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Master the physics and understand the current applications of modern X-ray and EUV sources with this fully updated second edition.

This thesis presents research on novel laboratory-scale synchrotron X-ray sources based on inverse Compton scattering and applications of their X-ray radiation using the Munich Compact Light Source (MuCLS) as an example. It provides an introduction to the theory of this laser-electron interaction, laser resonators and X-ray interactions with matter. On this basis, upgrades to the laser system including the development of a new laser optic, X-ray beam stabilisation and two techniques for fast X-ray

energy switching of inverse Compton sources are presented. On the application side, the beamline, designed and developed for the inverse Compton X-ray source at the MuCLS, is described before various techniques and applications are demonstrated at this laboratory-scale synchrotron X-ray facility. Among them are K-edge subtraction imaging, X-ray phase contrast imaging and X-ray absorption spectroscopy. Additionally, a new X-ray microscopy technique, called full-field structured-illumination super-resolution X-ray transmission microscopy, is presented. Apart from research conducted at the MuCLS, this thesis contains an in-depth overview on the state of the art of the various types of inverse

Compton X-ray sources that have been realised so far. Accordingly, this thesis may serve as a guide and reference work for researchers working with inverse Compton X-ray sources as well as future users of such devices.

Now revised to reflect the new, clinically-focused certification exams, Review of Radiological Physics, Fourth Edition, offers a complete review for radiology residents and radiologic technologists preparing for certification. . This new edition covers x-ray production and interactions, projection and tomographic imaging, image quality, radiobiology, radiation protection, nuclear medicine, ultrasound, and magnetic resonance - all of the important physics infor-

mation you need to understand the factors that improve or degrade image quality. Each chapter is followed by 20 questions for immediate self-assessment, and two end-of-book practice exams, each with 100 additional questions, offer a comprehensive review of the full range of topics. In this book, Carolyn A. MacDonald provides a comprehensive introduction to the physics of a wide range of x-ray applications, optics, and analysis tools. Theory is applied to practical considerations of optics and applications ranging from astronomy to medical imaging and materials analysis. Emphasizing common physical concepts that underpin diverse phenomena and applications of x-ray physics, the book opens with a look at nuclear medicine, motivating further investigations into scattering, detection, and noise statistics. The second section explores topics in x-ray generation, including characteristic emission, x-ray fluorescence analysis, bremsstrahlung emission, and synchrotron and laser sources. The third section details the main forms of interaction, including the physics of photoelectric absorption, coherent and Compton scattering, diffraction, and refractive, reflective, and diffractive optics. Appli-

cations in this section include x-ray spectroscopy, crystallography, and dose and contrast in radiography. A bibliography is included at the end of every chapter, and solutions to chapter problems are provided in the appendix. Based on a course for advanced undergraduates and graduate students in physics and related sciences and also intended for researchers, An Introduction to X-Ray Physics, Optics, and Applications offers a thorough survey of the physics of x-ray generation and of interaction with materials. Common aspects of diverse phenomena emphasized Theoretical development tied to practical applications Suitable for advanced undergraduate and graduate students in physics or related sciences, as well as researchers Examples and problems include applications drawn from medicine, astronomy, and materials analysis Detailed solutions are provided for all examples and problems

The complexity and vulnerability of the human body has driven the development of a diverse range of diagnostic and therapeutic techniques in modern medicine. The Nuclear Medicine procedures of Positron Emission Tomography (PET), Single Photon

Emission Computed Tomography (SPECT) and Radionuclide Therapy are well-established in clinical practice and are founded upon the principles of radiation physics. This book will offer an insight into the physics of nuclear medicine by explaining the principles of radioactivity, how radionuclides are produced and administered as radiopharmaceuticals to the body and how radiation can be detected and used to produce images for diagnosis. The treatment of diseases such as thyroid cancer, hyperthyroidism and lymphoma by radionuclide therapy will also be explored.

This open access book gives a complete and comprehensive introduction to the fields of medical imaging systems, as designed for a broad range of applications. The authors of the book first explain the foundations of system theory and image processing, before highlighting several modalities in a dedicated chapter. The initial focus is on modalities that are closely related to traditional camera systems such as endoscopy and microscopy. This is followed by more complex image formation processes: magnetic resonance imaging, X-ray projection imaging, computed tomography, X-ray phase-contrast imaging, nu-

clear imaging, ultrasound, and optical coherence tomography.

Now fully updated, the second edition of *Modern Diagnostic X-Ray Sources: Technology, Manufacturing, Reliability* gives an up-to-date summary of X-ray source technology and design for applications in modern diagnostic medical imaging. It lays a sound groundwork for education and advanced training in the physics of X-ray production, X-ray interactions with matter, and imaging modalities and assesses their prospects. The book begins with a comprehensive and easy-to-read historical overview of X-ray tube and generator development, including key achievements leading up to the current technological and economic state of the field. The book covers the physics of X-ray generation, including the process of constructing X-ray source devices. The stand-alone chapters can be read in order or in selections. They take you inside diagnostic X-ray tubes, illustrating their design, functions, metrics for validation, and interfaces. The detailed descriptions enable objective comparison and benchmarking. This detailed presentation of X-ray tube creation and functions enables you to understand how to opti-

mize tube efficiency, particularly with consideration for economics and environmental care. It also simplifies faultfinding. Along with covering the past and current state of the field, the book assesses the future regarding developing new X-ray sources that can enhance performance and yield greater benefits to the scientific community and to the public. After heading international R&D, marketing and advanced development for X-ray sources with Philips, and working in the X-ray industry for more than four decades, Rolf Behling retired in 2020 and is now the owner of the consulting firm XtraininX, Germany. He holds numerous patents and is continuously publishing, consulting and training. Comprehensive medical imaging physics notes aimed at those sitting the first FRCR physics exam in the UK and covering the scope of the Royal College of Radiologists syllabus. Written by Radiologists, the notes are concise and clearly organised with 100's of beautiful diagrams to aid understanding. The notes cover all of radiology physics, including basic science, x-ray imaging, CT, ultrasound, MRI, molecular imaging, and radiation dosimetry, protection and legislation. Although aimed at UK

radiology trainees, it is also suitable for international residents taking similar examinations, postgraduate medical physics students and radiographers. The notes provide an excellent overview for anyone interested in the physics of radiology or just refreshing their knowledge. This third edition includes updates to reflect new legislation and many new illustrations, added sections, and removal of content no longer relevant to the FRCR physics exam. This edition has gone through strict critique and evaluation by physicists and other specialists to provide an accurate, understandable and up-to-date resource. The book summarises and pulls together content from the FRCR Physics Notes at Radiology Cafe and delivers it as a paperback or eBook for you to keep and read anytime. There are 7 main chapters, which are further subdivided into 60 sub-chapters so topics are easy to find. There is a comprehensive appendix and index at the back of the book.

X-ray spectroscopy has emerged as a powerful tool in research and in industrial laboratories. It is used in the study of metals, semiconductors, amorphous solids, liquids

and gases. This comprehensive presentation develops the subject from its basic principles and relates the theory to experimental observations. The new edition includes topics that have recently become important, for example, the X-ray laser, appearance potential spectroscopy, synchrotron radiation and EXAFS of high-Tc superconducting materials. A thorough introduction, up to research level, is provided to EXAFS, which has seen rapid development in the past few years. This textbook conveniently presents the principles, applications and current techniques of X-ray spectroscopy, which makes it ideal for graduate students beginning research involving x-ray spectroscopy.

Passenger screening at commercial airports in the United States has gone through significant changes since the events of September 11, 2001. In response to increased concern over terrorist attacks on aircrafts, the Transportation Security Administration (TSA) has deployed security systems of advanced imaging technology (AIT) to screen passengers at airports. To date (December 2014), TSA has deployed AITs in U.S. airports of two different technologies that use different

types of radiation to detect threats: millimeter wave and X-ray backscatter AIT systems. X-ray backscatter AITs were deployed in U.S. airports in 2008 and subsequently removed from all airports by June 2013 due to privacy concerns. TSA is looking to deploy a second-generation X-ray backscatter AIT equipped with privacy software to eliminate production of an image of the person being screened in order to alleviate these concerns. This report reviews previous studies as well as current processes used by the Department of Homeland Security and equipment manufacturers to estimate radiation exposures resulting from backscatter X-ray advanced imaging technology system use in screening air travelers. Airport Passenger Screening Using Backscatter X-Ray Machines examines whether exposures comply with applicable health and safety standards for public and occupational exposures to ionizing radiation and whether system design, operating procedures, and maintenance procedures are appropriate to prevent over exposures of travelers and operators to ionizing radiation. This study aims to address concerns about exposure to radiation from X-ray backscatter AITs raised by

Congress, individuals within the scientific community, and others.

With every chapter revised and updated, *Physics for Diagnostic Radiology, Third Edition* continues to emphasize the importance of physics education as a critical component of radiology training. This best-selling text helps readers understand how various imaging techniques work, from planar analogue and digital radiology to computed tomography (CT), nuclear medicine, and positron emission tomography (PET) to ultrasound imaging and magnetic resonance imaging (MRI). New to the Third Edition Material on digital receptors Emphasis on the differences between analogue and digital images Coverage of multi-slice CT and three-dimensional resolution, dual energy applications, and cone beam CT Special radiographic techniques, including subtraction techniques and interventional radiology New chapter on PET, with discussion of multi-modality imaging (PET/CT) Additional material on radiation doses and risks to patients New chapter covering picture archiving and communication system (PACS), teleradiology, networks, archiving, and related factors A summary of the main teaching points at the beginning of each

chapter After an introductory chapter on basic physics, the book follows the x-ray imaging process: production of x-rays, interaction with the patient, radiation measurement, the image receptor, the radiological image, and image quality assessment. It then covers more advanced x-ray techniques as well as imaging with radioactive materials. The text also focuses on radiobiology, risk and radiation protection, and imaging with non-ionising radiation. The final chapter discusses data handling in a modern, electronic radiology department.

Interaction of Radiation with Matter focuses on the physics of the interactions of ionizing radiation in living matter and the Monte Carlo simulation of radiation tracks. Clearly progressing from an elementary level to the state of the art, the text explores the classical physics of track description as well as modern aspects based on condensed mat

Short presentation of aspects important for the application of X-ray contrast media: Composition and properties of contrast media, handling with respect to stability, purity and sterility; applications, interaction,

risks; drugs for prophylaxis and treatment of side effects.

Filling the need for a book bridging the effect of matter on X-ray radiation and the interaction of x-rays with plasmas, this monograph provides comprehensive coverage of the topic. As such, it presents and explains such powerful new X-ray sources as X-ray free-electron lasers, as well as short pulse interactions with solids, clusters, molecules, and plasmas, and X-ray matter interactions as a diagnostic tool. Equally useful for researchers and practitioners working in the field.

Deep learning is often viewed as the exclusive domain of math PhDs and big tech companies. But as this hands-on guide demonstrates, programmers comfortable with Python can achieve impressive results in deep learning with little math background, small amounts of data, and minimal code. How? With fastai, the first library to provide a consistent interface to the most frequently used deep learning applications. Authors Jeremy Howard and Sylvain Gugger, the creators of fastai, show you how to train a model on a wide range of tasks using fastai and PyTorch. You'll also dive progressively further into deep

learning theory to gain a complete understanding of the algorithms behind the scenes. Train models in computer vision, natural language processing, tabular data, and collaborative filtering Learn the latest deep learning techniques that matter most in practice Improve accuracy, speed, and reliability by understanding how deep learning models work Discover how to turn your models into web applications Implement deep learning algorithms from scratch Consider the ethical implications of your work Gain insight from the foreword by PyTorch cofounder, Soumith Chintala Edited by pioneers in this exciting field, and featuring contributions from leading researchers, this book discusses the principles and applications of XFELs.

An intense charged particle beam can be characterized as an organized charged particle flow for which the effects of beam self-fields are of major importance in describing the evolution of the flow. Research employing such beams is now a rapidly growing field with important applications ranging from the development of high power sources of coherent radiation to inertial confinement fusion. Major programs have

now been established at several laboratories in the United States and Great Britain, as well as in the USSR, Japan, and several Eastern and Western European nations. In addition, related research activities are being pursued at the graduate level at several universities in the US and abroad. When the author first entered this field in 1973 there was no single reference text that provided a broad survey of the important topics, yet contained sufficient detail to be of interest to the active researcher. That situation has persisted, and this book is an attempt to fill the void. As such, the text is aimed at the graduate student, or beginning researcher; however, it contains ample information to be a convenient reference source for the advanced worker.

Small-angle scattering of X rays and neutrons is a widely used diffraction method for studying the structure of matter. This method of elastic scattering is used in various branches of science and technology, including condensed matter physics, molecular biology and biophysics, polymer science, and metallurgy. Many small-angle scattering studies are of value for pure science and practical applications. It is well known that the most general and informa-

tive method for investigating the spatial structure of matter is based on wave-diffraction phenomena. In diffraction experiments a primary beam of radiation influences a studied object, and the scattering pattern is analyzed. In principle, this analysis allows one to obtain information on the structure of a substance with a spatial resolution determined by the wavelength of the radiation. Diffraction methods are used for studying matter on all scales, from elementary particles to macro-objects. The use of X rays, neutrons, and electron beams, with wavelengths of about 1 Å, permits the study of the condensed state of matter, solids and liquids, down to atomic resolution. Determination of the atomic structure of crystals, i.e., the arrangement of atoms in a unit cell, is an important example of this line of investigation.

Containing chapter contributions from over 130 experts, this unique publication is the first handbook dedicated to the physics and technology of X-ray imaging, offering extensive coverage of the field. This highly comprehensive work is edited by one of the world's leading experts in X-ray imaging physics and technology and

has been created with guidance from a Scientific Board containing respected and renowned scientists from around the world. The book's scope includes 2D and 3D X-ray imaging techniques from soft-X-ray to megavoltage energies, including computed tomography, fluoroscopy, dental imaging and small animal imaging, with several chapters dedicated to breast imaging techniques. 2D and 3D industrial imaging is incorporated, including imaging of artworks. Specific attention is dedicated to techniques of phase contrast X-ray imaging. The approach undertaken is one that illustrates the theory as well as the techniques and the devices routinely used in the various fields. Computational aspects are fully covered, including 3D reconstruction algorithms, hard/software phantoms, and computer-aided diagnosis. Theories of image quality are fully illustrated. Historical, radioprotection, radiation dosimetry, quality assurance and educational aspects are also covered. This handbook will be suitable for a very broad audience, including graduate students in medical physics and biomedical engineering; medical physics residents; radiographers; physicists and engineers in the field of imaging

and non-destructive industrial testing using X-rays; and scientists interested in understanding and using X-ray imaging techniques. The handbook's editor, Dr. Paolo Russo, has over 30 years' experience in the academic teaching of medical physics and X-ray imaging research. He has authored several book chapters in the field of X-ray imaging, is Editor-in-Chief of an international scientific journal in medical physics, and has responsibilities in the publication committees of international scientific organizations in medical physics. Features: Comprehensive coverage of the use of X-rays both in medical radiology and industrial testing The first handbook published to be dedicated to the physics and technology of X-rays Handbook edited by world authority, with contributions from experts in each field

This book gives a comprehensive account of modern x-ray science based on the use of synchrotron radiation and x-ray-free electron lasers (XFELs), presented against the historical background of the puzzling nature of light, and culminating in quantum electrodynamics (QED) and quantum optics. It covers the physical foundations of the creation, properties, and detection

of x-rays, uniquely emphasizing how the classical wave theory emerges from the photon concept of QED in lowest order. It then presents the formulation of the interactions of x-rays with atomic matter from both semi-empirical classical and first-principles quantum points of view. Particular attention is given to the evolution from optical to x-ray interactions, with emphasis on the unique power of x-rays in providing atom and chemical-bond specific information and their ability to separate charge and spin phenomena through x-ray polarization (dichroism) effects. In addition to various x-ray spectroscopy techniques, the book also discusses x-ray imaging and diffractive imaging, which through XFELs is now extended to the intrinsic length scale of atoms and chemical bonds and the associated timescales of their motions and transformations.

Read an exclusive interview with Dr. Jerry Battista here. A critical element of radiation treatment planning for cancer is the accurate prediction and delivery of a tailored radiation dose distribution inside the patient. Megavoltage x-ray beams are aimed at the tumour, while collateral dam-

age to nearby healthy tissue and organs is minimized. The key to optimal treatment therefore lies in adopting a trustworthy three-dimensional (3D) dose computation algorithm, which simulates the passage of both primary and secondary radiation throughout the exposed tissue. Edited by an award-winning university educator and pioneer in the field of voxel-based radiation dose computation, this book explores the physics and mathematics that underlie algorithms encountered in contemporary radiation oncology. It is an invaluable reference for clinical physicists who commission, develop, or test treatment planning software. This book also covers a core topic in the syllabus for educating graduate students and residents entering the field of clinical physics. This book starts with a historical perspective gradually building up to the three most important algorithms used for today's clinical applications. These algorithms can solve the same general radiation transport problem from three vantages: firstly, applying convolution-superposition principles (i.e. Green's method); secondly, the stochastic simulation of radiation particle interactions with tissue atoms (i.e. the Monte Carlo

method); and thirdly, the deterministic solution of the fundamental equations for radiation fields of x-rays and their secondary particles (i.e. the Boltzmann method). It contains clear, original illustrations of key concepts and quantities throughout, supplemented by metaphors and analogies to facilitate comprehension and retention of knowledge. Features: Edited by an authority in the field, enhanced with chapter contributions from physicists with clinical experience in the fields of computational dosimetry and dose optimization. Contains examples of test phantom results and clinical cases, illustrating pitfalls to avoid in clinical applications to radiation oncology. Introduces four-dimensional (4D) dose computation, on-line dose reconstruction, and dose accumulation that accounts for tissue displacements and motion throughout a course of radiation therapy.

This book has evolved by processes of selection and expansion from its predecessor, *Practical Scanning Electron Microscopy (PSEM)*, published by Plenum Press in 1975. The interaction of the authors with students at the Short Course on Scanning Electron Microscopy and X-Ray Microanalysis held annually at Lehigh University has

helped greatly in developing this textbook. The material has been chosen to provide a student with a general introduction to the techniques of scanning electron microscopy and x-ray microanalysis suitable for application in such fields as biology, geology, solid state physics, and materials science. Following the format of PSEM, this book gives the student a basic knowledge of (1) the user-controlled functions of the electron optics of the scanning electron microscope and electron microprobe, (2) the characteristics of electron-beam-sample interactions, (3) image formation and interpretation, (4) x-ray spectrometry, and (5) quantitative x-ray microanalysis. Each of these topics has been updated and in most cases expanded over the material presented in PSEM in order to give the reader sufficient coverage to understand these topics and apply the information in the laboratory. Throughout the text, we have attempted to emphasize practical aspects of the techniques, describing those instrument parameters which the microscopist can and must manipulate to obtain optimum information from the specimen. Certain areas in particular have been expanded in response to their increasing im-

portance in the SEM field. Thus energy-dispersive x-ray spectrometry, which has undergone a tremendous surge in growth, is treated in substantial detail.

Comprehensive overview of the spectroscopic, mineralogical, and geochemical techniques used in planetary remote sensing.

This book, like its first edition, addresses the fundamental principles of interaction between radiation and matter and the principle of particle detectors in a wide scope of fields, from low to high energy, including space physics and the medical environment. It provides abundant information about the processes of electromagnetic and hadronic energy deposition in matter, detecting systems, and performance and optimization of detectors.

This publication is aimed at students and teachers involved in programmes that train medical physicists for work in diagnostic radiology. It provides, in the form of a syllabus, a comprehensive overview of the basic medical physics knowledge required for the practice of modern diagnostic radiology. This makes it particularly useful for graduate students and residents in

medical physics programmes. The material presented in the publication has been endorsed by the major international organisations and is the foundation for academic and clinical courses in both diagnostic radiology physics and in emerging areas such as imaging in radiotherapy.

This book first provides readers with an introduction to the underlying physics and state-of-the-art application of photon counting detectors for X-ray imaging. The authors explain that a photon-counting imaging detector can realize quantitative analysis because the detector can derive X-ray attenuation information based on the analysis of intensity changes of individual X-ray. To realize this analysis, it is important to consider the physics of an object and detector material. In this book, the authors introduce a novel analytical procedure to create quantitative X-ray images for medical diagnosis.

These proceedings gather a selection of invited and contributed papers presented during the 16th International Conference on X-Ray Lasers (ICXRL 2018), held in Prague, Czech Republic, from 7 to 12 October 2018. The conference is part of an ongoing series dedicated to recent develop-

ments in the science and technology of X-ray lasers and other coherent X-ray sources, with an additional focus on supporting technologies, instrumentation and applications. The book highlights advances in a wide range of fields including laser and discharge-pumped plasma X-ray lasers, the injection and seeding of X-ray amplifiers, high-order harmonic generation and ultrafast phenomena, X-ray free electron lasers, novel schemes for (in)coherent XUV, X-ray and γ -ray generation, XUV and X-ray imaging, optics and metrology, X-rays and γ -rays for fundamental science, the practical implementation of X-ray lasers, XFELs and super-intense lasers, and the applications and industrial uses of X-ray lasers.

The reflection of and neutrons from surfaces has existed as an x-rays experimental for almost it is in the last technique fifty Nevertheless, only years. decade that these methods have become as of enormously popular probes This the surfaces and interfaces. to be due to of several appears convergence of intense different circumstances. These include the more n- availability be measured orders tron and sources that can over (so reflectivity x-ray many of

and the much weaker surface diffuse can now also be magnitude scattering of thin films and studied in some the detail); growing importance multil- basic the realization of the ers in both and technology research; important which in the of surfaces and and role roughness plays properties interfaces; the of statistical models to characterize the of finally development topology its and its characterization from on roughness, dependence growth processes The of and to surface scattering experiments. ability x-rays neutro4s study four five orders of in scale of surfaces over to magnitude length regardless their and also their to ability probe environment, temperature, pressure, etc. , makes these the choice for buried interfaces often probes preferred obtaining information about the microstructure of often in statistical a global surfaces, the local This is manner to complementary imaging microscopy techniques, of such studies in the literature witnessed the veritable by explosion published the last few Thus these lectures will useful for over a resource years.

Hardly any other discovery of the nineteenth century did have such an impact on

science and technology as Wilhelm Conrad Röntgen's seminal find of the X-rays. X-ray tubes soon made their way as excellent instruments for numerous applications in medicine, biology, materials science and testing, chemistry and public security. Developing new radiation sources with higher brilliance and much extended spectral range resulted in stunning developments like the electron synchrotron and electron storage ring and the freeelectron laser. This handbook highlights these developments in fifty chapters. The reader is given not only an inside view of exciting science areas but also of design concepts for the most advanced light sources. The theory of synchrotron radiation and of the free-electron laser, design examples and the technology basis are presented. The handbook presents advanced concepts like seeding and harmonic generation, the booming field of Terahertz radiation sources and upcoming brilliant light sources driven by laser-plasma accelerators. The applications of the most advanced light sources and the advent of nanobeams and fully coherent x-rays allow experiments from which scientists in the past could not even dream. Examples are

the diffraction with nanometer resolution, imaging with a full 3D reconstruction of the object from a diffraction pattern, measuring the disorder in liquids with high spatial and temporal resolution. The 20th century was dedicated to the development and improvement of synchrotron light sources with an ever ongoing increase of brilliance. With ultrahigh brilliance sources, the 21st century will be the century of x-ray lasers and their applications. Thus, we are already close to the dream of condensed matter and biophysics: imaging single (macro)molecules and measuring their dynamics on the femtosecond timescale to produce movies with atomic resolution.

X-ray scattering is a well-established technique in materials science. The aim of this text is to explain basic principles and applications of x-ray scattering in a simple way using many practical examples followed by more elaborate case studies. It contains a separate chapter on the different types of order/disorder in soft matter that play such an important role in modern self-assembling systems. Finally the last chapter treats soft matter surfaces and thin film that are increasingly used in coat-

ings and in many technological applications, such as liquid crystal displays and nanostructured block copolymer films. Digital Radiography has been firmly established in diagnostic radiology during the last decade. Because of the special requirements of high contrast and spatial resolution needed for roentgen mammography, it took some more time to develop digital mammography as a routine radiological tool. Recent technological progress in detector and screen design as well as increased experience with computer applications for image processing have now enabled Digital Mammography to become a mature modality that opens new perspectives for the diagnosis of breast diseases. The editors of this timely new volume Prof. Dr. U. Bick and Dr. F. Diekmann, both well-known international leaders in breast imaging, have for many years been very active in the frontiers of theoretical and translational clinical research, needed to bring digital mammography finally into the sphere of daily clinical radiology. I am very much indebted to the editors as well as to the other internationally recognized experts in the field for their outstanding state of the art contributions to this volume. It is in-

deed an excellent handbook that covers in depth all aspects of Digital Mammography and thus further enriches our book series Medical Radiology. The highly informative text as well as the numerous well-chosen superb illustrations will enable certified radiologists as well as radiologists in training to deepen their knowledge in modern breast imaging.

With the development of potent x-ray sources, Compton scattering has become a standard tool for studying electron densities in materials. This text looks at the Compton scattering method, leading to a fundamental understanding of the electrical and magnetic properties of solid materials, both elements and compounds.

This volume provides an overview of X-ray technology and the historical development of modern CT systems. The main focus of the book is a detailed derivation of reconstruction algorithms in 2D and modern 3D cone-beam systems. A thorough analysis of CT artifacts and a discussion of practical issues such as dose considerations give further insight into current CT systems. Although written mainly for graduate students, practitioners will also benefit from

this book.

This volume describes concurrent engineering developments that affect or are expected to influence future development of digital diagnostic imaging. It also covers current developments in Picture Archiving and Communications System (PACS) technology, with particular emphasis on integration of emerging imaging technologies into the hospital environment.

Eagerly awaited, this second edition of a best-selling text comprehensively describes from a modern perspective the basics of x-ray physics as well as the completely new opportunities offered by synchrotron radiation. Written by internationally acclaimed authors, the style of the book is to develop the basic physical principles without obscuring them with excessive mathematics. The second edition differs substantially from the first edition, with over 30% new material, including: A new chapter on non-crystalline diffraction - designed to appeal to the large community who study the structure of liquids, glasses, and most importantly polymers and bio-molecules A new chapter on x-ray imaging - developed in close cooperation with many of the leading experts in the

field Two new chapters covering non-crystalline diffraction and imaging Many important changes to various sections in the book have been made with a view to improving the exposition Four-colour representation throughout the text to clarify key concepts Extensive problems after each chapter There is also supplementary book material for this title available online (<http://booksupport.wiley.com>). Praise for the previous edition: "The publication of Jens Als-Nielsen and Des McMorrow's Elements of Modern X-ray Physics is a defining moment in the field of synchrotron radiation... a welcome addition to the bookshelves of synchrotron-radiation professionals and students alike.... The text is now my personal choice for teaching x-ray physics..." - Physics Today, 2002

Diagnostic X-rays are the largest contributor to radiation exposure. Protecting the patient from radiation is a major aim of modern health policy, and an understanding of the relationship between radiation dose and image quality is pivotal to optimising medical diagnostic radiology. In this volume the data provided for exploring these concerns are partly based on X-ray spectra, measured on diagnostic X-ray

tube assemblies, and are supplemented by the results of measurements on phantoms and simulation calculations. X-ray

mammography data makes up the main part of this book. The book also features

an extremely useful CD-ROM containing a comprehensive database in the form of Excel-files.