

## Turbulence

*An Introduction for Scientists and Engineers*

**P. A. Davidson**, Reader in Fluid Mechanics at the University of Cambridge

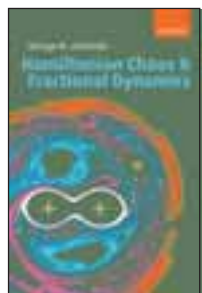
Based on a course by the author at the University of Cambridge, this comprehensive text on turbulence and fluid dynamics is aimed at year 4 undergraduates and graduates in applied mathematics, physics, and engineering, and provides an ideal reference for industry professionals and researchers. Containing many examples, the author combines the maximum of physical insight with the minimum of mathematical detail where possible. The text is highly illustrated throughout, and includes colour plates; required mathematical techniques are covered in extensive appendices.

2004 | 678 pages | 8 colour plates | numerous halftones and line drawings

978-0-19-852949-1, PAPERBACK £38.00/\$92.95  
978-0-19-852948-4, HARDBACK £116.00/\$224.50

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**George M. Zaslavsky**, New York University, USA

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April 2008 | 336 pages

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## Singular Elliptic Problems

*Bifurcation & Asymptotic Analysis*

**Marius Ghergu**, Researcher, Institute of Mathematics, Romanian Academy, and **Vicentiu Radulescu**, Senior Researcher at the Institute of Mathematics, Romanian Academy, and Full Professor at the University of Craiova, Romania

This book provides a comprehensive introduction to the mathematical theory of nonlinear problems described by singular elliptic equations. There are carefully analyzed logistic type equations with boundary blow-up solutions and generalized Lane-Emden-Powler equations or Gierer-Meinhardt systems with singular nonlinearity in anisotropic media. These nonlinear problems appear as mathematical models in various branches of Physics, Mechanics, Genetics, Economics, Engineering, and they are also relevant in Quantum Physics and Differential Geometry.

One of the main purposes of this volume is to deduce decay rates for general classes of solutions in terms of estimates of particular problems. Much of the material included in this volume is devoted to the asymptotic analysis of solutions and to the qualitative study of related bifurcation problems. Numerical approximations illustrate many abstract results of this volume. A systematic description of the most relevant singular phenomena described in these lecture notes includes existence (or nonexistence) of solutions, unicity or multiplicity properties, bifurcation and asymptotic analysis, and optimal regularity.

The method of presentation should appeal to readers with different backgrounds in functional analysis and nonlinear partial differential equations. All chapters include detailed heuristic arguments providing thorough motivation of the study developed later on in the text, in relationship with concrete processes arising in applied sciences. The book includes an extensive bibliography and a rich index, thus allowing for quick orientation among the vast collection of literature on the mathematical theory of nonlinear singular phenomena.

June 2008 | 320 pages | OUP USA

978-0-19-533472-2, HARDBACK £44.00/\$80.00

## Microstructure of Martensite

*Why it forms and how it gives rise to the shape-memory effect*



**Kaushik Bhattacharya**, California Institute of Technology, USA

The science of materials (metallurgy) tells us that every material contains microscopic features that vary at different length scales. This underlying microstructure determines the mechanical properties of the material. This book

presents the particularly dramatic and compelling case of shape-memory alloys, technologically important materials, beautifully explaining the link between microstructure and macroscopic properties. A sample wire of shape memory material is included with the book.

Oxford Series on Materials Modelling No. 2

November 2003 | 304 pages

978-0-19-850934-9, HARDBACK £52.50/\$99.50

## Computer Simulations of Dislocations



**Vasily Bulatov**, Lawrence Livermore National Laboratory, and **Wei Cai**, Stanford University, USA

The book presents a variety of methods for computer simulations of crystal defects in the form of 'numerical recipes', complete with computer codes and analysis tools. By working through numerous case studies and

problems, this book provides a useful starter kit for further method development in the computational materials sciences.

Oxford Series on Materials Modelling No. 3

November 2006 | 304 pages

978-0-19-852614-8, HARDBACK £42.50/\$79.50

## Milestones in Matrix Computation

*The Selected Works of Gene H. Golub with Commentaries*



Edited by **Raymond Chan**, The Chinese University of Hong Kong, **Chen Greif**, The University of British Columbia, and **Dianne O'Leary**, University of Maryland

The text presents and discusses some of the most influential papers in Matrix Computation authored by Gene H. Golub, one of the

founding fathers of the field. Including commentaries by leading experts and a brief biography, this text will be of great interest to students and researchers in numerical analysis and scientific computation.

February 2007 | 584 pages

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NUMERICAL MATHEMATICS AND SCIENTIFIC COMPUTATION

NEW EDITION

**Spectral/hp Element Methods for Computational Fluid Dynamics**

SECOND EDITION

**George Karniadakis**, Division of Applied Mathematics, Brown University, and **Spencer Sherwin**, Department of Aeronautics, Imperial College London



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*Computation and Approximation*

**Walter Gautschi**, Department of Computer Sciences, Purdue University, USA

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EMS Newsletter

Orthogonal polynomials are a widely used class of mathematical functions that are helpful in the solution of many important technical problems. This book provides, for the first time, a systematic development of computational techniques, including a suite of computer programs in Matlab downloadable from the Internet, to generate orthogonal polynomials of a great variety.

**Numerical Mathematics and Scientific Computation**

2004 | 312 pages

978-0-19-850672-0, HARDBACK £67.00/\$144.50

BIOGRAPHY

**Grégoire Allaire**

Grégoire Allaire is a Professor of Applied Mathematics at Ecole Polytechnique. He received his PhD from Paris 6 University in 1989 working with François Murat and Jean-Pierre Puel, then held a post-doctoral position at New York University before joining the French Atomic Energy Commission as a researcher. In 1997 he moved to Paris 6 University as a Professor of Applied Mathematics and then to Ecole Polytechnique in 2000. Professor Allaire's research focuses largely on the mathematical modelling and numerical simulation of various physical and mechanical problems featuring multiple scales. He worked in homogenization theory with application to composite materials, porous media, nuclear reactor physics, in shape and topology optimization of structures, and on two-phase flows.



For more information, see the web page: <http://www.cmap.polytechnique.fr/~allaire>

**Numerical Analysis and Optimization**

*An Introduction to Mathematical Modelling and Numerical Simulation*

**Grégoire Allaire**, Ecole Polytechnique, France  
Translated by **Alan Craig**, University of Durham

This text, based on the author's teaching at École Polytechnique, introduces the reader to the world of mathematical modelling and numerical simulation. Covering the finite difference method; variational formulation of elliptic problems; Sobolev spaces; elliptical problems; the finite element method; Eigenvalue problems; evolution problems; optimality conditions and algorithms and methods of operational research, and including a several exercises throughout, this is an ideal text for advanced undergraduate students and graduates in applied mathematics, engineering, computer science, and the physical sciences.



**Numerical Mathematics and Scientific Computation**

May 2007 | 472 pages

978-0-19-920522-6, PAPERBACK

£30.00/\$60.00

978-0-19-920521-9, HARDBACK

£75.00/\$150.00

**Mathematical Methods for the Magneto-hydrodynamics of Liquid Metals**

**Jean-Frédéric Gerbeau**, Institut National de Recherche en Informatique et en Automatique, France, **Claude Le Bris**, Ecole Nationale des Ponts et Chaussées, France, and **Tony Lelièvre**, Ecole Nationale des Ponts et Chaussées, France



This clear and comprehensive text focuses on mathematical and numerical techniques for the simulation of magnetohydrodynamic phenomena, with an emphasis on industrial applications. Aimed at research mathematicians, engineers and physicists, as well as those working in industry, the approach is highly mathematical and based on solid numerical analysis.

**Numerical Mathematics and Scientific Computation**

2006 | 320 pages

978-0-19-856665-6, HARDBACK £55.00/\$110.00

**Wavelet Methods for Elliptic Partial Differential Equations**

**Karsten Urban**, Director of the Institute of Numerical Mathematics, University of Ulm

Many processes in nature, science, and technology need to be simulated on a computer. Such a simulation requires a mathematical model and a solution method for the arising equations. One such model is elliptic partial differential equations, and wavelet methods provide a powerful tool for the solution of such equations. This book provides an introduction to the topic, as well as covering recent research.

**Numerical Mathematics and Scientific Computation**

April 2008 | 482 pages

978-0-19-852605-6, HARDBACK £65.00/\$130.00

**Iterative Methods for Toeplitz Systems**

**Michael K. Ng**, Department of Mathematics, The University of Hong Kong

'The book gives an excellent overview of the research and results in this area during the last few decades.'

EMS Newsletter

**Numerical Mathematics and Scientific Computation**

2004 | 364 pages

978-0-19-850420-7, HARDBACK £72.00/\$124.50

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'...an excellent introduction to finite elements, iterative linear solvers and scientific computing for graduates in engineering, numerical analysis, applied mathematics and interdisciplinary scientific computing.'

Adrian Carabeanu, *Zentralblatt Math*, Vol 1083

'The text offers a valuable contribution to all finite element researchers who would like to broaden both their fundamental and applied knowledge of the field.'

*Journal of Fluid Mechanics*

An excellent introduction to finite elements, iterative linear solvers and scientific computing aimed at graduates in engineering, numerical analysis, applied mathematics and interdisciplinary scientific computing. Including theoretical problems and practical exercises closely tied with freely downloadable MATLAB software, this book is an ideal teaching and learning resource.

**Numerical Mathematics and Scientific Computation**

2005 | 413 pages

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978-0-19-852867-8, HARDBACK

£39.00/\$72.50  
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**Numerical Methods for Structured Markov Chains**

**Dario A. Bini**, Department of Mathematics, University of Pisa, **Guy Latouche**, Department of Informatics at the Université Libre de Bruxelles, and **Beatrice Meini**, Department of Mathematics, University of Pisa



'The book is useful for researchers and PhD students both in the field of applied probability and numerical analysis, it can be used by specialists dealing with telecommunication and computer systems.'

Laszlo Lakatos, *Zentralblatt MATH* 1076

'...this is an excellent book'

*SIAM Review*, Vol.49 No.1 pp.123-176

Intersecting two large research areas - numerical analysis and applied probability/queueing theory—this book is a self-contained introduction to the numerical solution of structured Markov chains, which have a wide applicability in queueing theory and stochastic modeling. Aimed at graduates and researchers in numerical analysis, applied mathematics, probability, engineering and computer science it provides a thorough overview of the current literature.

**Numerical Mathematics and Scientific Computation**

2005 | 340 pages

978-0-19-852768-8, HARDBACK

£49.00/\$99.00

**Inverse Eigenvalue Problems**

*Theory, Algorithms, and Applications*

**Moody Chu**, Professor, North Carolina State University, and **Gene Golub**, Professor, Stanford University



'A valuable tool for postgraduates, engineers and mathematicians in the area.'

Amin Boumenir, *Zentralblatt MATH*, Vol 1075

'The book collects together much material not previously available in book form and benefits from both authors' many years of experience of working on inverse eigenvalue and related problems.'

Nicholas J Higham, *Fluid Mechanics*, Vol 556

Inverse eigenvalue problems arise in a remarkable variety of applications and associated with any inverse eigenvalue problem are two fundamental questions—the theoretical issue of solvability and the practical issue of computability. Both questions are difficult and challenging. In this text, the authors discuss the fundamental questions, some known results, many applications, mathematical properties, a variety of numerical techniques, as well as several open problems.

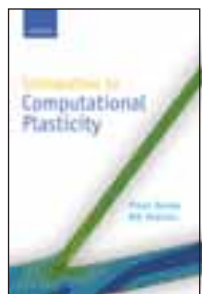
**Numerical Mathematics and Scientific Computation**

2005 | 406 pages

978-0-19-856664-9, HARDBACK

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**Introduction to Computational Plasticity**



**Fionn Dunne** and **Nik Petrinic**, both at Oxford University, UK

'The authors' intention to help, from undergraduates to researchers and practical engineers, to get modern practice in computational plasticity seems to be plainly accomplished in this interesting publication.'

JCF Telles, *Zentralblatt MATH*, Vol 1081, 2006

The book covers an introduction to the computational analysis of plasticity in engineering materials and structures. The general theory is presented which, wherever possible, is reduced to simple, one-dimensional forms to develop understanding and a good 'physical feel' for the theory. Implementations of the theory in to modern computer solution techniques are described and several examples given.

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£49.95/\$99.50

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**Werner Krauth**, CNRS - Laboratoire de Physique de l'Ecole Normale Supérieure, Paris, France

'This book is the best one I have reviewed all year.'

Alan Hinchliffe, *Physical Sciences Educational Reviews*

This book discusses the computational approach in modern statistical physics,

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£49.95/\$98.50

**Catalan Numbers With Applications**

**Thomas Koshy**, Professor of Mathematics, Framingham State College

This book presents a clear and comprehensive introduction to one of the truly fascinating topics in mathematics: Catalan numbers. They crop up in chess, computer programming and even train tracks. In addition to lucid descriptions of the mathematics and history behind Catalan numbers, Koshy includes short biographies of the prominent mathematicians who have worked with the numbers.

May 2008 | 304 pages | OUP USA

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