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## **Particle Physics Reference Library** - Christian W. Fabjan 2020

This second open access volume of the handbook series deals with detectors, large experimental facilities and data handling, both for accelerator and non-accelerator based experiments. It also covers applications in medicine and life sciences. A joint CERN-Springer initiative, the "Particle Physics Reference Library" provides revised and updated contributions based on previously published material in the well-known Landolt-Boernstein series on particle physics, accelerators and detectors (volumes 21A, B1,B2,C), which took stock of the field approximately one decade ago. Central to this new initiative is publication under full open access

## **Gastrointestinal Imaging** - Angela D. Levy 2015-07-29

Gastrointestinal Imaging presents a comprehensive review of gastrointestinal pathologies commonly encountered by practicing radiologists and residents in training. Chapters are organized by organ system and include the Pharynx and Esophagus, Stomach, Small Bowel, Appendix, Colon, Anorectum, Liver, Gallbladder, Bile Ducts, Pancreas, Spleen, Peritoneum, Mesentery, and Abdominal Wall, and a chapter on multisystem disorders. Part of the Rotations in Radiology series, this book offers a guided approach to imaging diagnosis with examples of all imaging modalities complimented by the basics of interpretation and technique and the nuances necessary to arrive at the best diagnosis. Each pathology is covered with a targeted discussion that reviews the definition, clinical features, anatomy and physiology, imaging techniques, differential diagnosis, clinical issues, key points, and further reading. This organization is ideal for trainees' use during specific rotations and for exam review, or as a quick refresher for the established gastrointestinal imager.

## *Dual Source CT Imaging* - Peter R. Seidensticker 2008-05-24

This book provides an introduction to Dual Source Computed Tomography (DSCT) technology and to the basics of contrast media administration. This is followed by 25 in-depth clinical scan and contrast media injection protocols.

## *Computed Tomography* - Thomas J. Vogl 2012-12-06

In January 1995, 300 participants from Asia, USA, and Europe lively discussed the "State of the Art and Future Aspects of CT" in Peking, China. The workshop was designed to cover all essential aspects of modern CT imaging including the historical development, different techniques, contrast agents, organ systems, and indications. The comparative evaluation of CT versus MRI and ultrasound was a central topic. Additionally, a special session was dedicated to "Angiography Tomorrow". This book summarizes the state of the art in both conventional and spiral CT imaging and provides some suggestions as for the future role of the method.

## *Computed Tomography Technology* - Euclid Seeram 1982

## **Progress of Precision Engineering and Nano Technology** - Shen Dong 2007-05-15

Volume is indexed by Thomson Reuters CPCI-S (WoS). Precision engineering and micro/nano technologies have been developing rapidly in recent years, and are set to become the dominant players in a new industrial revolution of the 21st century. They will not only provide new possibilities for exponential development of the global economy, but also cause a revolution in human understanding.

## **Three-Dimensional Digital Tomosynthesis** - Yulia Levakhina 2014-04-16

Yulia Levakhina gives an introduction to the major challenges of image reconstruction in Digital Tomosynthesis (DT), particularly to the connection of the reconstruction problem with the incompleteness of the DT dataset. The author discusses the factors which cause the formation of limited angle artifacts and proposes how to account for them in order to improve image quality and axial resolution of modern DT. The addressed methods include a weighted non-linear back projection scheme for algebraic reconstruction and novel dual-axis acquisition geometry. All discussed algorithms and methods are supplemented by detailed illustrations, hints for practical implementation, pseudo-code, simulation results and real patient case examples.

## Computational Methods and Clinical Applications in Musculoskeletal Imaging - Ben Glocker 2018-01-26

This book constitutes the refereed proceedings of the 5th International Workshop and Challenge on Computational Methods and Clinical Applications for Musculoskeletal Imaging, MSKI 2017, held in conjunction with MICCAI 2017, in Quebec City, QC, Canada, in September 2017. The 13 workshop papers were carefully reviewed and selected for inclusion in this volume. Topics of interest include all major aspects of musculoskeletal imaging, for example: clinical applications of musculoskeletal computational imaging; computer-aided detection and diagnosis of conditions of the bones, muscles and joints; image-guided musculoskeletal surgery and interventions; image-based assessment and monitoring of surgical and pharmacological treatment; segmentation, registration, detection, localization and visualization of the musculoskeletal anatomy; statistical and geometrical modeling of the musculoskeletal shape and appearance; image-based microstructural characterization of musculoskeletal tissue; novel techniques for musculoskeletal imaging.

## Abdominal Imaging. Computational and Clinical Applications - Hiroyuki Yoshida 2013-09-19

This book constitutes the refereed proceedings of the 5th International Workshop CCAA 2013, held in conjunction with MICCAI 2013, in Nagoya, Japan, in September 2013. The book includes 32 papers which were carefully reviewed and selected from 38 submissions. The topics covered are abdominal atlases, shape analysis and morphology in abdominal structures and organs, detection of anatomical and functional landmarks, dynamic, functional, physiologic, and anatomical abdominal imaging, registration methods for abdominal intra- and inter-patient variability, augmented reality techniques for intervention, clinical applications in radio-frequency ablation, open surgery, and minimally invasive surgery.

## Hybrid PET/CT and SPECT/CT Imaging - Dominique Delbeke 2010-03-27

This practical guide is a reference source of cases for images obtained on state-of-the-art integrated PET/CT and SPECT/CT imaging systems. It covers the full spectrum of clinical applications, including head and neck tumors, breast cancer, colorectal cancer, pancreatic cancer, and genitourinary tumors. In addition a wealth of illustrations reinforce the key teaching points discussed throughout the book.

## Multislice CT - Konstantin Nikolaou 2019-08-06

The fourth edition of this well-received book offers a comprehensive update on recent developments and trends in the clinical and scientific applications of multislice computed tomography. Following an initial section on the most significant current technical aspects and issues, detailed information is provided on a comprehensive range of diagnostic applications. Imaging of the head and neck, the cardiovascular system, the abdomen, and the lungs is covered in depth, describing the application of multislice CT in a variety of tumors and other pathologies. Emerging fields such as pediatric imaging and CT-guided interventions are

fully addressed, and emergency CT is also covered. Radiation exposure, dual-energy imaging, contrast enhancement, image postprocessing, CT perfusion imaging, and CT angiography all receive close attention. The new edition has been comprehensively revised and complemented by contributions from highly experienced and well-known authors who offer diverse perspectives, highlighting the possibilities offered by the most modern multidetector CT systems. This book will be particularly useful for general users of CT systems who wish to upgrade and enhance not only their machines but also their knowledge.

**Computational Radiomics for Cancer Characterization** - Omar Sultan Al-Kadi 2022-10-21

*Musculoskeletal Imaging* - Philip G. Conaghan 2010-03-18

This handbook provides a comprehensive insight into how imaging techniques should be applied to particular clinical problems and how the results can be used to determine the diagnosis and management of musculoskeletal conditions.

*Clinical PET-CT in Radiology* - Paul Shreve 2010-12-14

This book is specifically designed to meet the needs of practicing radiologists by offering a practical, unified approach to PET-CT. It details how to effectively apply PET-CT in patient management. Written by radiologists who fully appreciate and understand both PET and CT, the book details an integrated understanding of PET-CT as a combined modality. Clinical topics include PET-CT of thoracic malignancies, melanoma, and breast cancer. In addition, the book reinforces fundamental concepts, such as the role of imaging diagnosis in disease management.

**Computed Tomography for Technologists** - Lois E. Romans 2010-02-01

Leveraging the organization and focus on exam preparation found in the comprehensive text, this Exam Review will help any student to successfully complete the ARRT General Radiography and Computed Tomography exams. The book includes a bulleted format review of content, Registry-style questions with answers and rationales, and a mock exam following the ARRT format. The companion website offers an online testing simulation engine.

*Technical Fundamentals of Radiology and CT* - Guillermo Avendaño Cervantes 2016

Technical Fundamentals of Radiology and CT is intended to cover all issues related to radiology and computed tomography, from the technological point of view, both for understanding the operation of all devices involved and for their maintenance. It is intended for students and a wide range of professionals working in various fields of radiology, those who take images and know little about the workings of the devices, and professionals who install, maintain and solve technological problems of all radiological systems used in health institutions.

*Applied Nuclear Physics at Accelerators* - Marco Durante 2021-07-14

*CT Scanning* - Karupppasamy Subburaj 2011-10-03

Since its introduction in 1972, X-ray computed tomography (CT) has evolved into an essential diagnostic imaging tool for a continually increasing variety of clinical applications. The goal of this book was not simply to summarize currently available CT imaging techniques but also to provide clinical perspectives, advances in hybrid technologies, new applications other than medicine and an outlook on future developments. Major experts in this growing field contributed to this book, which is geared to radiologists, orthopedic surgeons, engineers, and clinical and basic researchers. We believe that CT scanning is an effective and essential tools in treatment planning, basic understanding of physiology, and and tackling the ever-increasing challenge of diagnosis in our society.

**Nature and Significance of the Recent Carbonate Mound Record** - Anneleen Foubert 2009-07-07

No books are available on the market describing recent carbonate mounds along the European continental margins and deciphering step by step their internal structure. The first results of IODP Expedition 307 "Modern Carbonate Mounds: Porcupine Drilling" are published in Ferdelman, T.G., Kano, A., Williams, T., Henriot, J.-P., and the Expedition 307 Scientists, 2006. Proc. IODP, 307: Washington, DC (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.307.2006. However, these proceedings do not give an overview of the existing knowledge on carbonate mounds and do not include detailed post-cruise analysis and advanced interpretations.

*Positron Emission Tomography* - Dale L. Bailey 2004-10-28

Essential for students, science and medical graduates who want to understand the basic science of Positron Emission Tomography (PET), this book describes the physics, chemistry, technology and overview of the clinical uses behind the science of PET and the imaging techniques it uses. In recent years, PET has moved from high-end research imaging tool used by the highly specialized to an essential component of clinical evaluation in the clinic, especially in cancer management. Previously being the realm of scientists, this book explains PET instrumentation, radiochemistry, PET data acquisition and image formation, integration of structural and functional images, radiation dosimetry and protection, and applications in dedicated areas such as drug development, oncology, and gene expression imaging. The technologist, the science, engineering or chemistry graduate seeking further detailed information about PET, or the medical advanced trainee wishing to gain insight into the basic science of PET will find this book invaluable. This book is primarily repackaged content from the Basic Science section of the 'big' Valk book on PET. It contains new, completely revised and unchanged chapters covering the "basic sciences" section of the main book - total 18 chapters: 2 new (chapters 1, 16) 8 completely revised (chapters 4, 5, 8, 13, 14, 15, 17, 18) 3 minor corrections (chapters 2, 6, 11) 5 unchanged (chapters 3, 7, 9, 10, 12)

*MRI from Picture to Proton* - Donald W. McRobbie 2017-04-13

MR is a powerful modality. At its most advanced, it can be used not just to image anatomy and pathology, but to investigate organ function, to probe in vivo chemistry, and even to visualise the brain thinking. However, clinicians, technologists and scientists struggle with the study of the subject. The result is sometimes an obscurity of understanding, or a dilution of scientific truth, resulting in misconceptions. This is why MRI from Picture to Proton has achieved its reputation for practical clarity. MR is introduced as a tool, with coverage starting from the images, equipment and scanning protocols and traced back towards the underlying physics theory. With new content on quantitative MRI, MR safety, multi-band excitation, Dixon imaging, MR elastography and advanced pulse sequences, and with additional supportive materials available on the book's website, this new edition is completely revised and updated to reflect the best use of modern MR technology.

**CT- and MR-Guided Interventions in Radiology** - Andreas H. Mahnken 2013-05-14

Interventional radiology is an indispensable and still expanding area of modern medicine that encompasses numerous diagnostic and therapeutic procedures. The revised and extended second edition of this volume covers a broad range of non-vascular interventions guided by CT or MR imaging. Indications, materials, techniques, and results are all carefully discussed. A particularly comprehensive section is devoted to interventional oncology as the most rapidly growing branch of interventional radiology. In addition, detailed information is provided that will assist in establishing and developing an interventional service. This richly illustrated book will be a most valuable source of information and guidance for all radiologists who deal with non-vascular procedures.

**Emission Tomography** - Miles N. Wernick 2004-12-07

PET and SPECT are two of today's most important medical-imaging methods, providing images that reveal subtle information about physiological processes in humans and animals. Emission Tomography: The Fundamentals of PET and SPECT explains the physics and engineering principles of these important functional-imaging methods. The technology of emission tomography is covered in detail, including historical origins, scientific and mathematical foundations, imaging systems and their components, image reconstruction and analysis, simulation techniques, and clinical and laboratory applications. The book describes the state of the art of emission tomography, including all facets of conventional SPECT and PET, as well as contemporary topics such as iterative image reconstruction, small-animal imaging, and PET/CT systems. This book is intended as a textbook and reference resource for graduate students, researchers, medical physicists, biomedical engineers, and professional engineers and physicists in the medical-imaging industry. Thorough tutorials of fundamental and advanced topics are presented by dozens of the leading researchers in PET and SPECT. SPECT has long been a mainstay of clinical imaging, and PET is now one of the world's fastest growing medical imaging techniques, owing to its dramatic contributions to cancer imaging and other applications. Emission Tomography: The Fundamentals of PET and SPECT is an essential resource for understanding the technology of SPECT and PET, the most widely used forms of molecular

imaging. \*Contains thorough tutorial treatments, coupled with coverage of advanced topics \*Three of the four holders of the prestigious Institute of Electrical and Electronics Engineers Medical Imaging Scientist Award are chapter contributors \*Include color artwork

**Computed Tomography - E-Book** - Euclid Seeram 2013-08-13

Radiologic technologists play an important role in the care and management of patients undergoing advanced imaging procedures. This new edition provides the up-to-date information and thorough coverage you need to understand the physical principles of computed tomography (CT) and safely produce high-quality images. You'll gain valuable knowledge about the practice of CT scanning, effective communication with other medical personnel, and sectional anatomic images as they relate to CT. Comprehensively covers CT at just the right depth for technologists - going beyond superficial treatment to accommodate all the major advances in CT. One complete CT resource covers what you need to know! Brings you up to date with the latest in multi-slice spiral CT and its applications - the only text to include full coverage of this important topic. Features a chapter devoted to quality control testing of CT scanners (both spiral CT and conventional scan-and-stop), helping you achieve and maintain high quality control standards. Provides the latest information on: advances in volume CT scanning; CT fluoroscopy; multi-slice spiral/helical CT; and multi-slice applications such as 3-D imaging, CT angiography, and virtual reality imaging (endoscopy) - all with excellent coverage of state-of-the-art principles, instrumentation, clinical applications and quality control. Two new chapters cover recent developments and important principles of multislice CT and PET/CT, giving you in-depth coverage of these quickly emerging aspects of CT. Nearly 100 new line drawings and images illustrate difficult concepts, helping you learn and retain information. All-new material updates you on today's CT scanners, CT and PACS, image quality and quality control for multislice CT scanners, and clinical applications.

**Cardiovascular Computed Tomography** - James Stirrup 2020-01-02

Recent years have seen a marked increase in cardiovascular computed tomography (CT) imaging, with the technique now integrated into many imaging guidelines, such as those published by ESC and NICE. Rapid clinical and technological progress has created a need for guidance on the practical aspects of CT image acquisition, analysis and interpretation. The Oxford Specialist Handbook of Cardiovascular CT, now revised for the second edition by practising international experts with many years of hands-on experience, is designed to fulfil this need. The Handbook is a practical guide on performing, analysing and interpreting cardiovascular CT scans, covering all aspects from patient safety to optimal image acquisition to differential diagnoses of tricky images. It takes an international approach to both accreditation and certification, highlighting British, European, and American examinations and courses. The format is designed to be accessible and is laid out in easy to navigate sections. It is meant as a quick-reference guide, to live near the CT scanner, workstation, or on the office shelf. The Handbook is aimed at all cardiovascular CT users (Cardiologists, Radiologists and Radiographers), particularly those new to cardiovascular CT, although even the advanced user should find useful tips and tricks within.

*Insights in Gynecological Oncology: 2021* - Sarah M. Temkin 2022-11-15

*Bone Morphogenetic Proteins* - Slobodan Vukicevic 2012-11-28

From the basic science to potential and approved clinical applications the most recent data in the rapidly growing field of bone morphogenetic proteins (BMPs) are summarized in this topical volume. Distinguished scientists present reviews on a range of scientific topics, including biochemistry, biology, molecular biology and preclinical animal studies on spinal fusion, cartilage repair, craniofacial and dental reconstruction using BMPs, as well as approved clinical applications in human bone non-unions. This book provides a resource not only for experts in the field, but also for undergraduate students, newcomers and clinicians worldwide, given that the use of BMPs in orthopedic reconstruction has been already approved in Europe, Australia, Canada and the USA.

**Computed Tomography** - Euclid Seeram 2009

Radiologic technologists play an important role in the care and management of patients undergoing advanced imaging procedures. This new edition provides the up-to-date information and thorough coverage you need to understand the physical principles of computed tomography (CT) and safely produce high-

quality images. You'll gain valuable knowledge about the practice of CT scanning, effective communication with other medical personnel, and sectional anatomic images as they relate to CT. Comprehensively covers CT at just the right depth for technologists - going beyond superficial treatment to accommodate all the major advances in CT. One complete CT resource covers what you need to know! Brings you up to date with the latest in multi-slice spiral CT and its applications - the only text to include full coverage of this important topic. Features a chapter devoted to quality control testing of CT scanners (both spiral CT and conventional scan-and-stop), helping you achieve and maintain high quality control standards. Provides the latest information on: advances in volume CT scanning; CT fluoroscopy; multi-slice spiral/helical CT; and multi-slice applications such as 3-D imaging, CT angiography, and virtual reality imaging (endoscopy) - all with excellent coverage of state-of-the-art principles, instrumentation, clinical applications and quality control. Two new chapters cover recent developments and important principles of multislice CT and PET/CT, giving you in-depth coverage of these quickly emerging aspects of CT. Nearly 100 new line drawings and images illustrate difficult concepts, helping you learn and retain information. All-new material updates you on today's CT scanners, CT and PACS, image quality and quality control for multislice CT scanners, and clinical applications.

*Adult Reference Computational Phantoms* - C. H. Clement 2009

This report describes the development and intended use of the computational phantoms of the Reference Male and Reference Female. In its recent recommendations (ICRP Publication 103: Recommendations of the ICRP. Annals of the ICRP 37(2-3) (2007)), the ICRP adopted these computational phantoms for forthcoming updates of organ dose coefficients for both internal and external radiation sources. The phantoms are based on medical image data of real persons, yet are consistent with the data given in ICRP Publication 89 on the reference anatomical and physiological parameters for both male and female subjects. The reference phantoms are constructed after modifying the voxel models (Golem and Laura) of two individuals whose body height and mass resembled the reference data. The organ masses of both models were adjusted to the ICRP data on the adult Reference Male and Reference Female, without compromising their anatomic realism. This report describes the methods used for this process and the characteristics of the resulting computational phantoms. The Introduction summarises the main reasons for constructing these phantoms - voxel phantoms being the state of the art, and the necessity of compliance with the anatomical characteristics of the ICRP 89 Reference Male and Reference Female. Chapter 2 summarises the specifications of the computational phantoms with respect to external dimensions and the source and target regions that are required; Chapter 3 characterises the previously segmented voxel models Golem and Laura that are the origin of the reference phantoms; Chapter 4 sketches the modifications that had to be applied to these models to create voxel models of the Reference Male and Reference Female; Chapter 5 is a description of the resulting reference computational phantoms of the Reference Male and Reference Female; and Chapter 6 indicates their applications and highlights their limitations. The phantoms' technical description is contained in Appendices A-H that form the larger part of this Publication. The numerical data representing the phantoms are contained on an electronic data storage medium (CD-ROM) that accompanies the printed publication. One of the aims of the report is to assist those who want to implement the phantoms for their own calculations. Furthermore, to illustrate the uses of these phantoms, graphical illustrations of conversion coefficients for some external and internal exposures are included in Appendices I-L. A comprehensive set of recommended values will be published in separate reports. Keywords: Computational phantoms, voxel models, Reference Male, Reference Female

**Medical CT & Ultrasound: Current Technology & Applications - AAPM Summer School 1995** - Lee W. Goldman 1995

*PET/CT Atlas on Quality Control and Image Artefacts* - International Atomic Energy Agency 2014

Positron emission tomography/computed tomography (PET/CT), as any other imaging modality, is acceptable for routine clinical and research applications only if technical pitfalls can be avoided. Artefacts from incorrect or sub-optimal acquisition procedures should be recognized and, if possible, corrected retrospectively and the resulting image information interpreted correctly, which entails an appreciation of variants of the represented image information. This publication provides guidance on the physics and

technical aspects behind PET and PET/CT image distortions. Cases are presented to provide nuclear medicine and radiology professionals with an assortment of examples of possible image distortions and errors in order to support a correct image interpretation. Nearly 70 typical PET and PET/CT cases, comprising image sets and cases, have been collected in this volume, all catalogued and augmented with explanations as to the causes of, and solutions to, each individual image problem. The atlas will prove useful to physicists, physicians, technologists, and service engineers in the clinical field.

**CT Imaging of Myocardial Perfusion and Viability** - U. Joseph Schoepf 2013-11-22

Recent research has identified the assessment of myocardial perfusion and viability as another promising CT application for the comprehensive diagnosis of coronary heart disease. In this book, the first to be devoted to this novel application of CT, leading experts from across the world present up-to-date information and consider future directions. After short sections outlining the state of the art in the traditional applications of CT to image structure and function, the full range of CT techniques that may be employed to evaluate the myocardial blood supply are discussed in detail. Similarly, diverse CT approaches for the assessment of myocardial viability are described, with careful consideration of the available experimental and clinical evidence and the role of quantitative imaging. Protocol recommendations that will be of invaluable practical assistance are also provided.

**Visual grading evaluation of reconstruction methods and dose optimisation in abdominal Computed Tomography** - Bharti Kataria 2019-10-15

Since its introduction in the 1970's CT has emerged as a modality of choice because of its high sensitivity in producing accurate diagnostic images. A third of all Computed Tomography (CT) examinations are abdominal CTs which deliver one of the highest doses among common examinations. An increase in the number of CT examinations has raised concerns about the negative effects of ionising radiation as the dose is cumulative over the life span of the individual. Image quality in CT is closely related to the radiation dose, so that a certain dose with an associated small, but not negligible, risk is a prerequisite for high image quality. Typically, dose reduction in CT results in higher noise and a decrease in low contrast resolution which can be detrimental to the image quality produced. New technology presents a wide range of dose reduction strategies, the latest being iterative reconstruction (IR). The aim of this thesis was to evaluate two different classes of iterative reconstruction algorithms: statistical (SAFIRE) and model-based (ADMIRE) as well as to explore the diagnostic value of a low-dose abdominal CT for optimisation purposes. This thesis included a total of 140 human subjects in four image quality evaluation studies, three of which were prospective studies (Papers I, II and IV) and one retrospective study (Paper III). Visual grading experiments to determine the potential dose reductions, were performed with pairwise comparison of image quality in the same patient at different tube loads (dose) and reconstructed with Filtered back projection (FBP) and SAFIRE strength 1 in a low-dose abdominal CT (Paper I) and FBP and ADMIRE strengths 3 and 5 in a standard dose abdominal CT (Paper II). Paper IV evaluated the impact of slice thicknesses in CT images reconstructed with ADMIRE strengths 3 and 5 when comparing multiplanar reconstruction (MPR) formatted images in a standard dose abdominal CT. Paper III, on the other hand, was an absolute assessment of image quality and pathology between the three phases of a CT Urography (CTU) protocol to explore the diagnostic value of low-dose abdominal CT. The anonymised images were displayed in random order and image quality was assessed by a group of radiologists using image quality criteria from the "European guidelines of quality criteria for CT". The responses from the reviewer assessment were analysed statistically with ordinal logistic regression i.e. Visual Grading Regression (VGR). Results in Paper I show that a small dose reduction (5-9 %) was possible using SAFIRE strength 1 and indicated the need for further research to evaluate the dose reduction potential of higher strengths of the algorithm. In Paper II a 30% dose reduction was possible without change in ADMIRE algorithm strength as no improvement in image quality was observed between tube loads 98- and 140 mAs. When comparing tube loads 42 and 98 mAs, further dose reduction was possible with ADMIRE strength 3 (22-47%). However, for images reconstructed with ADMIRE strength 5, a dose reduction of 34-74% was possible for some, but not all image criteria. Image quality in low-contrast objects such as the liver parenchyma, was affected and a decline in diagnostic confidence was observed. Paper IV showed potential dose reductions are possible with increasing slice thickness from 1 mm to 2 mm (24-35%) and 1 mm to 3mm (25-41%). ADMIRE strength 3

continued to provide diagnostically acceptable images with possible dose reductions for all image criteria assessed. Despite objective evaluations showing a decrease in noise and an increase in contrast to noise ratio, ADMIRE strength 5 had diverse effects on the five image criteria, depending on slice thickness and further dose reductions were limited to certain image criteria. The findings do not support a general recommendation to replace ADMIRE3 with ADMIRE5 in clinical abdominal CT protocols. Paper III studied another aspect of optimisation and results show that visualisation of renal anatomy was as expected in favour of the post-contrast phases when compared to the native phase. Assessment of pathology showed no significant differences between the three phases. Significantly higher diagnostic certainty for renal anatomy was observed for the post-contrast phases when compared to the native phase. Significantly high certainty scores were also seen for the nephrographic phase for incidental findings. The conclusion is that a low-dose series seems to be sufficient as a first-line modality in certain patient groups. This thesis clinically evaluated the effect of IR in abdominal CT imaging and estimated potential dose reductions. The important conclusion from papers I, II and IV is that IR improves image quality in abdominal CT allowing for some dose reductions. However, the clinical utility of the highest strength of the algorithm is limited to certain criteria. The results can be used to optimise the clinical abdominal CT protocol. The conclusion from paper III may increase clinical awareness of the value of the low-dose abdominal protocol when choosing an imaging method for certain patient groups who are more sensitive to radiation. Datortomografi (DT) används i allt större omfattning vid bilddiagnostik och ger en viss stråldos till patienten. DT är en viktig, snabb och patientvänlig undersökningsteknik. En fördel med denna teknik är att bildmaterialet kan rekonstrueras i olika format för att åskådliggöra anatomin på bästa sätt beroende på vilken frågeställning som ska besvaras. Joniserande strålning från dessa undersökningar anses öka risken för negativa effekter även om risken för den enskilde patienten är mycket liten. Antalet datortomografiundersökningar ökar från år till år vilket kan leda till ökade stråldoser till befolkningen. Optimering av undersökningsteknik och val av undersökning för att minska negativa effekter av röntgenstrålning är därför nödvändig. Det övergripande målet med avhandlingen var att utvärdera bildkvalitet vid en DT-undersökning av buken (då dessa medför en av de högsta stråldoserna bland de vanliga röntgenundersökningarna), att kvantifiera möjlig stråldosminskning med hjälp av iterativa rekonstruktionsalgoritmer och att utvärdera diagnostiska värdet av lågdosundersökningsteknik vid DT-buk. Av de fyra delstudierna var delarbeten I, II och IV prospektiva och delarbete III retrospektivt. För de prospektiva studierna, samlades bildmaterial in vid en klinisk berättigad undersökning av lågdos-DT av buken (delarbetet I), eller standarddos-DT av buken (delarbetet II och IV). Bilder rekonstruerades med en standard bildrekonstruktionsalgoritm, filtrerad återprojektion (FBP), och med styrka 1 av den iterativa algoritmen SAFIRE (delarbetet I). I delarbeten II och IV, gjordes bildrekonstruktioner med FBP och med styrka 3 och 5 av den iterativa algoritmen ADMIRE. Aidentifierade bildmaterial för varje patient visades parvis i slumpmässig ordning för ett antal granskare och bildkvaliteten bedömdes med hjälp av europeiska bildkriterier. I den retrospektiva studien, delarbete III, hämtades bildmaterialet från utförda DT-urografiundersökningar från bildarkivet. För varje undersökning visades bilder från varje fas i DT-urografiundersökningen separat i slumpmässig ordning. För samtliga delarbeten, hämtades bildkriterierna från "European Guidelines of Quality Criteria for CT" och modifierades för att passa till varje studie. Granskarnas bedömning analyserades med ordinal logistisk regression så kallad visual grading regression (VGR). Resultat från delarbetet I visade att det fanns en signifikant inverkan av dos ( $p < 0,001$ ) och rekonstruktionsalgoritm ( $p < 0,01$ ) på samtliga bildkriterier, med en beräknad möjlig dosminskning på 5-9%. Delarbetet II visade att rekonstruktionsalgoritmen ADMIRE förbättrar bildkvaliteten i jämförelse med FBP. ADMIRE styrka 3 tillåter en dosminskning mellan 22-47% för samtliga bildkriterier medan ADMIRE styrka 5 tillåter en dosminskning mellan 34-74% för nästan alla bedömda bildkriterier utom återgivning av leverns parenchym. Ett mycket oväntat resultat var att bildkvaliteten för 70% dosnivå bedömdes som högre eller likvärdig med 100% dosnivå, vilket innebär att stråldosen kan sänkas med 30% utan förändring i algoritm eller styrka. Resultaten av delarbete III visade att avbildning av njuranatomi var som förväntat för varje fas med fördel för kontrastuppladdningsfaserna jämfört med den nativa fasen. Detta var inte ett oväntat resultat eftersom DT-urografi protokollet är utformat för att visualisera njuranatomi på bästa möjliga sätt. Vid bedömning av patologiska fynd, erhöles dock små och ickesignifikanta skillnader mellan faserna. Däremot noterades signifikant högre

bedömnings säkerhet för patologi i njurarna för de kontrast förstärkta faserna jämfört med nativfasen, och endast för bifynd signifikant högre poäng för parenkymfasen. Delarbete IV visade att styrka 5 jämfört med styrka 3 av den iterativa rekonstruktionsalgoritmen, har olika effekter på bedömningen av bildkvalitetskriterierna. Ökning av MPR-snittjocklek från 1 mm till 2 mm eller 3mm, ger en förbättring i bildkvalité, vilket möjliggör en viss dosreduktion. Den kliniska användbarheten av ADMIRE styrka 5 är begränsad, medan ADMIRE styrka 3 levererar bättre bildkvalitet för samtliga undersökta bildkriterier vid datortomografiundersökning av buken. Den viktigaste slutsatsen av delarbeten I, II och IV är att iterativa rekonstruktionsalgoritmer förbättrar bildkvalitet jämfört med FBP för samma stråldos och en dosminskning är möjlig. Detta kan användas för att optimera det kliniska DT-bukundersöknings protokoll. Slutsatsen för delarbetet III var att en lågdos-DT-bukundersökning är ett av många dosreduceringsalternativ, som möjligen kan användas för att minska strålningsbördan hos vissa patientgrupper som är mer känsliga för röntgenstrålning.

**MDCT: A Practical Approach** - S. Saini 2007-03-14

This book describes current examination techniques and advanced clinical applications of state-of-the-art multidetector computed tomography (MDCT) scanners. There are contributions from several distinguished radiologists and clinicians. Each chapter is written from a practical perspective, so that radiologists, residents, medical physicists, and radiology technologists can obtain relevant information about MDCT applications.

*Guide to Medical Image Analysis* - Klaus D. Toennies 2017-03-29

This comprehensive guide provides a uniquely practical, application-focused introduction to medical image analysis. This fully updated new edition has been enhanced with material on the latest developments in the field, whilst retaining the original focus on segmentation, classification and registration. Topics and features: presents learning objectives, exercises and concluding remarks in each chapter; describes a range of common imaging techniques, reconstruction techniques and image artifacts, and discusses the archival and transfer of images; reviews an expanded selection of techniques for image enhancement, feature detection, feature generation, segmentation, registration, and validation; examines analysis methods in view of image-based guidance in the operating room (NEW); discusses the use of deep convolutional networks for segmentation and labeling tasks (NEW); includes appendices on Markov random field optimization, variational calculus and principal component analysis.

**Applications of X-ray Computed Tomography in the Geosciences** - Florias Mees 2003

X-ray computed tomography (CT) is a technique that allows non-destructive imaging and quantification of internal features of objects. X-ray CT reveals differences in density and atomic composition and can therefore be used for the study of porosity, the relative distribution of contrasting solid phases and the penetration of injected solutions. In this book, various applications of X-ray CT in the geosciences are illustrated by papers covering a wide range of disciplines, including petrology, soil science, petroleum geology, geomechanics and sedimentology.

PET - Michael E. Phelps 2006-12-30

This book is designed to give the reader a solid understanding of the physics and instrumentation aspects of PET, including how PET data are collected and formed into an image. Topics include basic physics, detector technology used in modern PET scanners, data acquisition, and 3D reconstruction. A variety of modern PET imaging systems are also discussed, including those designed for clinical services and research, as well as small-animal imaging. Methods for evaluating the performance of these systems are also outlined. The book will interest nuclear medicine students, nuclear medicine physicians, and technologists.

Computed Tomography of the Coronary Arteries - Mårten Sandstedt 2020-10-20

Computed tomography (CT) is an increasingly used modality for investigations of patients with suspected coronary artery disease (CAD). Technical advances could improve diagnostic accuracy and lead to clinical workflow improvements. Also, more prognostic information can optimize clinical follow-up strategies and treatments. The general aim of this thesis was to explore the use of CT for CAD investigations. Three studies aimed to examine new technologies, including the evaluation of an on-site, computed tomography-based fractional flow reserve (CT-FFR) software (study I), the evaluation of an AI-based, calcium scoring computed tomography (CSCT) software (study III), and the evaluation of an photon-counting detector

(PCD)-CT (study IV). One study aimed to evaluate the long-term prognostic value of coronary computed tomography angiography (CCTA) in symptomatic patients with no history of CAD (study II). The software evaluation studies (study I and III) and the prognostic study (study II) utilized CT data from clinical patients, while the PCD-CT evaluation study (study IV) used CT data from cadaveric specimens. The performances of both software programs were compared with standard references, being represented by fractional flow reserve (FFR) measurements (study I), and coronary artery calcification (CAC) scores from a semi-automatic software (study III), respectively. The PCD-CT performance on CAC quantification was compared with corresponding results from an energy integrating detector (EID)-CT, using micro-CT as the standard reference (study IV). The prognostic study merged registries to identify major adverse cardiac events (MACE), having a follow-up time of up to 7.5 years (study II). The CT-FFR and CSCT software correlation and agreement to corresponding standard references were good and excellent, respectively. Also, both software programs had time-saving potential (study I and III). The CAC quantification was more accurate using PCD-CT than EID-CT (study IV). The prognosis was excellent in patients with normal coronary arteries, and progressively impaired in non-obstructive and obstructive CAD (study II). The results in this thesis convey developmental, technical CT technology advances for CAD investigations. In addition, prognostic follow-up data is communicated. The results may benefit patients by an increased accuracy in the CT evaluation of CAD and can contribute to improve clinical follow-up strategies. Furthermore, the results suggest possibilities to improve the workflow in clinical radiology, which potentially could impact health care costs. Datortomografi (DT) är en kliniskt använd modalitet för utredning av misstänkt kranskärlsjukdom. För att förbättra framtida diagnostik, klinisk effektivitet och uppföljningsstrategier är det av stor vikt med teknisk vidareutveckling, och att erhålla relevant prognostisk information. Syftet med denna avhandling var att studera användandet av DT vid misstänkt kranskärlssjukdom. Tre studier syftade till att utvärdera nya tekniker, vilket innefattade utvärderingar av två nya mjukvaror samt en utvärdering av fotonräknar-DT (FR-DT). En studie syftade till att utvärdera det prognostiska värdet av DT kranskärl. Det första delarbetet utvärderade en mjukvara, som använde data från DT kranskärl för att beräkna tryckfall över misstänkta kranskärlstenoser. Tiden för att erhålla tryckfallsmätningarna registrerades också. Resultaten av tryckfallsmätningarna jämfördes med en standardreferens, vilken utgjordes av invasiva, kateterburna tryckfallsregistreringar. Det andra delarbetet undersökte prognosen för patienter med olika fynd vid DT kranskärl. Genom registersamkörning erhöles data om kranskärlsrelaterad sjukdom med uppföljningstid på upp till 7.5 år. Det tredje delarbetet utvärderade en AI-mjukvara som utförde automatiska mätningar av kranskärlskalk, baserat på kliniskt utförda DT-undersökningar för detta ändamål (calcium scoring). Tiden för att erhålla mätningarna registrerades också. Resultaten jämfördes med en standardreferens, vilken utgjordes av en konventionell, semi-automatisk metod. Det fjärde delarbetet utvärderade förmågan att kvantifiera kranskärlskalk från avlidna med FRDT. Bilder från både FR-DT och DT användes för kvantifiering av kalkvolym och jämfördes med en standardreferens, vilken utgjordes av micro-DT. Korrelationen och överensstämmelsen mellan mjukvarorna och standardreferenserna var god för tryckfallberäkningarna över kranskärlsförträngningar, och mycket god för AI-baserad mätning av kranskärlskalk. Båda mjukvarorna hade tidsbesparande potential. För patienter med normala kranskärl var prognosen utmärkt, men den försämrades med ökad grad av kranskärlssjukdom. Användande av FR-DT bidrog till en bättre noggrannhet än DT vid kvantifiering av kranskärlskalk. Avhandlingen förmedlar värdet av teknisk utveckling vid utredning med DT för misstänkt kranskärlssjukdom. Dessutom presenteras nya, prognostiska data. Resultaten kan gynna patienten genom skärpt diagnostik och mer effektiva utredningar, vilket kan ge framtida ekonomiska effekter. Därtill kan de prognostiska resultaten bidra till förbättrade, kliniska uppföljningsstrategier.

**Computed Tomography** - Willi A. Kalender 2011-07-07

The book offers a comprehensive and user-oriented description of the theoretical and technical system fundamentals of computed tomography (CT) for a wide readership, from conventional single-slice acquisitions to volume acquisition with multi-slice and cone-beam spiral CT. It covers in detail all characteristic parameters relevant for image quality and all performance features significant for clinical application. Readers will thus be informed how to use a CT system to an optimum depending on the different diagnostic requirements. This includes a detailed discussion about the dose required and about

dose measurements as well as how to reduce dose in CT. All considerations pay special attention to spiral CT and to new developments towards advanced multi-slice and cone-beam CT. For the third edition most of the contents have been updated and latest topics like dual source CT, dual energy CT, flat detector CT and interventional CT have been added. The enclosed CD-ROM again offers copies of all figures in the book and attractive case studies, including many examples from the most recent 64-slice acquisitions, and interactive exercises for image viewing and manipulation. This book is intended for all those who work daily, regularly or even only occasionally with CT: physicians, radiographers, engineers, technicians and physicists. A glossary describes all the important technical terms in alphabetical order. The enclosed DVD again offers attractive case studies, including many examples from the most recent 64-slice acquisitions, and interactive exercises for image viewing and manipulation. This book is intended for all those who work daily, regularly or even only occasionally with CT: physicians, radiographers, engineers, technicians and physicists. A glossary describes all the important technical terms in alphabetical order.

**Multislice CT** - M.F. Reiser 2012-12-06

The introduction of multidetector spiral CT into clinical practice is without any doubt one of the most important technical developments in the field of computed tomography in general, and spiral CT in particular, in recent years. Indeed, multislice CT technology, based on the spiral CT technique invented by W. Kalender almost 20 years ago, has opened immense and totally new perspectives for better utilisation of contrast medium during the examination, for optimal multiplanar reconstruction and for increased patient throughput. The potential applications, more specifically in the area of CT angiography of the brain and the heart and vessels, are most interesting and definitely contribute to better patient care as well as to more efficient utilisation of equipment. These exciting new clinical applications explain the keen desire of radiologists and other clinicians to hear and learn more about the first results obtained with this new equipment in daily clinical practice. This book will satisfy their needs. Professor Maximilian F. Reiser was among the first to install multidetector CT in his department in Munich and to gain experience with this new radiological tool. He was also able to organise a very successful and well attended international meeting on this hot topic as early as z 2000 in Starnberg, Germany.