From this starting point macroscopic consequences are worked out along two main routes: First, the hydrodynamic equations, in particular the Navier–Stokes equation, are worked out using the lattice gas version of the Chapman Enskog expansions. Second, the hydrodynamic equations are derived through projection operators and Green–Kubo relations. The latter approach produces in particular the correlations (spectra) of the density fluctuations.

A typical feature of this book (and for natural reasons, most other books of this kind) is that its focus reflects the research done by the authors. The book thus focuses on the fundamental statistical mechanical nature of lattice gases, their Green–Kubo relations and both thermal and non-thermal fluctuations.

The theory is clear, pedagogical and follows a natural line of development. Some of the chapters are specific to lattice gases while others give good introductions to established subjects like basic statistical mechanics, hydrodynamic linear response theory and projection operator techniques. The theoretical results, in particular for the fluctuation power spectra, are compared with simulation results throughout. There is also a chapter on applications that describes special purpose cellular automata computers, and large scale simulations of hydrodynamic instabilities as well as the data post-processing.

This book does not include many of the lattice gas extensions to fluids more complex than thermal ones. There is no treatment of lattice gases with surface tension, colloidal particles or surfactants, nor are the lattice Boltzmann models treated. Partly for these reasons this book very nicely complements the book *Lattice gas Cellular Automata* by Rothman and Zaleski, which leans more towards applications to complex flows. However, in the last chapter there is an excellent short review of the literature on the models that have evolved from the basic lattice gas models. This review includes the applications to complex fluids.

Who should read this book?

For graduate students entering into the subject area of lattice gases or related methods this book would be an excellent starting point. But also for experts in related fields of fluid dynamics and statistical physics will this book serve as a very good introduction. Finally, to the community of researchers in in the field of lattice gas/lattice Boltzmann techniques the book by Rivet and Boon will be a valuable reference for the basic, and also not so basic, theory of the field.

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Wave Motion*: *Theory and Application by J. Billingham, A.C. King (Cambridge University Press, UK, 2001, 468 pp.) £24.95, US$ 37.95 paperback. ISBN 0 521 63450 4

Wave motion occurs in many applications in the sciences and everyday life. Examples include waves on a beach, waves on the stretched strings of a guitar, sound waves, electromagnetic waves, chemical waves and traffic waves. This book provides an excellent advanced introduction to the mathematical theory of wave motion. It is ideally suited to advanced undergraduate students and beginning postgraduate students. Moreover, mathematicians, physicists and engineers will find interest in the most advanced topics.

The book is divided into three parts.

The first part is concerned with the theory of linear waves. After introducing the basic concepts, the authors explore systematically the properties of waves on a stretched string, sound waves, linear water waves, waves in elastic solids and electromagnetic waves. Each section starts with a clear derivation of the basic equations. When necessary basic concepts of fluid mechanics, electromagnetism, chemistry, thermodynamics, etc. are derived from physical principles.

The second part of the book deals with nonlinear waves. The authors first introduce the concepts of shocks by considering traffic waves. They then use the ideas developed for traffic flows to investigate more complicated problems arising in gas dynamics. There is a very nice chapter on nonlinear waves in which shallow water theory, the Stokes' expansion for gravity waves, the Korteweg–de Vries equation and nonlinear capillary waves are investigated. This second part of the book concludes with a chapter on electrochemical waves the transmission of nerve impulses (Fitzhugh–Nagumo model).

The third part covers some advanced topics. Here the interested reader will learn about diffraction, scattering, solitons, the inverse scattering transform, Burgers' equation and the nonlinear Schrödinger equation. These problems are more difficult but the first two parts of the book provide the necessary background to grasp the material.

One attractive feature of the book is the abundance of worked examples and exercises (with solutions available to teachers). The mathematics is clearly presented and physical interpretations of the results are given when appropriate. While learning about waves, the reader will also be introduced to important methods in applied mathematics such as WKB expansions, Fourier methods, asymptotic analysis, the Wiener–Hopf technique and perturbation theory.

In conclusion, this is a wonderful book whose reading I would recommend to any scientist interested in learning the mathematical theory of wave motion.

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Large Eddy Simulation for Incompressible Flows – An Introduction by Pierre Sagaut (Springer-Verlag, Germany, 2001, 319 pp.) DM 119.00, US$ 59.95 hardcover. ISBN 3 540 67890 5

Large-Eddy Simulation (LES) is a tool to compute turbulent flows by resolving the large scales and modeling the small ones (the so-called Sub-Grid Scales: SGS). This is an intermediate approach between solving for the mean flow quantities governed, e.g., by the Reynolds Averaged Navier–Stokes equations (RANS) and solving for the full unsteady flow (Direct Numerical Simulation: DNS). The first approach (RANS) is computationally cheap with rather limited information. The second approach (DNS), yielding the desired results and a complete physical description of the flow, is in general prohibitively expensive.

This book is a review of effective and precise modeling techniques for LES of high Reynolds number industrial flows. This alternative method to DNS provides detailed unsteady flow characteristics without having to solve for all wave numbers of the flow. The effects of the non-resolved small scales are then taken into