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Functional Materials Cambridge University Press
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Simulation and Its Discontents Univ. Press of Mississippi
This book illustrates the computational framework based on knowledge of flow and mass transfer together with optimization techniques to solve problems relevant to micromixing technology. The authors provide a detailed analysis of the different numerical techniques applied to the design of micromixers. Flow and mixing analysis is based on both the Eulerian and Lagrangian approaches; relative advantages and disadvantages of the two methods and suitability to different types of mixing problems are analysed. The book also discusses the various facets of numerical schemes subjected to discretization errors and computational grid requirements. Since a large number of studies are based on commercial computational fluid dynamics (CFD) packages, relevant details of these packages to the mixing problem using them are presented. Numerical optimization techniques coupled with CFD analysis of flow and mixing have proved to be an important tool for micromixers design, and therefore, are an important part of the book. These techniques are presented briefly, and focus is on

surrogate modeling and optimization applied to design of micromixers.

Issues in Nuclear, High Energy, Plasma, Particle, and Condensed Matter Physics: 2013 Edition Springer

First published in 1996 this book examines the search for unity in the Church.

Visualization in Science Education Elsevier

Solid state physics, the study and prediction of the fundamental physical properties of materials, forms the backbone of modern materials science and has many technological applications. The unique feature of this text is the MATLAB®-based computational approach with several numerical techniques and simulation methods included. This is highly effective in addressing the need for visualization and a direct hands-on approach in learning the theoretical concepts of solid state physics. The code is freely available to all textbook users. Additional Features: Uses the pedagogical tools of computational physics that have become important in enhancing physics teaching of advanced subjects such as solid state physics Adds visualization and simulation to the subject in a way that enables students to participate actively in a hand-on approach Covers the basic concepts of solid state physics and provides students with a deeper understanding of the subject matter Provides unique example exercises throughout the text Obtains mathematical analytical solutions Carries out illustrations of important formulae results using programming scripts that students can run on their own and reproduce graphs and/or simulations Helps students visualize solid state processes and apply certain numerical techniques using MATLAB®, making the process of learning solid state physics much more effective Reinforces the examples discussed within the chapters through the use of end-of-chapter exercises Includes simple analytical and numerical examples to more challenging ones, as well as computational problems with the opportunity to run codes, create new ones, or modify existing ones to solve problems or reproduce certain results

Spin-orbit Coupled Bose Gases Springer Science & Business Media

The XVI International Workshop on Condensed Matter Theories (CMT) was held in San Juan. Puerto Rico between June 1 and 5, 1992. It was attended by about 80 scientists from allover the world. The Workshop was started in 1977 by V. C. Aguilera-Navarro, in Sao Paolo, Brazil, as the Panamerican Workshop on Condensed Matter Theories, to promote the exchange of ideas and techniques of groups that normally do not interact, such as people working in the areas of Nuclear Physics and Solid state Physics, Many Body Theory, or Quantum Fluids, and Classical Statistical Mechanics, and so on. It had also the purpose of bringing together people from different regions of the globe. The next CMT Workshop was held in 1978 in Trieste, Italy, outside of America. But the next four met in the American continent: Buenos Aires, Argentina (1979), Caracas, Venezuela (1980), Mexico City, Mexico (1981), and St. Louis, Missouri (1982). At this time the scope and the participation had increased, and the name was changed to the "International" Workshop in CMT. The 1983 edition took place in Altenberg, Germany. The following CMT workshops took place in Granada, Spain (1984), San Francisco, California (1985), Argonne, Illinois (1986), Oulu, Finland (1987), Taxco, Mexico (1988), Campos do Jordao, Brazil (1989), Elba Island, Italy (1990), and Mar del Plata, Argentina (1991). There were 48 invited talks in this Workshop.

Plasma Modeling MIT Press

With its many beautiful colour pictures, this book gives fascinating insights into the unusual forms and behaviour of matter under extremely high pressures and temperatures. These extreme states are generated, among other things, by strong shock, detonation and electric explosion waves, dense laser beams, electron and ion beams, hypersonic entry of spacecraft into dense atmospheres of planets and in many other situations characterized by extremely high pressures and temperatures. Written by one of the world's foremost experts on the topic, this book will inform and fascinate all scientists dealing with materials properties and physics and also serve as an excellent introduction to plasma-, shock-wave and high-energy-density physics for students and newcomers seeking an overview. This second edition is thoroughly revised and expanded, in particular with new material on high energy-density physics, nuclear explosions and other nuclear transformation processes.

The Practical OPNET User Guide for Computer Network Simulation National Academies Press

Plasma Modeling: Methods and applications presents and discusses the different approaches that can be adopted for plasma modeling, giving details about theoretical and numerical methods. It describes kinetic models used in plasma investigations, develops the theory of fluid equations and hybrid models, and discusses applications and practical problems across a range of fields. This updated second edition contains over 200 pages of new material, including an extensive new part that discusses methods to calculate data needed in plasma modeling, such as thermodynamic and transport properties, state specific rate coefficients in heavy particle collisions and electron impact cross-sections. This updated research and reference text is an excellent resource to assist and direct students and researchers who want to develop research activity in the field of plasma physics in the choice of the best model for the problem of interest.

ScholarlyEditions

Visualization, meaning both the perception of an object that is seen or touched and the mental imagery that is the product of that perception, is believed to be a major strategy in all thought. It is particularly important in science, which seeks causal explanations for phenomena in the world-as-experienced. Visualization must therefore play a major role in science education. This book addresses key issues concerning visualization in the teaching and learning of science at any level in educational systems. ‘Visualization in Science Education’ draws on the insights from cognitive psychology, science, and education, by experts from Australia, Israel, Slovenia, UK, and USA. It unites these with the practice of science education, particularly the ever-increasing use of computer-managed modelling packages, especially in chemistry. The first section explores the significance and intellectual standing of visualization. The second section shows how the skills of visualization have been developed practically in science education. This is followed by accounts of how the educational value of visualization has been integrated into university courses in physics, genomics, and geology. The fourth section documents experimental work on the classroom assessment of visualization. An endpiece summarises some of the research and development needed if the contribution of this set of universal skills is to be fully exploited at all levels and in all science subjects.

Selected Water Resources Abstracts Walter de Gruyter GmbH & Co KG

The triennial International Alloy Conferences (IACs) aim at the identification and promotion of the common elements developed in the study, either experimental, phenomenological, or theoretical and computational, of materials properties across materials types, from metals to minerals. To accomplish this goal, the IACs bring together scientists from a wide spectrum of materials science including experiment, theory, modeling, and computation, incorporating a broad range of materials properties.

The first IAC, IAC-1, took place in Athens, Greece, June 16-21, 1996. The present volume of proceedings contains the papers presented at IAC-2, that took place in Davos, Switzerland, August 8-13, 1999. The topics in this book fall into several themes, which suggest a number of different classification schemes. We have chosen a scheme that classifies the papers in the volume into the categories Microstructural Properties; Ordering, Kinetics and Diffusion; Magnetic Properties and Elastic Properties. We have juxtaposed apparently disparate approaches to similar physical processes, in the hope of revealing the dynamic character of the processes under consideration. We hope this will invigorate new kinds of discussion and reveal challenges and new avenues to the description and prediction of properties of materials in the solid state and the conditions that produce them.

Scientific and Technical Aerospace Reports Royal Society of Chemistry

Quantum simulation is a very active and growing field. Various quantum systems can be used to emulate existing materials in an accurate and controllable way, as well as to generate new states of matter that have not been found in the real world but the existence of which does not contradict the fundamental laws of physics. Ultracold atoms form a perfect system to realize idealized models and study physical mechanisms that stand out clearly in them. Recent efforts have been made to simulate artificial gauge fields with ultracold atoms, including spin-dependent gauge fields, such as spin-orbit coupling. Motivated by this goal our lab explored several approaches to generate a one-dimensional spinorbit coupling interaction, which has a rich phase diagram and plays an important role for topological insulators, the quantum spin Hall effect and spintronics. The first method we developed allowed us to detect a stripe phase by dressing Bose-Einstein condensates with an optical superlattice and Raman beams. The observed density modulation in the ground state meets the definition of the long-awaited supersolid state of matter. The second approach we took was to generate spin-orbit coupling without use of lasers. The method is based on the idea of periodic driving of the quantum system and dressing its evolution with fast micromotion, often refered to as Floquet engineering. Our experiment provided an insightful pedagogical example of what Floquet engineering is capable of. In the experiment we endowed a low energy radio-frequency photon with tunable momentum. When dressed with recoil momentum, the interaction of a radio-frequency photon with an atom occurred in a Doppler-sensitive way. We also demonstrated how to tune the momentum and flip its direction. In this thesis, I first describe the experiments done in the optical superlattice. Then I discuss the behavior of periodically driven classical and quantum systems and provide detailed analysis of how a radio-frequency photon can be magnetically dressed with tunable momentum. The experiments we carried out demonstrated novel methods of generation for spin-dependent gauge fields and showed pedagogical examples and interpretations of evolution of periodically driven systems. The scheme of periodically driven atoms inspired a theoretical study of heating in Floquet systems.

Extreme States of Matter Cambridge University Press

The first comprehensive general resource on state-of-the-art protocell research, describing current approaches to making new forms of life from scratch in the laboratory. Protocells offers a comprehensive resource on current attempts to create simple forms of life from scratch in the laboratory. These minimal versions of cells, known as protocells, are entities with lifelike properties created from nonliving materials, and the book provides in-depth investigations of processes at the interface between nonliving and living matter. Chapters by experts in the field put this state-of-the-art research in the context of theory, laboratory work, and computer simulations on the components and properties of protocells. The book also provides perspectives on research in related areas and such broader societal issues as commercial applications and ethical considerations. The book covers all major scientific approaches to creating minimal life, both in the laboratory and in simulation. It emphasizes the bottom-up view of physicists, chemists, and material scientists but also includes the molecular biologists' top-down approach and the origin-of-life perspective. The capacity to engineer living technology could have an enormous socioeconomic impact and could bring both good and ill. Protocells promises to be the essential reference for research on bottom-up assembly of life and living technology for years to come. It is written to be both resource and inspiration for scientists working in this exciting and important field and a definitive text for the interested layman.

Theory and Simulation of Hard-Sphere Fluids and Related Systems CRC Press

Exploring Monte Carlo Methods is a basic text that describes the numerical methods that have come to be known as "Monte Carlo." The book treats the subject generically through the first eight chapters and, thus, should be of use to anyone who wants to learn to use Monte Carlo. The next two chapters focus on applications in nuclear engineering, which are illustrative of uses in other fields. Five appendices are included, which provide useful information on probability distributions, general-purpose Monte Carlo codes for radiation transport, and other matters. The famous "Buffon’s needle problem" provides a unifying theme as it is repeatedly used to illustrate many features of Monte Carlo methods. This book provides the basic detail necessary to learn how to apply Monte Carlo methods and thus should be useful as a text book for undergraduate or graduate courses in numerical methods. It is written so that interested readers with only an understanding of calculus and differential equations can learn Monte Carlo on their own. Coverage of topics such as variance reduction, pseudo-random number generation, Markov chain Monte Carlo, inverse Monte Carlo, and linear operator equations will make the book useful even to experienced Monte Carlo practitioners. Provides a concise treatment of generic Monte Carlo methods Proofs for each chapter Appendixes include Certain mathematical functions; Bose Einstein functions, Fermi Dirac functions, Watson functions

Condensed Matter Field Theory Springer Nature

Includes all works deriving from DOE, other related government-sponsored information and foreign nonnuclear information.

Computational Statics and Dynamics ScholarlyEditions

Chemistry 2e is designed to meet the scope and sequence requirements of the two-semester general chemistry course. The textbook provides an important opportunity for students to learn the core concepts of chemistry and understand how those concepts apply to their lives and the world around them. The book also includes a number of innovative features, including interactive exercises and real-world applications, designed to enhance student learning. The second edition has been revised to incorporate clearer, more current, and more dynamic explanations, while maintaining the same organization as the first edition. Substantial improvements have been made in the figures, illustrations, and example exercises that support the text narrative. Changes made in Chemistry 2e are described in the preface to help instructors transition to the second edition.

Radioactive Waste Management Visualization in Science Education

Hard spheres and related objects (hard disks and mixtures of hard systems) are paradigmatic systems: indeed, they have served as a basis for the theoretical and numerical development of a number of fields, such as general liquids and fluids,

amorphous solids, liquid crystals, colloids and granular matter, to name but a few. The present volume introduces and reviews some important basics and progress in the study of such systems. Their structure, thermodynamic properties, equations of state, as well as kinetic and transport properties are considered from different and complementary points of view. This book addresses graduate students, lecturers as well as researchers in statistical mechanics, physics of liquids, physical chemistry and chemical engineering.

EPA Publications Bibliography Springer Nature

Chemistry and chemical engineering have changed significantly in the last decade. They have broadened their scopeâ€"into biology, nanotechnology, materials science, computation, and advanced methods of process systems engineering and controlâ€"so much that the programs in most chemistry and chemical engineering departments now barely resemble the classical notion of chemistry. Beyond the Molecular Frontier brings together research, discovery, and invention across the entire spectrum of the chemical sciencesâ€"from fundamental, molecular-level chemistry to large-scale chemical processing technology. This reflects the way the field has evolved, the synergy at universities between research and education in chemistry and chemical engineering, and the way chemists and chemical engineers work together in industry. The astonishing developments in science and engineering during the 20th century have made it possible to dream of new goals that might previously have been considered unthinkable. This book identifies the key opportunities and challenges for the chemical sciences, from basic research to societal needs and from terrorism defense to environmental protection, and it looks at the ways in which chemists and chemical engineers can work together to contribute to an improved future.

Protocells Springer Science & Business Media

One of the first books to provide a comprehensive description of OPNET® IT Guru and Modeler software, The Practical OPNET® User Guide for Computer Network Simulation explains how to use this software for simulating and modeling computer networks. The included laboratory projects help readers learn different aspects of the software in a hands-on way. Quickly Locate Instructions for Performing a Task The book begins with a systematic introduction to the basic features of OPNET, which are necessary for performing any network simulation. The remainder of the text describes how to work with various protocol layers using a top-down approach. Every chapter explains the relevant OPNET features and includes step-by-step instructions on how to use the features during a network simulation. Gain a Better Understanding of the "Whats" and "Whys" of the Simulations Each laboratory project in the back of the book presents a complete simulation and reflects the same progression of topics found in the main text. The projects describe the overall goals of the experiment, discuss the general network topology, and give a high-level description of the system configuration required to complete the simulation. Discover the Complex Functionality Available in OPNET By providing an in-depth look at the rich features of OPNET software, this guide is an invaluable reference for IT professionals and researchers who need to create simulation models. The book also helps newcomers understand OPNET by organizing the material in a logical manner that corresponds to the protocol layers in a network.

Energy Research Abstracts CRC Press

How the simulation and visualization technologies so pervasive in science, engineering, and design have changed our way of seeing the world. Over the past twenty years, the technologies of simulation and visualization have changed our ways of looking at the world. In Simulation and Its Discontents, Sherry Turkle examines the now dominant medium of our working lives and finds that simulation has become its own sensibility. We hear it in Turkle's description of architecture students who no longer design with a pencil, of science and engineering students who admit that computer models seem more “real” than experiments in physical laboratories. Echoing architect Louis Kahn's famous question, “What does a brick want?”, Turkle asks, “What does simulation want?” Simulations want, even demand, immersion, and the benefits are clear. Architects create buildings unimaginable before virtual design; scientists determine the structure of molecules by manipulating them in virtual space; physicians practice anatomy on digitized humans. But immersed in simulation, we are vulnerable. There are losses as well as gains. Older scientists describe a younger generation as “drunk with code.” Young scientists, engineers, and designers, full citizens of the virtual, scramble to capture their mentors' tacit knowledge of buildings and bodies. From both sides of a generational divide, there is anxiety that in simulation, something important is slipping away. Turkle's examination of simulation over the past twenty years is followed by four in-depth investigations of contemporary simulation culture: space exploration, oceanography, architecture, and biology.

Condensed Matter Theories MIT Press

"Climate change. Water contamination. Air pollution. Food shortages. These and other global issues are regularly featured in the media. However, did you know that chemistry plays a crucial role in addressing these challenges? A knowledge of chemistry is also essential to improve the quality of our lives. For instance, faster electronic devices, stronger plastics, and more effective medicines and vaccines all rely on the innovations of chemists throughout the world. With our world so dependent on chemistry, it is unfortunate that most chemistry textbooks do not provide significant details regarding real-world applications. Enter Chemistry in Context-"the book that broke the mold." Since its inception in 1993, Chemistry in Context has focused on the presentation of chemistry fundamentals within a contextual framework"--

Resources in Education Springer

Modern experimental developments in condensed matter and ultracold atom physics present formidable challenges to theorists. This book provides a pedagogical introduction to quantum field theory in many-particle physics, emphasizing the applicability of the formalism to concrete problems. This second edition contains two new chapters developing path integral approaches to classical and quantum nonequilibrium phenomena. Other chapters cover a range of topics, from the introduction of many-body techniques and functional integration, to renormalization group methods, the theory of response functions, and topology. Conceptual aspects and formal methodology are emphasized, but the discussion focuses on practical experimental applications drawn largely from condensed matter physics and neighboring fields. Extended and challenging problems with fully worked solutions provide a bridge between formal manipulations and research-oriented thinking. Aimed at elevating graduate students to a level where they can engage in independent research, this book complements graduate level courses on many-particle theory.

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