advances in imaging and electron physics 167

#imaging technology #electron physics research #advanced microscopy #scientific imaging #physics breakthroughs

Explore the latest breakthroughs in imaging technology and electron physics. This content delves into cutting-edge advancements, from high-resolution scientific imaging techniques to innovative applications in electron microscopy, driving new discoveries across various scientific disciplines.

Advances in Imaging and Electron Physics

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This special volume of Advances in Imaging and Electron Physics details the current theory, experiments, and applications of neutron and x-ray optics and microscopy for an international readership across varying backgrounds and disciplines. Edited by Dr. Ted Cremer, these volumes attempt to provide rapid assimilation of the presented topics that include neutron and x-ray scatter, refraction, diffraction, and reflection and their potential application. Contributions from leading authorities Informs and updates on all the latest developments in the field

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The subjects reviewed in the Advances in Imaging and Electron Physics series cover a broad range of themes including microscopy, electromagnetic fields and image coding. This volume concentrates on microscopy and pattern recognition and also electron physics. Several of these topics are covered in this volume, which opens with a long chapter of monograph stature on quantitative electron microscopy at the atomic resolution level by scientists from a well-known and very distinguished Antwerp University Laboratory. This is unique in that the statistical aspects are explored fully. This is followed by a contribution by A.M. Grigoryan and S.S. Again on transform-based image enhancement, covering both frequency-ordered systems and tensor approaches. The volume concludes with an account of the problems of image registration and ways of solving them by Maria Petrou of the University of Surrey; feature detection, related image transforms and quality measures are examined separately. The text bridges the gap between academic researchers and R&D designers by addressing and solving daily issues, which makes this book essential reading. Emphasizes broad and in depth article collaborations between world-renowned scientists in the field of image and electron physics Presents theory and it's application in a practical sense, providing long awaited solutions and new findings Provides a comprehensive overview of international congress proceedings and associated publications, as source material

Advances in Imaging and Electron Physics

* A special volume devoted principally to the role of the late Sir Charles Oatley in the development of the scanning electron microscopeings * It contains historical articles and reminiscences by most of the scientists who have worked on the scanning electron microscope in Oatley's laboratory * Emphasizes broad and in depth article collaborations between world-renowned scientists in the field of image and electron physics Although the scanning electron microscope had a prehistory in Germany and the USA, its real champion was Charles Oatley, who launched his project in the Cambridge University Engineering Department shortly after the end of World War II. A first microscope was built successfully by D. McMullan, one of the Guest Editors of this volume and a succession of progressively improved instruments followed. One in particular, built by K.C.A. Smith was commissioned specially for the Canadian Pulp and Paper Research Institute for use in their Montreal laboratories. All these efforts culminated in the commercial model built by the Cambridge Instrument Company and marketed in 1965 under the trade name, Stereoscan. these Advances, it seemed appropriate, in the centenary year of the birth of Sir Charles Oatley, that more details should be published to celebrate these achievements. This volume is the result. It contains not only historical articles and reminiscences by most of the scientists who have worked on the scanning electron microscope in Oatley's laboratory but also full or partial reproductions of many of the key publications, beginning with McMullan's early paper of 1953 and including Oatley's own Early history of the scanning electron microscope (1982). A website has been created, in which supplementary material is collected. This volume is a tribute to a bold pioneering scientist and a vivid record of the creation of the first commercial scanning electron microscopes and of subsequent developments.

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Selected Problems of Computational Charged Particle Optics

Advances in Imaging and Electron Physics merges two long-running serials--Advances in Electronics and Electron Physics and Advances in Optical and Electron Microscopy. This series features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains. This monograph summarizes the authors' knowledge and experience acquired over many years in their work on computational charged particle optics. Its main message is that even in this era of powerful computers with a multitude of general-purpose and problem-oriented programs, asymptotic analysis based on perturbation theory remains one of the most effective tools to penetrate deeply into the essence of the problem in question.

Aberration-corrected Electron Microscopy

The invention of the electron microscope more than 70 years ago made it possible to visualize a new world, far smaller than anything that could be seen with the traditional microscope. The biologist could study viruses and the components of cells, the materials scientist could study the structure of metals and alloys and many other substances, and especially their defects. But even the electron microscope had limits, and truly atomic structure was still too small to be observed directly. The so-called "limit of resolution" of the microscope was well understood, but attempts to use the necessary correctors were unsuccessful until the late 1990s. Such correctors now equip many microscopes in Europe, the USA and Japan and the results are extremely impressive. Moreover, microscopists feel that they are only at the beginning of a new era of subatomic microscopic imaging. In the present volume, we have brought together the principal contributors, instrument designers and microscopists to discuss this topic in depth. * First book on the subject of correctors * Well known contributors from academia and microscope manufacturers * Provides an ideal starting point for preparing funding proposals

Advances in Imaging and Electron Physics Including Proceedings CPO-10

Advances in Imaging and Electron Physics, Volume 212, merges two long-running serials, Advances in Electronics and Electron Physics and Advances in Optical and Electron Microscopy. The series features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science, digital image processing, electromagnetic wave propagation, electron microscopy and the computing methods used in all these domains. Contains contributions from leading authorities on the subject matter Informs and updates on the latest developments in the field of imaging and electron physics Provides practitioners interested in microscopy, optics, image processing, mathematical morphology, electromagnetic fields, electrons and ion emission with a valuable resource Features extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies, microlithography, image science and digital image processing

Advances in Imaging and Electron Physics

Advances in Imaging and Electron Physics, Volume 224 highlights new advances in the field, with this new volume presenting interesting chapters on Measuring elastic deformation and orientation gradients by scanning electron microscopy - conventional, new and emerging methods, Development of an alternative global method with high angular resolution, Implementing the new global method, Numerical validation of the method and influence of optical distortions, and Applications of the method. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Advances in Imaging and Electron Physics series Updated release includes the latest information on Measuring elastic deformation and orientation gradients by scanning electron microscopy - conventional, new and emerging methods

Hadean Earth

This book consolidates the latest research on the Hadean Eon - the first 500 million years of Earth history - which has permitted hypotheses of early Earth evolution to be tested, including geophysical models that include the possibility of plate tectonic-like behavior. These new observations challenge the longstanding Hadean paradigm – based on no observational evidence - of a desiccated, lifeless, continent-free wasteland in which surface petrogenesis was largely due to extraterrestrial impacts. The eon was termed “Hadean” to reflect such a hellish environment. That view began to be challenged in 2001 as results of geochemical analyses of greater than 4 billion year old zircons from Australia emerged. These data were consistent with the zircons forming in a world much more similar to today than long thought and interpreted to indicate that sediment cycling was occurring in the presence of liquid water. This new view leaves open the possibility that life could have emerged shortly after Earth accretion. The epistemic limitations under which the old paradigm persisted are closely examined. The book is principally designed as a monograph but has the potential to be used as a text for advanced graduate courses on early Earth evolution.

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and low energies, microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains.

Recent Advances in Scientific Computing and Partial Differential Equations

The volume is from the proceedings of the international conference held in celebration of Stanley Osher's sixtieth birthday. It presents recent developments and exciting new directions in scientific computing and partial differential equations for time dependent problems and their interplay with other fields, such as image processing, computer vision and graphics. Over the past decade, there have been very rapid developments in the field. This volume emphasizes the strong interaction of advanced mathematics with real-world applications and algorithms. The book is suitable for graduate students and research mathematicians interested in scientific computing and partial differential equations.

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Aberration-corrected Imaging in Transmission Electron Microscopy

This book provides a concise introduction to practical aspects of atomic-resolution imaging in aberration-corrected electron microscopy. As such, it addresses recent advances in electron optical instrumentation used for ultra-high resolution imaging in materials and nano-science. It covers two of the most popular atomic resolution imaging techniques' namely high-resolution transmission electron microscopy and scanning transmission electron microscopy. The book bridges the gap between application-oriented textbooks in conventional electron microscopy and books in physics covering dedicated topics in charged-particle optics and aberration correction. The book is structured in three parts which can be read separately. While in the first part the fundamentals of the imaging techniques and their limits in conventional electron microscopes are explained, the second part provides readers with the basic principles of electron optics and the characteristics of electron lenses. The third part, focusing on aberrations, describes the functionality of aberration correctors and provides readers with practical guidelines for the daily work with aberration-corrected electron microscopes. The book represents a detailed and easy readable guide to aberration-corrected electron microscopy.

Handbook of Nanoscopy, 2 Volume Set

This completely revised successor to the Handbook of Microscopy supplies in-depth coverage of all imaging technologies from the optical to the electron and scanning techniques. Adopting a twofold approach, the book firstly presents the various technologies as such, before going on to cover the materials class by class, analyzing how the different imaging methods can be successfully applied. It covers the latest developments in techniques, such as in-situ TEM, 3D imaging in TEM and SEM, as well as a broad range of material types, including metals, alloys, ceramics, polymers, semiconductors, minerals, quasicrystals, amorphous solids, among others. The volumes are divided between methods and applications, making this both a reliable reference and handbook for chemists, physicists, biologists, materials scientists and engineers, as well as graduate students and their lecturers.

Metamorphic Geology

In Earth evolution, mountain belts are the loci of crustal growth, reworking and recycling. These crustal-scale processes are unravelled through microscale investigations of textures and mineral assemblages of metamorphic rocks. Multiple episodes of metamorphism, re-equilibration and deformation, however, generally produce a complex and tightly interwoven pattern of microstructures and assemblages. Over the last two decades, the combination of advanced computing and technological capabilities with new concepts has provided a vast array of novel petrological tools and high-resolution/high-sensitivity techniques for microanalysis and imaging. Such novel approaches are proving fundamental to untangling the enigma represented by metamorphism with an unprecedented level of detail and confidence. As a result, the first decade and a half of this century has already seen the tumultuous development of new research avenues in metamorphic petrology. This book aims to provide

a timely overview of the state of the art of this field, of newly developed petrological techniques, future advancements and significant new case studies.

Chemical Biology

Written by a team of international researchers and teachers at the cutting edge of chemical biology research, this book provides an exciting, comprehensive introduction to a wide range of chemical and physical techniques with applications in areas as diverse as molecular biology, signal transduction, drug discovery and medicine. Techniques include: Cryo-electron microscopy, atomic force microscopy, differential scanning calorimetry in the study of lipid structures, membrane potentials and membrane probes, identification and quantification of lipids using mass spectroscopy, liquid state NMR, solid state NMR in biomembranes, molecular dynamics, two dimensional infra-red studies of biomolecules, single and two-photon fluorescence, optical tweezers, PET imaging and chemical genetics. KEY FEATURES: a unique guide to the rapidly evolving, interdisciplinary field of chemical biology. adopts a molecular structure for maximum flexibility. addresses relevant, topical chemical biological questions throughout. includes stunning illustrations. associates website with PowerPoint slides of figures within the book. Chemical Biology: Techniques and Applications provides an invaluable resource for final year undergraduate and post graduate bioscience and biomedical students and pharmaceutical researchers with an interest in this fascinating, and ever changing field.

Advances in Low-Level Color Image Processing

Color perception plays an important role in object recognition and scene understanding both for humans and intelligent vision systems. Recent advances in digital color imaging and computer hardware technology have led to an explosion in the use of color images in a variety of applications including medical imaging, content-based image retrieval, biometrics, watermarking, digital inpainting, remote sensing, visual quality inspection, among many others. As a result, automated processing and analysis of color images has become an active area of research, to which the large number of publications of the past two decades bears witness. The multivariate nature of color image data presents new challenges for researchers and practitioners as the numerous methods developed for single channel images are often not directly applicable to multichannel ones. The goal of this volume is to summarize the state-of-the-art in the early stages of the color image processing pipeline.

Particle Beam Physics

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Advances in Electronics and Electron Physics

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New Theories for Chemistry

Many new developments, related to the interpretation and importance of symmetry relationships, quantum mechanics, general relativity, field theory and mathematics have occurred in the second half of the 20th century without having a visible impact on chemical thinking. By re-examining basic theories, The New Theories for Chemistry aims to introduce a new understanding of old concepts, such as electron spin, The Periodic Table and electronegativity. The book focuses on the new mathematical concepts that enable the exploration of interactions between particles, waves and fields within a chemical context, and is packed with examples to support its arguments. The author adopts a practical approach and topics are arranged sequentially, from the mathematical basis through to general concepts. An essential reference source, this book is suitable for physicists, theoretical and physical chemists, as well as students and researchers working in the field. Re-examines basic theories, such as electronegativity and electron spin, and introduces new theory Full of practical experiments and examples Is an excellent single reference source

The Beginnings of Electron Microscopy - Part 2

The Beginnings of Electron Microscopy - Part 2, Volume 221 in the Advances in Imaging and Electron Physics series, highlights new advances in the field, with this new volume presenting interesting chapters on Recollections from the Early Years: Canada-USA, My Recollection of the Early History of Our Work on Electron Optics and the Electron Microscope, Walter Hoppe (1917–1986), Reminiscences of the Development of Electron Optics and Electron Microscope Instrumentation in Japan, Early Electron Microscopy in The Netherlands, L. L. Marton, 1901-1979, The Invention of the Electron Fresnel Interference Biprism, The Development of the Scanning Electron Microscope, and much more. Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in Advances in Imaging and Electron Physics series

Formerly Advances in Electronics and Electron Physics

Academic Press is pleased to announce the creation of Advances in Imaging and Electron Physics. This serial publication results from the merger of two long running serials--Advances in Electronics and Electron Physics and Advances in Optical & Electron Microscopy. Advances in Imaging & Electron Physics will feature extended articles on the physics of electron devices (especially semiconductor devices), particle optics at high and low energies,microlithography, image science and digital image processing, electromagnetic wave propagation, electron microscopy, and the computing methods used in all these domains. Continuation order customers for either of the original Advances will receiveVolume 90, the first combined volume.

Advanced Computing in Electron Microscopy

This updated and revised edition of a classic work provides a summary of methods for numerical computation of high resolution conventional and scanning transmission electron microscope images. At the limits of resolution, image artifacts due to the instrument and the specimen interaction can complicate image interpretation. Image calculations can help the user to interpret and understand high resolution information in recorded electron micrographs. The book contains expanded sections on aberration correction, including a detailed discussion of higher order (multipole) aberrations and their effect on high resolution imaging, new imaging modes such as ABF (annular bright field), and the latest developments in parallel processing using GPUs (graphic processing units), as well as updated references. Beginning and experienced users at the advanced undergraduate or graduate level will find the book to be a unique and essential guide to the theory and methods of computation in electron microscopy.

Introduction to the Physics of Electron Emission

A practical, in-depth description of the physics behind electron emission physics and its usage in science and technology Electron emission is both a fundamental phenomenon and an enabling component that lies at the very heart of modern science and technology. Written by a recognized authority in the field, with expertise in both electron emission physics and electron beam physics, An Introduction to Electron Emission provides an in-depth look at the physics behind thermal, field, photo, and secondary electron emission mechanisms, how that physics affects the beams that result through space charge and emittance growth, and explores the physics behind their utilization in an array of applications. The book addresses mathematical and numerical methods underlying electron emission, describing where the equations originated, how they are related, and how they may be correctly used to model actual sources for devices using electron beams. Writing for the beam physics and solid state communities, the author explores applications of electron emission methodology to solid state, statistical, and quantum mechanical ideas and concepts related to simulations of electron beams to condensed matter, solid state and fabrication communities. Provides an extensive description of the physics behind four electron emission mechanisms—field, photo, and secondary, and how that physics relates to factors such as space charge and emittance that affect electron beams. Introduces readers to mathematical and numerical methods, their origins, and how they may be correctly used to model actual sources for devices using electron beams Demonstrates applications of electron methodology as well as quantum mechanical concepts related to simulations of electron beams to solid state design and manufacture Designed to function as both a graduate-level text and a reference for research professionals Introduction to the Physics of Electron Emission is a valuable learning tool for postgraduates studying quantum mechanics, statistical mechanics, solid state physics, electron transport, and beam physics. It is also an indispensable resource for academic researchers and

professionals who use electron sources, model electron emission, develop cathode technologies, or utilize electron beams.