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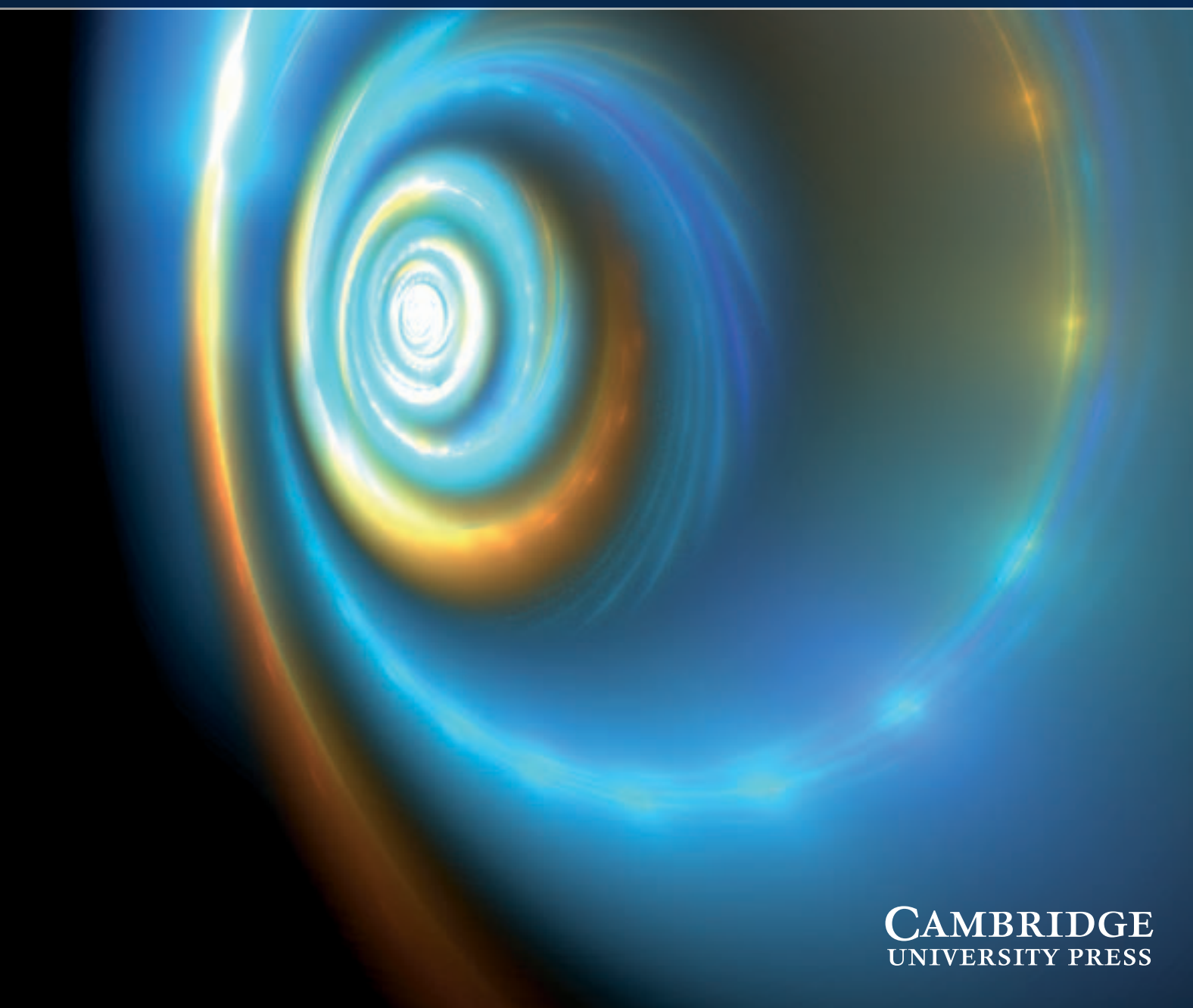

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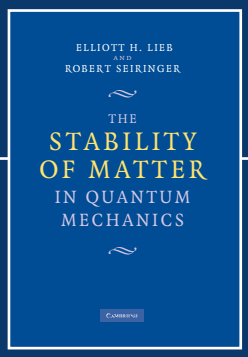


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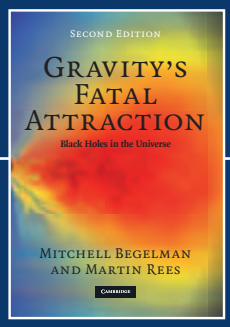


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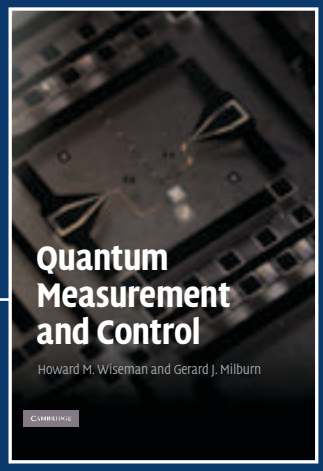


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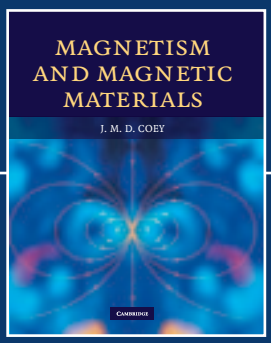


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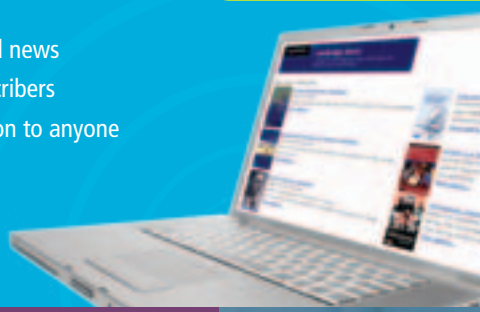

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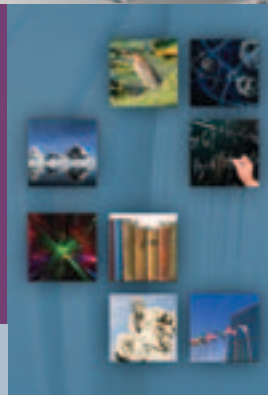

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# Optics, optoelectronics and photonics

TEXTBOOK

## Optical Physics

Fourth edition

**Stephen G. Lipson**
Technion – Israel Institute of Technology, Haifa
**Ariel Lipson**
Imperial College of Science, Technology and Medicine, London
**and Henry Lipson**
University of Manchester Institute of Science and Technology

This fourth edition of a well-established textbook is ideal for undergraduate and advanced courses on modern optics. Numerous practical examples are given, many from student laboratory experiments and lecture demonstrations. Illustrated with 400 figures, text is supplemented by advanced topics and up-to-date applications. Additional resources are available at www.cambridge.org/lipson.

**' … a well established and essential text for both undergraduate and graduate physicists … father and son writing in concert have written a scholarly, authoritative and clearly written account of the principles and application of wave theory.'**
Edward Atkins, *Physics Education*

**Contents**: 1. History of ideas; 2. Waves; 3. Geometrical optics; 4. Fourier theory; 5. Electromagnetic waves; 6. Polarization and anisotropic media; 7. The scalar theory of diffraction; 8. Fraunhofer diffraction and interference; 9. Interferometry; 10. Optical waveguides and modulated media; 11. Coherence; 12. Image formation; 13. The classical theory of dispersion; 14. Quantum optics and lasers; Appendices; Index.

2010 246 x 189 mm 550pp
375 b/w illus. 190 exercises
978-0-521-49345-1 Hardback c. £35.00
**Publication October 2010**
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## Visions of Discovery

**Edited by Raymond Chiao**
University of California, Berkeley
**William Phillips**
National Institute of Standards and Technology, Gaithersburg, USA
**Anthony Leggett**
University of Illinois, Urbana-Champaign
**Marvin Cohen**
University of California, Berkeley
**and Charles Harper**
John Templeton Foundation, Philadelphia

In honour of the work of Charles H. Townes, world-leading researchers, including Nobel Laureates, explore the most basic questions of science, philosophy, and the nature of existence. This fascinating book is ideal for anyone seeking answers to deep questions about the universe and human life.

2010 247 x 174 mm 800pp 185 b/w illus.
978-0-521-88239-2 Hardback c. £45.00
**Publication October 2010**
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TEXTBOOK

## Mathematical Methods for Optical Sciences

**Greg Gbur**
University of North Carolina, Charlotte

The first textbook on mathematical methods focusing on techniques for optical science and engineering, this textbook is ideal for graduate students. Strong emphasis is placed on connecting mathematical concepts to optical systems. Essay problems based on research publications and numerous exercises strengthen the connection between the theory and its application.

**Contents**: 1. Vector algebra; 2. Vector calculus; 3. Vector calculus in curvilinear coordinate systems; 4. Matrices and linear algebra; 5. Advanced matrix techniques and tensors; 6. Distributions; 7. Infinite series; 8. Fourier series; 9. Complex analysis; 10. Advanced complex analysis; 11. Fourier transforms; 12. Other integral transforms; 13. Discrete transforms; 14. Ordinary differential equations; 15. Partial differential equations; 16. Bessel functions; 17. Legendre functions and spherical harmonics; 18. Orthogonal functions; 19. Green's functions; 20. The calculus of variations; 21. Asymptotic and perturbation techniques; Appendices; Index.

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978-0-521-51610-5 Hardback c. £50.00
**Publication September 2010**
www.cambridge.org/9780521516105

## Laser Dynamics

**Thomas Erneux**
Université Libre de Bruxelles
**and Pierre Glorieux**
Laboratoire d'Astronomie de i'Université des Sciences et Techniques de Lille-Flandres-Artois

Bridging the gap between laser physics and applied mathematics, this book offers a new perspective on laser dynamics for graduate students and researchers. It moves from the application of basic tools to specific set-ups of practical interest, so readers can learn basic mathematical techniques and explore different laser systems.

2010 247 x 174 mm 352pp
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**Publication May 2010**
www.cambridge.org/9780521830409

## Modern Introduction to Surface Plasmons

**Theory, Mathematica Modeling, and Applications**

**Dror Sarid**
University of Arizona
**and William Challener**
Seagate Technology

Introducing graduate students in physics, optics, materials science and electrical engineering to surface plasmons, this book also covers guided modes at planar interfaces of metamaterials with negative refractive index. Online resources include Mathematica code to generate figures from the book and extended discussion of select topics.

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**Publication May 2010**
www.cambridge.org/9780521767170

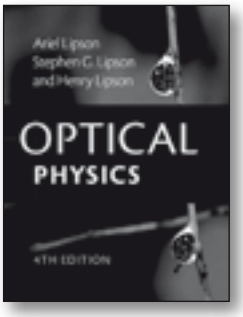
TEXTBOOK

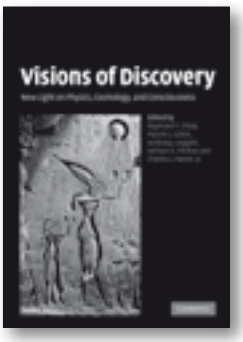
## Introduction to Nanophotonics

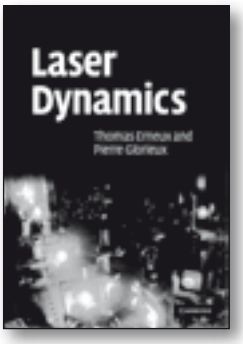
**Sergey V. Gaponenko**
National Academy of Sciences of Belarus

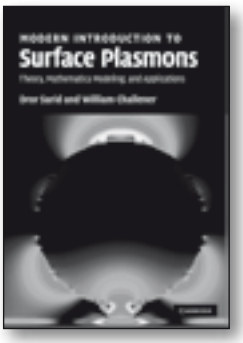
Describing the basic phenomena, principles, experimental advances and potential impact of nanophotonics, this graduate-level textbook is ideal for students in physics, optical and electronic engineering and materials science. Mathematics is kept to a minimum and theoretical issues are reduced to a conceptual level. Each chapter ends in problems.

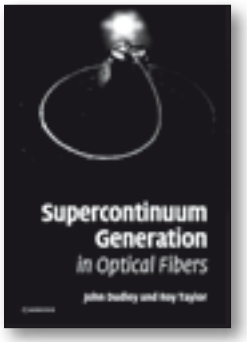
**'Sergey Gaponenko has produced a breathtaking and timely book that is just perfect for graduate-level students, or for the senior person wanting to know more about the**

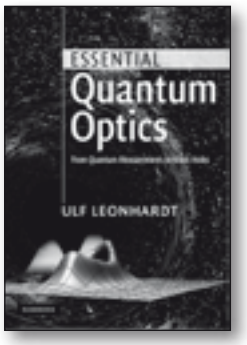


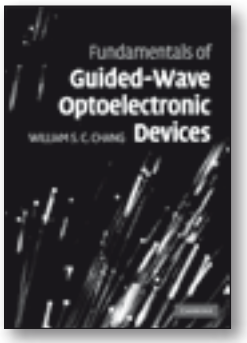



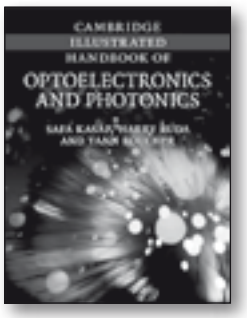






**field. The book has just the right tone and covers the material with an experimental focus hitherto not seen.'**
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**Edited by J. M. Dudley**
Université de Franche-Comté
**and J. R. Taylor**
Imperial College of Science, Technology and Medicine, London

Describing the theory, operational regimes and areas of applications, this unique book is an indispensable guide for researchers and graduate students. With contributions from major figures and pioneering groups, the book provides comprehensive computer codes so readers can confidently predict and model supercontinuum generation characteristics under realistic conditions.

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TEXTBOOK

## Essential Quantum Optics

**From Quantum Measurements to Black Holes**
**Ulf Leonhardt**
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**'A masterful and beautifully written exposition of the theoretical ideas and tools of quantum optics that every serious student or researcher, theorist or experimentalist, should have under their belt. Leonhardt tells a connected story, while making each discussion as 'simple as possible, but not simpler'.'**
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## Cambridge Illustrated Handbook of Optoelectronics and Photonics

**Safa Kasap**
University of Saskatchewan, Canada
**Harry Ruda**
University of Toronto
**and Yann Boucher**
Ecole National d'Ingénieurs de Brest (ENIB)

From fundamental concepts to cutting-edge applications, this is the first encyclopaedic reference of important terms and effects in optoelectronics and photonics. It contains broad coverage of terms and concepts from materials to optical devices and communications systems. Self-contained descriptions of common tools and phenomena are provided for undergraduate and graduate students, scientists, engineers and technicians in industry and laboratories. The book strikes a balance between materials and devices related coverage and systems level terms, and captures key nomenclature used in the field. Equations are used where necessary, and lengthy derivations are avoided. Over 600 clear and self-explanatory illustrations are used to help convey key concepts, and enable readers to quickly grasp important concepts.

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McMaster University, Ontario

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# Condensed matter physics, nanoscience and mesoscopic physics

## Basic Aspects of the Quantum Theory of Solids

**Order and Elementary Excitations**
**Daniel Khomskii**
Rijksuniversiteit Groningen, The Netherlands

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**Publication October 2010**
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## Experimental and Computational Techniques in Soft Condensed Matter Physics

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Baylor University, Texas

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**Publication August 2010**
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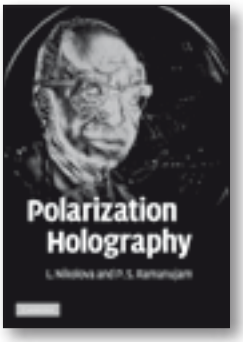
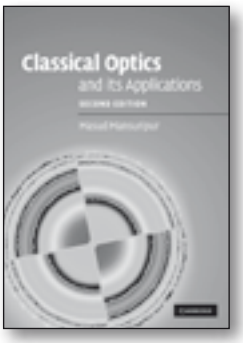
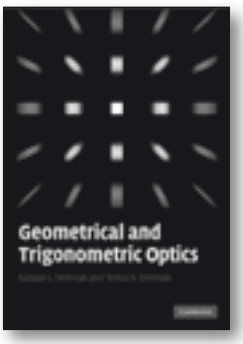
## High-Temperature Levitated Materials

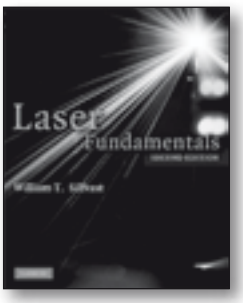
**David L. Price**
Centre National de la Recherche Scientifique (CNRS), Paris

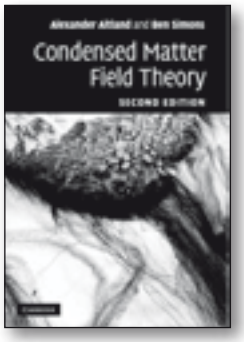
Describing several methods of levitation, this book summarizes the state-of-the-art of levitation techniques, and explores the concepts behind the experiments

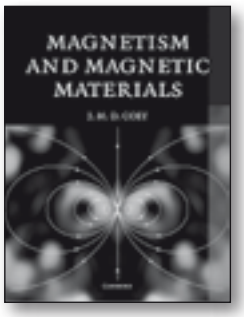


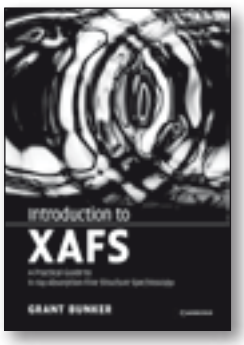



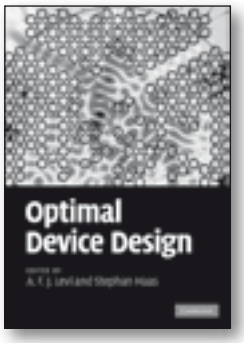






and associated theoretical ideas. Aimed at researchers in physics, physical chemistry and materials science, the book will also interest professionals working in high-temperature materials processing and the aerospace industry.

2010 247 x 174 mm 224pp 151 b/w illus.
978-0-521-88052-7 Hardback c. £70.00
**Publication May 2010**
www.cambridge.org/9780521880527

TEXTBOOK

## Quantum Mechanics for Nanostructures

**Vladimir Mitin**
State University of New York, Buffalo
**Dmitry Sementsov**
Ulyanovsk State University, Russia
**and Nizami Vagidov**
State University of New York, Buffalo

Introducing quantum mechanics and the world of nanostructures, this textbook will enable engineers to apply the theories to numerous nanostructure problems. It covers the fundamentals of quantum mechanics and applies these to nanoscale objects and materials, and nanodevices. Several examples throughout the text help students to understand the material.

**Contents**: 1. Nanoworld and quantum physics; 2. Wave-particle duality and its manifestation in radiation and particle's behavior; 3. Layered nanostructures as the simplest systems to study electron behavior in one-dimensional potential; 4. Additional examples of quantized motion; 5. Approximate methods of finding quantum states; 6. Quantum states in atoms and molecules; 7. Quantization in nanostructures; 8. Nanostructures and their applications; Appendices; Index.

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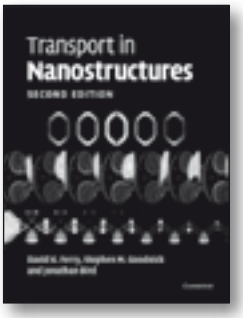


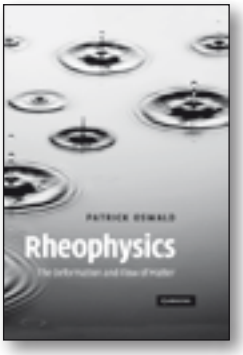


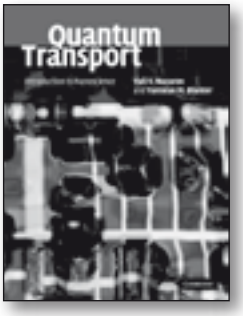


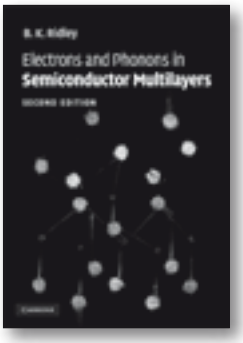

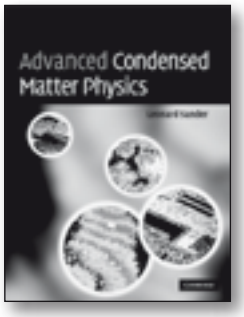


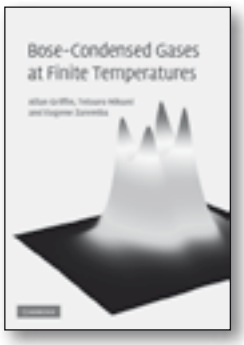


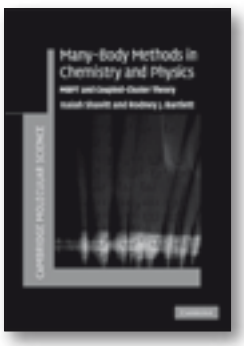


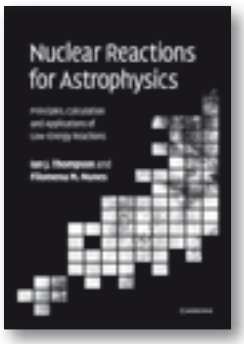


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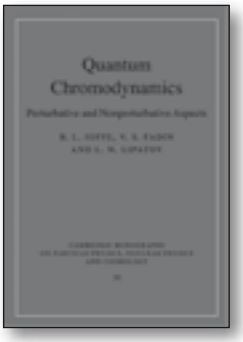


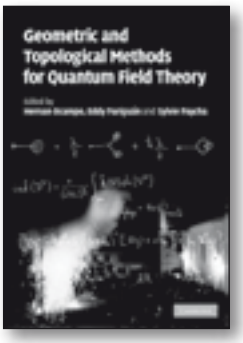


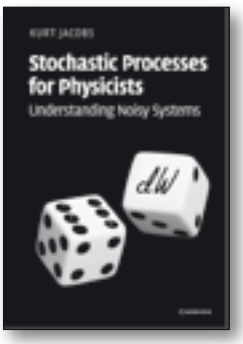


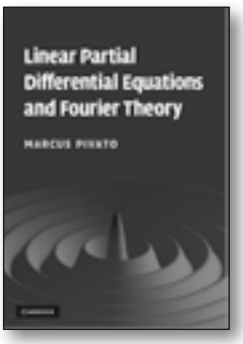

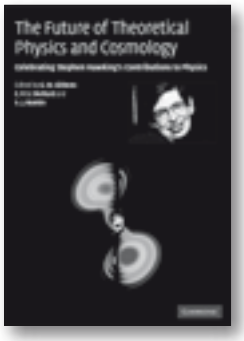


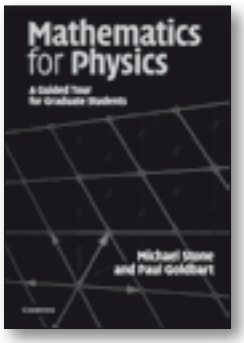


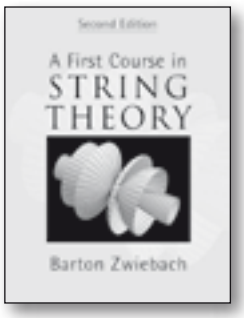


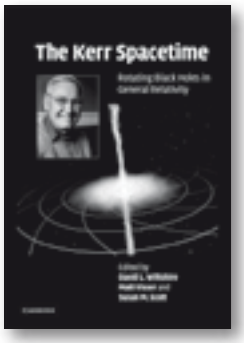


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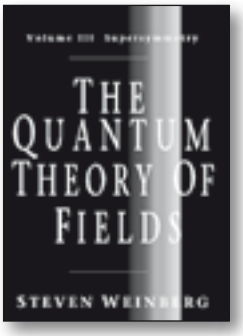


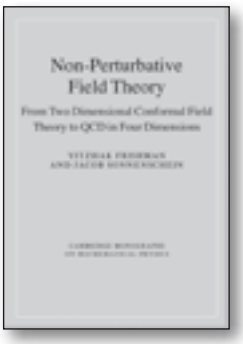


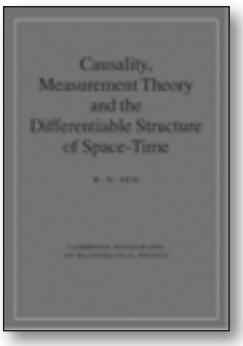

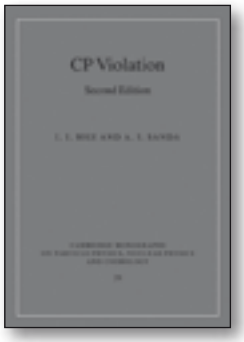


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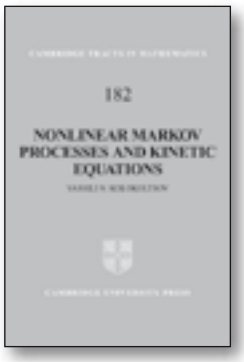


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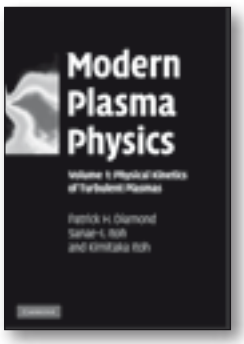


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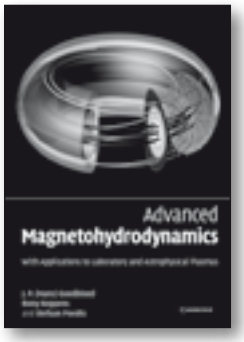


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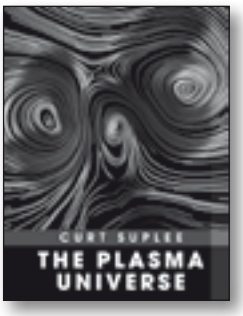


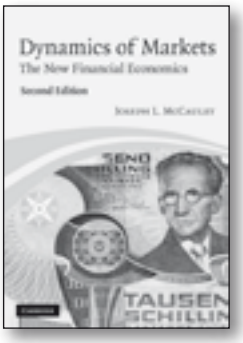


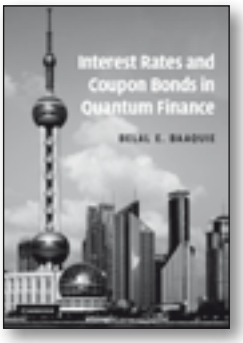

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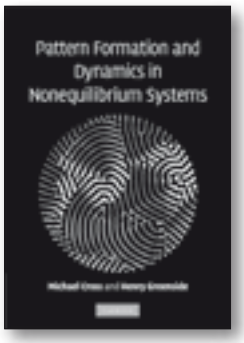


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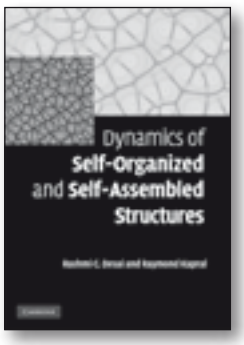


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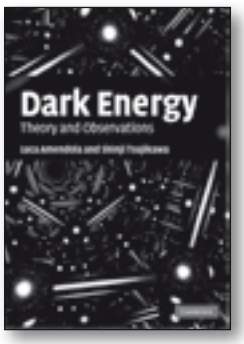


# Cosmology, relativity and gravitation

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**Chunnong Zhao**
Australian International Gravitational Research Centre, Perth

**Li Ju**
Australian International Gravitational Research Centre, Perth

**and Eric Howell**
University of Western Australia, Perth

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## Dark Energy

### Theory and Observations

**Luca Amendola**
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**and Shinji Tsujikawa**
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## Numerical Relativity

### Solving Einstein's Equations on the Computer

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Aimed at students and researchers entering the field, this pedagogical introduction to numerical relativity will also interest scientists seeking a broad survey of its challenges and achievements. The book contains 300 exercises, numerous illustrations (many in color), summary boxes, and applications to help readers master the subject.

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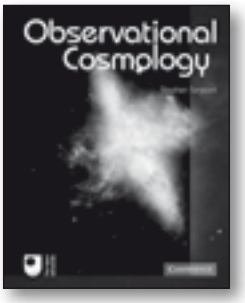


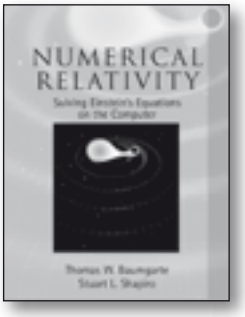


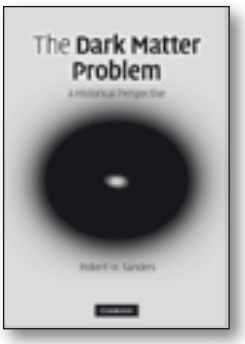


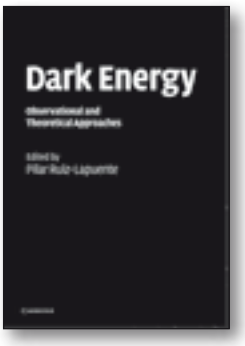

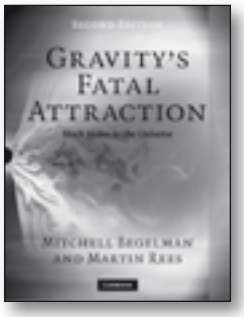


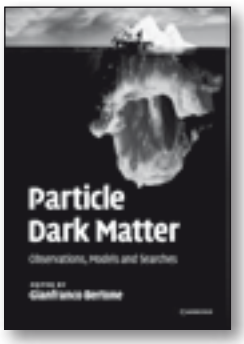


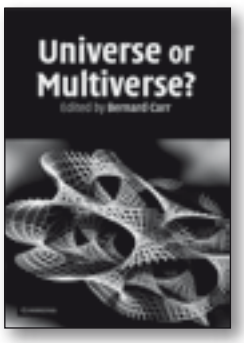


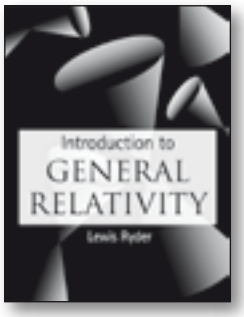


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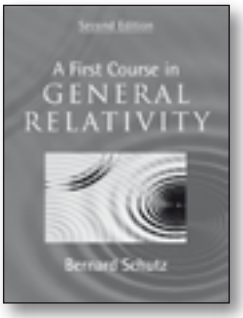


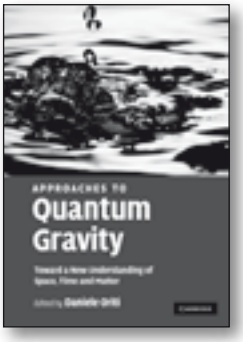


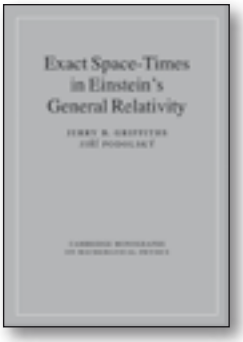


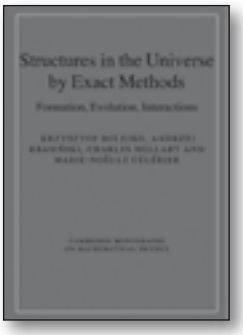

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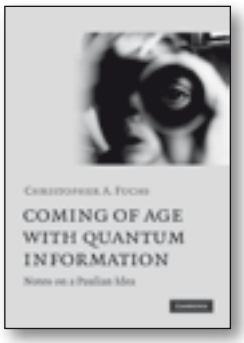
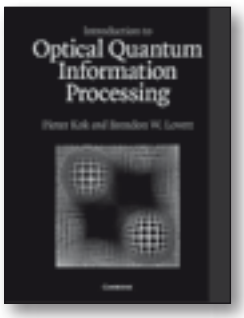
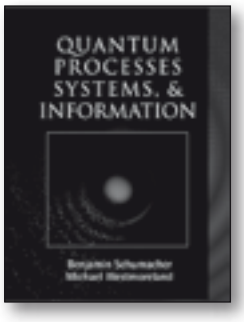



# Quantum physics, quantum information and quantum computation

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**'This is a fantastic book, with one of the authors no less than the very inventor of the word and idea of a qubit. When I opened the book for the first time, I found I couldn't stop reading through it and working out some of the problems. … There's no book out there I would recommend more for learning the mechanics of this quantum world.'**

Chris Fuchs, Perimeter Institute for Theoretical Physics

**Contents**: 1. Bits and quanta; 2. Qubits; 3. States and observables; 4. Distinguishability and information; 5. Quantum dynamics; 6. Entanglement; 7. Information and ebits; 8. Density operators; 9. Open systems; 10. A particle in space; 11. Dynamics of a free particle; 12. Spin and rotation; 13. Ladder systems; 14. Many particles; 15. Stationary states in 1-D; 16. Bound states in 3-D; 17. Perturbation theory; 18. Quantum information processing; 19. Classical and quantum entropy; 20. Error correction; Appendixes; Index.

2010 246 x 189 mm 440pp
63 b/w illus. 835 exercises
978-0-521-87534-9 Hardback c. £40.00
**Publication March 2010**
www.cambridge.org/9780521875349

## Semantic Techniques in Quantum Computation

**Edited by Simon Gay**
University of Glasgow
**and Ian Mackie**
University of Sussex

This book is a collection of work from leading researchers that explores quantum computation from the perspective of the branch of theoretical computer science known as semantics, as an alternative to the more well-known studies of algorithmics, complexity theory, and information theory.

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**eBook available**
www.cambridge.org/9780521513746

TEXTBOOK

## Quantum Mechanics with Basic Field Theory

**Bipin Desai**
University of California, Riverside

Students and instructors alike will find this organized, detailed approach to quantum mechanics ideal for a two-semester graduate course. Topics are covered in logical order through concise, highly focused chapters, and over 200 exercises aid understanding of the subject. Password-protected solutions are available to instructors at www.cambridge.org/9780521877602.

**'*Quantum Mechanics with Basic Field Theory* is an innovative textbook for a two semester graduate course that provides an excellent coverage of the fundamentals interspersed with their relevance to striking modern discoveries. As an expert quantum theorist, Desai has succeeded in providing a student-friendly exposition that is enhanced by exciting topics such**

**as superconductivity, spontaneous symmetry breaking, and neutrino oscillations.'**

Vernon Barger, J. H. Van Vleck and Vilas Professor of Physics and Director of the Institute of Elementary Particle Physics, University of Wisconsin

**Contents**: Preface; 1. Basic formalism; 2. Fundamental commutator and time evolution of state vectors and operators; 3. Dynamical equations; 4. Free particles; 5. Particles with spin 1/2; 6. Gauge invariance, angular momentum and spin; 7. Stern-Gerlach experiments; 8. Some exactly solvable bound state problems; 9. Harmonic oscillator; 10. Coherent states; 11. Two-dimensional isotropic harmonic oscillator; 12. Landau levels and quantum Hall effect; 13. Two-level problems; 14. Spin 1/2 systems in the presence of magnetic field; 15. Oscillation and regeneration in neutrino and neutral K-mesons as two-level systems; 16. Time-independent perturbation for bound states; 17. Time-dependent perturbation; 18. Interaction of charged particles and radiation in perturbation theory; 19. Scattering in one dimension; 20. Scattering in three dimensions - a formal theory; 21. Partial wave amplitudes and phase shifts; 22. Analytic structure of the S-matrix; 23. Poles of the Green's function and composite systems; 24. Approximation methods for bound states and scattering; 25. Lagrangian method and Feynman path integrals; 26. Rotations and angular momentum; 27. Symmetry in quantum mechanics and symmetry groups; 28. Addition of angular momenta; 29. Irreducible tensors and Wigner-Eckart theorem; 30. Entangled states; 31. Special theory of relativity: Klein Gordon and Maxwell's equation; 32. Klein Gordon and Maxwell's equation; 33. Dirac equation; 34. Dirac equation in the presence of spherically symmetric potentials; 35. Dirac equation in a relativistically invariant form; 36. Interaction of Dirac particle with electromagnetic field; 37. Multiparticle systems and second quantization; 38. Interactions of electrons and phonons in condensed matter; 39. Superconductivity; 40. Bose Einstein condensation and superfluidity; 41. Lagrangian formulation of classical fields; 42. Spontaneous symmetry breaking; 43. Basic quantum electrodynamics and Feynman diagrams; 44. Radiative corrections; 45. Anomalous magnetic moment and Lamb shift; Appendix; References; Index.

2009 246 x 189 mm 858pp 230 exercises
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## Quantum Measurement and Control

**Howard M. Wiseman**
**and Gerard J. Milburn**

The first comprehensive treatment of modern quantum measurement and measurement-based quantum control, this important book will interest graduate students and researchers in quantum information, quantum metrology, quantum control and related fields. It introduces key experiments and technologies through dozens of recent experiments, and contains nearly 300 exercises to build understanding.

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TEXTBOOK

## Quantum Mechanics

**Gennaro Auletta**
Pontificia Universitas Gregoriana
**Mauro Fortunato**
Cassa depositi e prestiti S.p.A., Italy
**and Giorgio Parisi**
Università degli Studi di Roma 'La Sapienza', Italy

Advanced undergraduate and graduate students will benefit from this new perspective on the fundamental physical paradigm and its applications.

**Contents**: Introduction; **Part I.** Basic Features of Quantum Mechanics: 1. From classical mechanics to quantum mechanics; 2. Quantum observable and states; 3. Quantum dynamics; 4. Examples of quantum dynamics; 5. Density matrix; **Part II.** More Advanced Topics: 6. Angular momentum and spin; 7. Identical particles; 8. Symmetries and conservation laws; 9. The measurement problem; **Part III.** Matter and Light: 10. Perturbations and approximation methods; 11. Hydrogen and helium atoms; 12. Hydrogen molecular ion; 13. Quantum optics; **Part IV.** Quantum Information: State and Correlations: 14. Quantum theory of open systems; 15. State measurement in quantum mechanics; 16. Entanglement: non-separability; 17. Entanglement: quantum information; References; Index.

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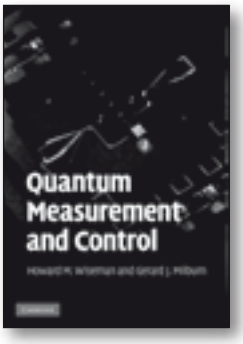
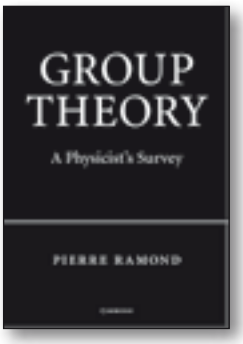
# Mathematical methods and computational tools

## Group Theory

**A Physicist's Survey**
**Pierre Ramond**
University of Florida




Designed for advanced undergraduate and graduate students, this book introduces physicists to many of the fascinating mathematical aspects of group theory, and mathematicians to its physics applications. It gives a comprehensive overview of the main aspects of both finite and continuous group theory, highlighting applications to fundamental physics.

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**Publication May 2010**
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TEXTBOOK

## Mathematical Methods for Physics and Engineering

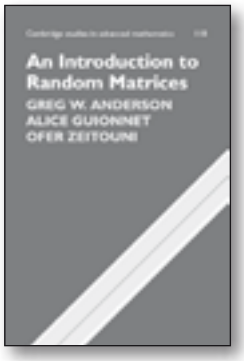
**Ken F. Riley**
University of Cambridge
**Mike P. Hobson**
University of Cambridge
**and Stephen J. Bence**

Set comprising the third edition of acclaimed textbook and its solutions manual, for undergraduate mathematics courses in the physical sciences.

**From a review of a previous edition: '… a great scientific textbook. It is a tour de force … to write mathematical sections that are both complete and at an appropriate academic level. The authors have clearly succeeded in this challenge, making this a remarkable pedagogical book … The choice of exercises is excellent and possibly the best feature of the book. In summary, this textbook is a great reference at undergraduate levels, particularly for those who like to teach or learn using lots of examples and exercises.'**

R. Botet, *European Journal of Physics*

**Contents**: Prefaces; 1. Preliminary algebra; 2. Preliminary calculus; 3. Complex numbers and hyperbolic functions; 4. Series and limits; 5. Partial differentiation; 6. Multiple integrals; 7. Vector algebra; 8. Matrices and vector spaces; 9. Normal modes; 10. Vector calculus; 11. Line, surface and volume integrals; 12. Fourier series; 13. Integral transforms; 14. First-order ordinary differential equations; 15. Higher-




order ordinary differential equations; 16. Series solutions of ordinary differential equations; 17. Eigenfunction methods for differential equations; 18. Special functions; 19. Quantum operators; 20. Partial differential equations: general and particular; 21. Partial differential equations: separation of variables; 22. Calculus of variations; 23. Integral equations; 24. Complex variables; 25. Application of complex variables; 26. Tensors; 27. Numerical methods; 28. Group theory; 29. Representation theory; 30. Probability; 31. Statistics; Index.

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**Greg W. Anderson**
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**Alice Guionnet**
ENS-Lyon

**and Ofer Zeitouni**
Weizmann Institute/University of Minnesota

The theory of random matrices plays an important role in many areas of pure mathematics. This rigorous introduction is specifically designed for graduate students in mathematics or related sciences, who have a background in probability theory but have not been exposed to advanced notions of functional analysis, algebra or geometry.

**Cambridge Studies in Advanced Mathematics, 118**

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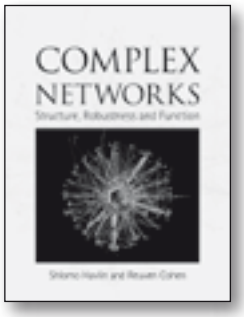


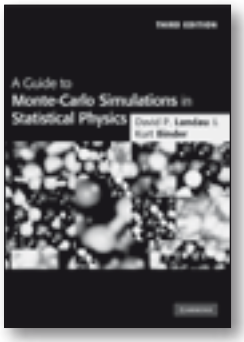


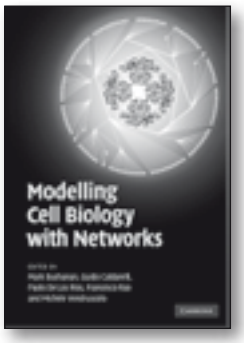


# Statistical physics

## Self-Organised Criticality

### Theory, Models and Characterisation

**Gunnar Pruessner**
Imperial College of Science, Technology and Medicine, London

Providing an overview of numerical and analytical methods, from foundations to applications, this book is an easy access point to important results and sophisticated methods. Written for graduate students and practicing researchers in physics, mathematics, biology, sociology, finance, medicine and engineering, it gives a practical, hands-on approach.

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85 b/w illus. 22 tables
978-0-521-85335-4 Hardback c. £45.00
**Publication December 2010**
www.cambridge.org/9780521853354

## Introduction to Statistical Field Theory

**Edouard Brézin**
Ecole Normale Supérieure, Paris

Written for advanced undergraduate and beginning graduate students, this textbook provides a concise introduction to statistical field theory. It deals directly with the loop-expansion of the free-energy, or background field method, avoiding long developments on field theory techniques.

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**Publication September 2010**
www.cambridge.org/9780521193030

TEXTBOOK

## Complex Networks

### Structure, Robustness and Function

**Shlomo Havlin**
Bar-Ilan University, Israel

**and Reuven Cohen**
Weizmann Institute of Science, Israel

Examining important results and analytical techniques, this graduate-level textbook is a step-by-step presentation of the structure and function of complex networks. It explains both the theoretical methods used and the experimental and analytical results obtained. End-of-chapter review questions help students monitor their understanding of the materials presented.

**Contents**: 1. Introduction; **Part I.** Random Network Models: 2. The Erdos-Renyi models; 3. Observations in real-world networks; 4. Models for complex networks; 5. Growing network models; **Part II.** Structure and Robustness of Complex Networks: 6. Distances in scale-free networks - the ultra small world; 7. Self-similarity in complex networks; 8. Distances in geographically embedded networks; 9. The network's structure - the generating function method; 10. Percolation on complex networks; 11. Structure of random directed networks - the bow tie; 12. Introducing weights - bandwidth allocation and multimedia broadcasting; **Part III.** Network Function - Dynamics and Applications: 13. Optimization of the network structure; 14. Epidemiological models; 15. Immunization; 16. Thermodynamic models on networks; 17. Spectral properties, transport, diffusion and dynamics; 18. Searching in networks; 19. Biological networks and network motifs; **Part IV.** Appendices; References; Index.

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## A Guide to Monte Carlo Simulations in Statistical Physics

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**and Kurt Binder**
Johannes Gutenberg Universität Mainz, Germany

Expanding the discussion of Monte Carlo simulation in physics and related areas, this edition now contains material describing powerful new algorithms, recent technical advances and key applications. Many examples, recipes, case studies, and exercises are included, making this an ideal textbook for graduates and researchers.

**From a review of the first edition: 'This book will serve as a useful introduction to those entering the field, while for those already versed in the subject it provides a timely survey of what has been achieved.'**
D. C. Rapaport, *Journal of Statistical Physics*

2009 247 x 174 mm 488pp 10 b/w illus.
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**eBook available**
www.cambridge.org/9780521768481

# Biological physics

## Modelling Cell Biology with Networks

**Edited by Mark Buchanan**

**Guido Caldarelli**
Consiglio Nazionale delle Ricerche (CNR), Rome

**Paolo De Los Rios**
Ecole Polytechnique Federale de Lausanne, Switzerland

**Francesco Rao**
Centro Fermi, Rome

**and Michele Vendruscolo**
University of Cambridge

With contributions from leaders in both network theory and modern cell biology, this comprehensive introduction is the first book on the subject. It is a key introductory text for graduate students and researchers in physics, biology and biochemistry, presenting ideas and

techniques outside the reader's own area of specialization.

2010 247 x 174 mm 272pp 73 b/w illus.
978-0-521-88273-6 Hardback c. £45.00
**Publication June 2010**
www.cambridge.org/9780521882736

## The Handbook of Medical Image Perception and Techniques

**Edited by Ehsan Samei**
Duke University, North Carolina
**and Elizabeth Krupinski**
University of Arizona

This state-of-the-art book reviews key issues and methods in medical image perception research through associated techniques, illustrations and examples. Written by key figures in the field, the book covers a range of topics including the history of medical image perception research, the basics of vision and cognition, and dedicated application areas, especially those concerned with the interface between the clinician and the display of medical image data. It summarises many of the basic techniques used to conduct and analyse medical image perception and observer performance research, allowing readers to understand basic research techniques so they can adopt them for use in their own studies. Written for both newcomers to the field and experienced researchers, this book provides a broad overview of medical image perception, and will serve as a reference volume for years to come.

**Contributors**: Ehsan Samei, Elizabeth Krupinski, Harold Kundel, Calvin Nodine, Arthur Burgess, Robert Wagner, David Manning, Kevin Berbaum, Edmund Franken, Robert Caldwell, Kevin Schartz, Claudia Mello-Thoms, Robert Saunders, Maria Petrou, Xiang Li, Georgia Tourassi, Steve Hillis, Dev Chakraborty, Craig Abbey, Miguel Eckstein, Matthew Kupinski, Maryellen Giger, Weijie Chen, Yulei Jiang, Matthew Freedman, Teresa Osicka, Michael Ulissey, Ronald Summers, Eugenio Alberdi, Andrey Povyakalo, Lorenzo Strigini, Peter Ayton, Jeff Siewerdson, Kent Ogden, Walter Huda, Margarita Zuley, Richard Van Metter; Hans Roehrig, Carl Zylack

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www.cambridge.org/9780521513920

TEXTBOOK

## Chemical Biophysics

### Quantitative Analysis of Cellular Systems

**Daniel A. Beard**
Medical College of Wisconsin
**and Hong Qian**
University of Washington

First textbook to apply rigorous physical chemistry principles to mathematical and computational modelling of biochemical systems.

**'There are a growing number of physicists, engineers, mathematicians and chemists who are interested in joining the post-genomics party and addressing cutting-edge problems in molecular and cell biology. The barrier to entry can be high and prohibitive. This marvelous new book opens the door for the quantitively inclined. Beard and Qian, in an accessible and clear style, present fundamental methods that can be used to model and analyze an array of biomolecular systems and processes, ranging from enzyme kinetics to gene regulatory networks to cellular transport. This book will appeal to autodidacts as well as professors looking for course texts.'**
J. J. Collins, Professor of Biomedical Engineering and MacArthur Fellow, Boston University

**Contents**: Preface; Introduction; **Part I.** Background Material: 1. Concepts from physical chemistry; 2. Conventions and calculations for biochemical systems; 3. Chemical kinetics and transport processes; **Part II.** Analysis and Modeling of Biochemical Systems: 4. Enzyme-catalyzed reactions; 5. Biochemical signaling modules; 6. Biochemical reaction networks; 7. Coupled biochemical systems and membrane transport; **Part III.** Special Topics: 8. Spatially distributed systems and reaction-diffusion modeling; 9. Constraint-based analysis of biochemical systems; 10. Biomacromolecular structure and molecular association; 11. Stochastic biochemical systems and the chemical master equation; 12. Appendix: the statistical basis of thermodynamics; Bibliography; Index.

**Cambridge Texts in Biomedical Engineering**

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**eBook available**
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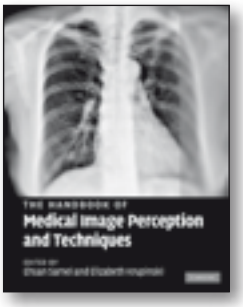
# Computational science and modelling

## Scientific Computation

**Gaston H. Gonnet**
Eidgenössische Technische Hochschule Zürich
**and Ralf Scholl**




Using real-life applications, this graduate-level textbook introduces different mathematical methods of scientific computation to solve minimization problems. Each chapter solves several realistic problems, allowing readers to see how the methods are put to use, making it easier to grasp the basic ideas. Interactive exercises are available at www.cambridge.org/9780521849890.

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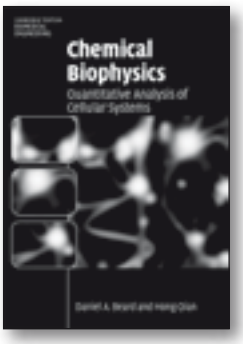


## Learning MATLAB

**Tobin A. Driscoll**
University of Delaware

*Learning MATLAB* is ideal for readers seeking a focused and brief approach to the software, rather than an encyclopaedic one. This handbook is suitable for graduate students, advanced undergraduate students, and professional MATLAB users in mathematics, computer science, science, and engineering.

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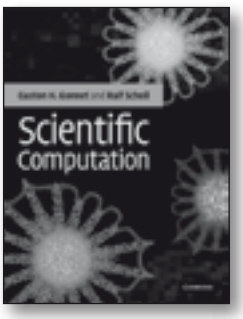
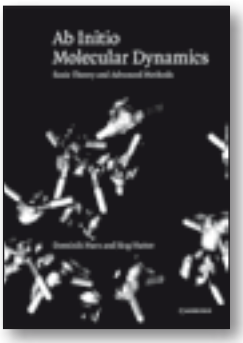



TEXTBOOK

## Ab Initio Molecular Dynamics

### Basic Theory and Advanced Methods

**Dominik Marx**
Ruhr-Universität, Bochum, Germany
**and Jürg Hutter**
Universität Zürich




The first book on this rapidly growing field for graduate students and researchers, covering a range of methods and applications.

**Contents**: **Part I.** Basic Techniques: 1. Setting the stage: why *ab initio* molecular dynamics?; 2. Getting started: unifying Md and electronic structure; 3. Implementation: using the plane wave basis set; 4. Atoms with plane waves: accurate pseudopotentials; **Part II.** Advanced Techniques: 5. Beyond standard *ab initio* molecular dynamics; 6. Beyond norm-

conserving pseudopotentials; 7. Computing properties; 8. Parallel computing;
**Part III.** Applications: 9. From materials to biomolecules; 10. Properties from *ab initio* simulations; 11. Outlook; References; Index.

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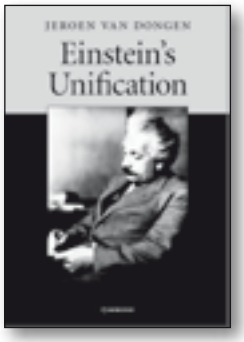


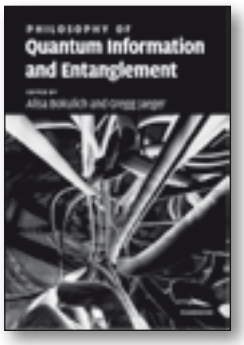


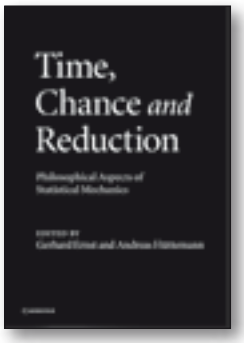

# History, philosophy and foundations of physics

## Einstein's Unification

**Jeroen van Dongen**
Universiteit Utrecht, The Netherlands

Shedding new light on Einstein's later work, this book explores Einstein's belief that he could find a unified theory of all of nature's forces by repeating the methods he used when formulating general relativity. This book will interest physicists, historians and philosophers of science.

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**Publication June 2010**
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## Information and the Nature of Reality

**From Physics to Metaphysics**
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Arizona State University
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University of Copenhagen

Many scientists regard mass and energy as the primary currency of nature. In recent years, however, the concept of information has gained importance. In this book, eminent scientists, philosophers and theologians chart various aspects of information, from quantum information to biological and digital information, to understand how nature works.

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**Publication June 2010**
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## Philosophy of Quantum Information and Entanglement

**Edited by Alisa Bokulich**
Boston University
**and Gregg Jaeger**
Boston University

Bringing together fourteen world-leading physicists and philosophers of physics, this interdisciplinary volume addresses the most important developments and debates in this exciting area of research. Offering a broad spectrum of approaches to resolving deep foundational challenges, this book is ideal for historians, philosophers of science and physicists.

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**Publication March 2010**
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## Time, Chance, and Reduction

**Philosophical Aspects of Statistical Mechanics**
**Edited by Gerhard Ernst**
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**and Andreas Hüttemann**
Westfälische Wilhelms-Universität Münster, Germany

Statistical mechanics is one of the fundamental theories of physics, raising important philosophical questions on the nature of time, chance and reduction. This book addresses the philosophical issues inherent in the reduction of thermodynamics to statistical mechanics, compiling current research by experts in the field to create an invaluable summary.

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## Communicating Science

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**Nicholas Russell**
Department of Humanities, Imperial College London

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Rachel Zelkowitz, *Science News* online

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## Quantum Theory at the Crossroads

**Reconsidering the 1927 Solvay Conference**
**Guido Bacciagaluppi**
University of Aberdeen
**and Antony Valentini**
Imperial College of Science, Technology and Medicine, London

This book contains a complete translation of the original proceedings of the 1927 Solvay conference, with background essays and an extensive analysis in light of current research. This book will be of interest to graduate students and researchers in physics, and the history and philosophy of quantum theory.

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## Discovering the Expanding Universe

**Harry Nussbaumer**
Swiss Federal Institute of Technology, Zürich
**and Lydia Bieri**
Harvard University, Massachusetts
**Foreword by Allan Sandage**
Observatories of the Carnegie Institution, California

This book explores the history of the discovery of the expanding universe, one of the most exciting exploits in astronomy.

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www.cambridge.org/9780521514842

## Heisenberg and the Interpretation of Quantum Mechanics

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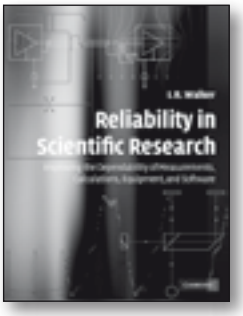


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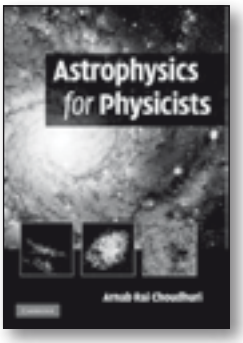


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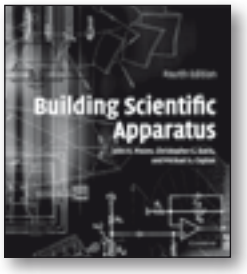


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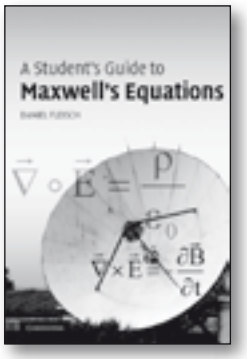


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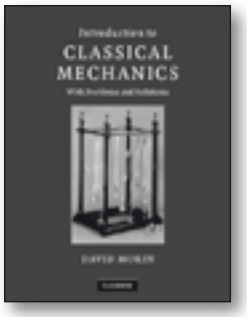


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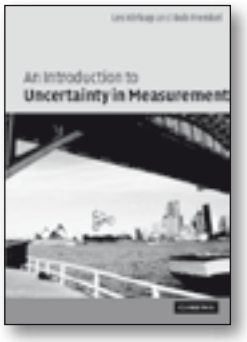


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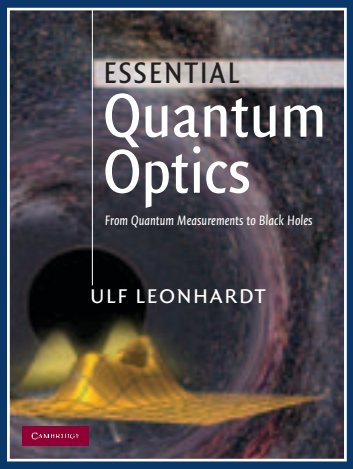


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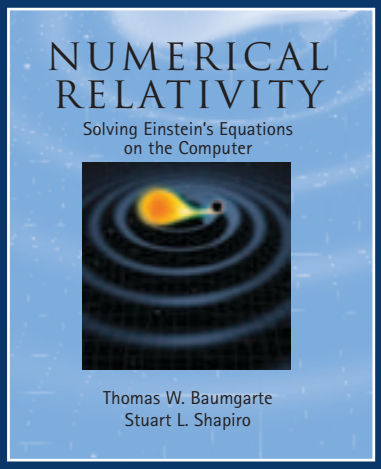


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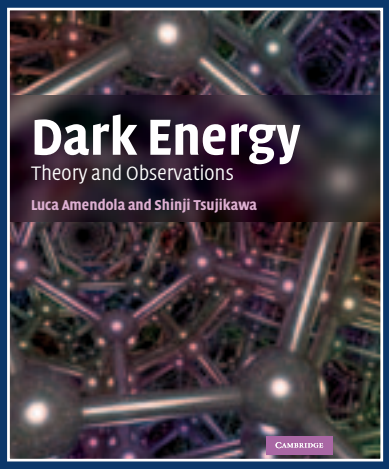


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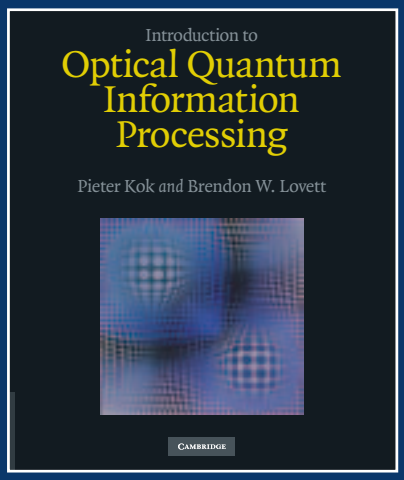


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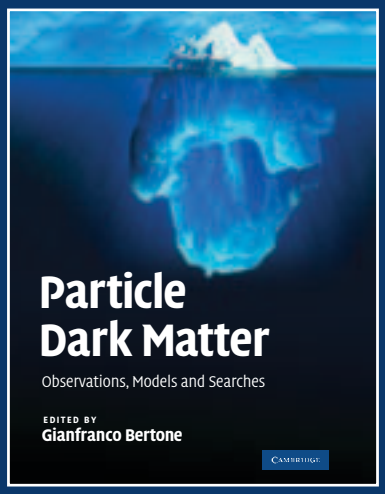


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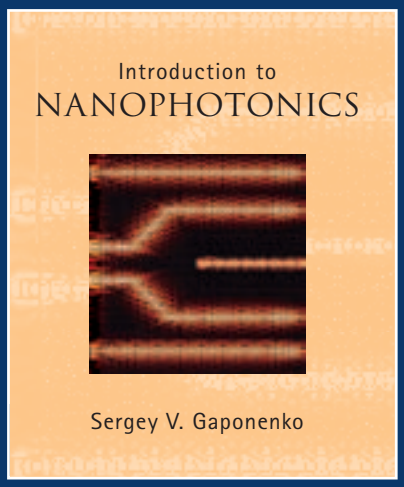


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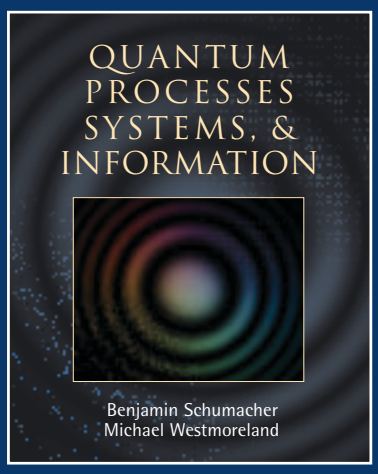


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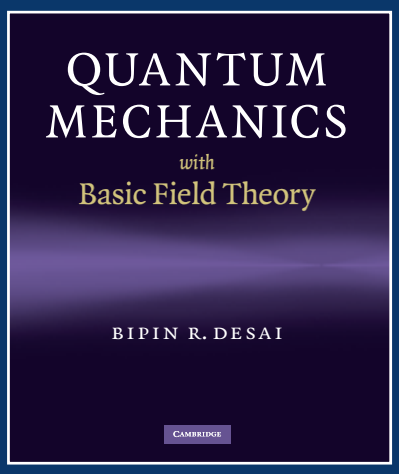


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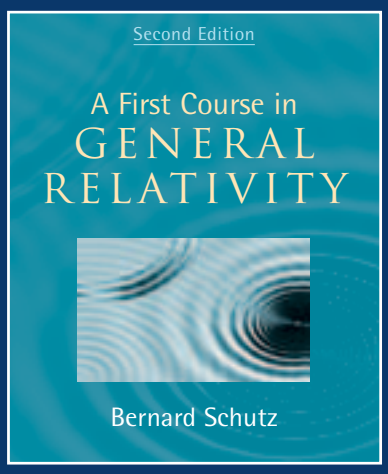


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