In summary, although the text cannot stand alone, its different point of view renders it a welcome addition to my bookshelf.

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Metal Clusters in Catalysis

By B. C. Gates, L. Guzci, and H. Knoezinger, Eds., ("Studies in Surface Science and Catalysis," **29**), Elsevier Science Publishers, 648 pp., $84.75.

This book provides an excellent and thorough review of the state of the art in molecular and supported metal cluster chemistry. Research in this area has expanded quite rapidly over the past decade, spurred on by advances in instrumentation and by the compelling analogy that can be drawn between adsorbate-metal crystallite systems and organometallic clusters. Indeed, the authors suggest that information gained from relating organometallic-cluster chemistry to metal-surface chemistry will contribute to a better fundamental understanding of the links between the areas of catalysis, organometallic chemistry, and surface science.

The book is divided into three parts. Part 1 concerns synthesis, structure and characterization, thermochemical properties and reactivity of metal clusters. The book is quite exhaustive in its review of the literature, from simple to complex systems. Excellent descriptive discussions provide the reader with not only a general understanding of these topics but also a thorough list of references for consultation. This part of the book is an excellent resource for anyone just entering this field of research since one is able to draw on the considerable experience of the work cited.

The last chapter of Part I deals specifically with particular metal clusters and the homogeneous catalytic processes in which they participate, presented by examples categorized by type of transition metal. While the fragility of the complex is always a concern, these studies are inspired by the hope that a metal cluster will be found with sites that can form products not normally found on catalytic metal surfaces.

The fragmentation of metal clusters under reaction conditions has encouraged the development of ways to stabilize the clusters. Part II of this book describes materials derived from metal clusters in or on supports including metal oxides, functionalized metal oxides, and polymeric materials. The section begins with an overview of experimental techniques useful in characterizing these cluster-support systems. The importance of this chapter can be appreciated when one pauses to realize that most of the instrumental methods discussed were unknown or were available only in a less sophisticated fashion as little as twenty years ago.

The application of these techniques to explore metal cluster chemistry highlights once more the analogy between metal clusters and adsorbate-metal systems. For example, much of the current understanding of carbon monoxide adsorption on metal crystallites as studied by vibrational spectroscopies draws directly on work done with metal carbonyl clusters.

Sectioned off as separate topics in Part II of this book are four distinct areas dealing with metal clusters and supports. These are: 1) metal clusters from vapor chemistry, which includes metal complexes with and without ligands studied using matrix isolation techniques as well as metal clusters evaporated onto supports; 2) metal clusters within zeolite