

Introduction To Rf Engineering Atnf

This book summarizes the recent progress in the physics and astrophysics of neutron stars and, most importantly, it identifies and develops effective strategies to explore, both theoretically and observationally, the many remaining open questions in the field. Because of its significance in the solution of many fundamental questions in nuclear physics, astrophysics and gravitational physics, the study of neutron stars has seen enormous progress over the last years and has been very successful in improving our understanding in these fascinating compact objects. The book addresses a wide spectrum of readers, from students to senior researchers. Thirteen chapters written by internationally renowned experts offer a thorough overview of the various facets of this interdisciplinary science, from neutron star formation in supernovae, pulsars, equations of state super dense matter, gravitational wave emission, to alternative theories of gravity. The book was initiated by the European Cooperation in Science and Technology (COST) Action MP1304 "Exploring fundamental physics with compact stars" (NewCompStar).

This book reports on the extraordinary observation of TeV gamma rays from the Crab Pulsar, the most energetic light ever detected from this type of object. It presents detailed information on the painstaking analysis of the unprecedentedly large dataset from the MAGIC telescopes, and comprehensively discusses the implications of pulsed TeV gamma rays for state-of-the-art pulsar emission models. Using these results, the book subsequently explores new testing methodologies for Lorentz Invariance Violation, in terms of a wavelength-dependent speed of light. The book also covers an updated search for Very-High-Energy (VHE), >100 GeV, emissions from millisecond pulsars using the Large Area Telescope on board the Fermi satellite, as well as a study on the promising Pulsar Wind Nebula candidate PSR J0631. The observation of VHE gamma rays is essential to studying the non-thermal sources of radiation in our Universe. Rotating neutron stars, also known as pulsars, are an extreme source class known to emit VHE gamma rays. However, to date only two pulsars have been detected with emissions above 100 GeV, and our understanding of their emission mechanism is still lacking.

Discover a modern approach to the analysis, modeling and design of high sensitivity phased arrays. Network theory, numerical methods and computational electromagnetic simulation techniques are uniquely combined to enable full system analysis and design optimization.

Beamforming and array signal processing theory are integrated into the treatment from the start. Digital signal processing methods such as polyphase filtering and RFI mitigation are described, along with technologies for real-time hardware implementation. Key concepts from interferometric imaging used in radio telescopes are also considered. A basic development of theory and modeling techniques is accompanied by problem sets that guide readers in developing modeling codes that retain the simplicity of the classical array factor method while incorporating mutual coupling effects and interactions between elements. Combining current research trends with pedagogical material suitable for a first-year graduate course, this is an invaluable resource for students, teachers, researchers, and practicing RF/microwave and antenna design engineers.

Big Data in Radio Astronomy: Scientific Data Processing for Advanced Radio Telescopes provides the latest research developments in big data methods and techniques for radio astronomy. Providing examples from such projects as the Square Kilometer Array (SKA), the world's largest radio telescope that generates over an Exabyte of data every day, the book offers solutions for coping with the challenges and opportunities presented by the exponential growth of astronomical data. Presenting state-of-the-art results and research, this book is a timely reference for both practitioners and researchers working in radio astronomy, as well as students looking for a basic understanding of big data in astronomy. Bridges the gap between radio astronomy and computer science Includes coverage of the observation lifecycle as well as data collection, processing and analysis Presents state-of-the-art research and techniques in big data related to radio astronomy Utilizes real-world examples, such as Square Kilometer Array (SKA) and Five-hundred-meter Aperture Spherical radio Telescope (FAST)

An Illustrated History

Opening a New Window on the Universe

Telescope Control Systems

The Emergence of Astrophysics in Asia

Bispecific Antibodies

Principles of Multimessenger Astronomy

Current Developments in Biotechnology and Bioengineering: Crop Modification, Nutrition, and Food Production provides extensive coverage of new developments, state-of-the-art technologies, and potential future trends, presenting data-based scientific knowledge on agribiotechnology and describing world agriculture and the role biotechnology can play in ensuring food security over the next fifty years. The book discusses the effects of climate change in agriculture and the resultant emergence of new crops, including drought tolerant and more nutritious plants. In addition, the book discusses insect and virus resistance in plants and outlines plant metabolic engineering for agriculture, genetically engineered plants, and microbial diseases. Highlights recent developments in agriculture due to biotechnology Relates the effect of climate change in agriculture to the development of new crops Describes the application of metabolic engineering in the development of new genetically modified plants

Development of transgenic crop plants, their utilization for improved agriculture, health, ecology and environment and their socio-political impacts are currently important fields in education, research and industries and also of interest to policy makers, social activists and regulatory and funding agencies. This work prepared with a class-room approach on this multidisciplinary subject will fill an existing gap and meet the requirements of such a broad section of readers. Volume 2 with 13 chapters contributed by 41 eminent scientists from nine countries deliberates on the utilization of transgenic crops for resistance to herbicides, biotic stress and abiotic stress, manipulation of developmental traits, production of biofuel, biopharmaceuticals and algal bioproducts, amelioration of ecology and environment and fostering functional genomics as well as on regulations and steps for commercialization, patent and IPR issues, and compliance to concerns and compulsions of utilizing transgenic plants.

The study of extraterrestrial magnetic fields is a relatively new one, confirmation of the existence of the first such field (that of our Sun) having come as late as 1908. In the past 30 years a great amount of knowledge has been accumulated on Cosmic Magnetism, which has turned out to be a truly fascinating topic for study. Percy Seymour's book is the first to deal with the topic in a non-mathematical way, and he offers a fine introduction to his subject. The first three chapters consolidate our knowledge on magnetism in general and the magnetic field of the Earth, as well as discussing the reasons for studying astronomy and cosmic magnetism in particular. The remainder of the book is devoted to the main areas of cosmic magnetism - solar, planetary and interplanetary fields, fields in stars and pulsars, fields of the milky way and fields in other galaxies. Cosmic Magnetism is an ideal book for sixth-formers and undergraduates studying physics or astronomy and will also appeal to amateur astronomers. as previous work on this topic has been 'hidden' in specialised academic journals.

Expanding the range of antenna frequency is the main objective of this book. Solutions proposed are based on the development of new theoretical methods for analyzing and synthesizing antennas. The book shows that concentrated capacitive loads connected along linear and V-antennas provide a high level of matching with a cable over a wide frequency range and improves directional characteristics of antennas, i.e. increases the communication distance. New theoretical methods are proposed for analysis and synthesis of antennas under consideration: 1) method of calculating directional characteristics of radiators with a given current distribution, and 2) method of electrostatic analogy for calculating mutual and total fields of complex multi-element radiating structures. These methods allow us to obtain optimal

directional characteristics for director-type antennas (arrays of Yagi-Uda) and log-periodic antennas with concentrated capacitances and show that use of capacitors makes it possible to extend the frequency range of the director antennas and to decrease dimensions of the log-periodic antennas. Multi-element (flat and three-dimensional) self-complementary antennas with different variants of connecting generator poles and cable wires to antenna elements are proposed, which improves the matching with a cable. Characteristics of flat structures are compared with characteristics of volume structures: conical, parabolic, and located on a pyramid edges. The book describes new versions of transparent antennas, antennas for cellular communication, multi-tier and multi-radiator antennas, and much more.

Cosmic Magnetism,

Reflections Fifty Years After Jansky's Discovery

Revealing the Most Energetic Light from Pulsars and Their Nebulae

Rulers of an Ancient Maya City

The Square Kilometre Array: An Engineering Perspective

Volume 2: Utilization and Biosafety

This open access book on the history of the National Radio Astronomy Observatory covers the scientific discoveries and technical innovations of late 20th century radio astronomy with particular attention to the people and institutions involved. The authors have made extensive use of the NRAO Archives, which contain an unparalleled collection of documents pertaining to the history of radio astronomy, including the institutional records of NRAO as well as the personal papers of many of the pioneers of U.S. radio astronomy. Technical details and extensive citations to original sources are given in notes for the more technical readers, but are not required for an understanding of the body of the book. This book is intended for an audience ranging from interested lay readers to professional researchers studying the scientific, technical, political, and cultural development of a new science, and how it changed the course of 20th century astronomy.

Radiometric Tracking Techniques for Deep-Space Navigation focuses on a broad array of technologies and concepts developed over the last four decades to support radio navigation on interplanetary spacecraft. In addition to an overview of Earth-based radio navigation techniques, the book includes a simplified conceptual presentation of each radiometric measurement type, its information content, and the expected measurement accuracy. The methods described for both acquiring and calibrating radiometric measurements also provide a robust system to support guidance and navigation for future robotic space exploration. This introduction to the principles of low-temperature engineering emphasizes the design and analysis of cryogenic systems. The new edition includes fresh material on superconductivity, liquid natural gas technology, rectification system design, refrigerators, and instrumentation. SI units are now used throughout the book. Unlike the previous edition, which was designed primarily as a college text, the new edition is written to serve as a professional reference as well, and is particularly useful for mechanical and chemical engineers involved in the design of cryogenic systems. Senior-level and graduate students interested in the fundamentals of cryogenic engineering will find this volume indispensable. This book discusses the study of astronomy in different cultures, applied historical astronomy and history of multi-wavelength astronomy, and the genesis of recent research. It contains peer-reviewed papers gathered from the International Conference on Oriental Astronomy 9 (ICOA-9) held at the Indian Institute of Science Education and Research Pune, India. It covers the areas like megalithic and other prehistoric astronomy, astronomical records in ancient texts, astronomical myths and architecture, astronomical themes in numismatics and rock art, ancient astronomers and their instruments, star maps and star catalogues, historical records and observations of astronomical events, calendars, calendrical science and chronology, the relation between astronomy and mathematics, and maritime astronomy. This book will be a valuable complement to a future generation of students and researchers who develop an interest in the field of Asian and circum-Pacific history of astronomy.

Engineering Nitrogen Utilization in Crop Plants

Gnu Astronomy Utilities

Astronomical Data Manipulation and Analysis

Crop Modification, Nutrition, and Food Production

Portable Life Support Systems

Recollection by pioneers in radio astronomy, to mark the fiftieth anniversary of extraterrestrial radio emission in 1933.

Freeman, Fellow of the Royal Society.

This book summarizes the science to be carried out by the upcoming Cherenkov Telescope Array, a major ground-based gamma-ray observatory that will be constructed over the next six to eight years. The major scientific themes, as well as core program of key science projects, have been developed by the CTA Consortium, a collaboration of scientists from many institutions worldwide. CTA will be the major facility in high-energy and very high-energy photon astronomy over the next decade and beyond. CTA will have capabilities well beyond past and present observatories. Thus, CTA's science program is expected to be rich and broad and will complement other major multiwavelength and multimessenger facilities. This book is intended to be the primary resource for the science case for CTA and it thus will be of great interest to the broader physics and astronomy communities. The electronic version (e-book) is available in open access.

The Maya metropolis of Tikal was once one of the greatest cities in the world, its skyline dominated by huge temple-pyramids. In ad 750 over 100,000 people lived here, in the heart of the Guatemalan rainforest. Today Tikal is a popular site on the Maya tourist itinerary. But why did the city flourish? What does its history reveal about Maya civilization? And why did Tikal collapse? Drawing upon over 30 years of excavation and research, some of it his own, Peter D. Harrison gives a vivid account of the turbulent story of Tikal from 800 bc to the late 9th century ad. Strategically located, the city was a trade centre, an architectural pioneer and a focal point of warfare. The apogee of power and wealth was achieved during the reign of the Jaguar Claw clan, who built the Great Temples, some with tombs of treasures that hint at the richness of life of the lords of Tikal. Illustrated with photographs of artefacts and objects found at the site, remaining structures and a reconstruction of a Tikal king in full regalia, Peter D. Harrison offers a summary of what is known to date of this romantic, mysterious city and its rulers.

Molecular and Genetic Perspectives

NBC 2011. 14-17 June 2011. Aalborg, Denmark

Feedback and Control for Everyone

Drought Stress in Maize (*Zea mays* L.)

Understanding Variable Stars

ICOA-9, Pune, India, 15-18 November 2016

This book focuses on early germination, one of maize germplasm most important strategies for adapting to drought-induced stress. Some genotypes have the ability to adapt by either reducing water losses or by increasing water uptake. Drought tolerance is also an adaptive strategy that enables crop plants to maintain their normal physiological processes and deliver higher economical yield despite drought stress. Several processes are involved in conferring drought tolerance in maize: the accumulation of osmolytes or antioxidants, plant growth regulators, stress proteins and water channel proteins, transcription factors and signal transduction pathways. Drought is one of the most detrimental forms of abiotic stress around the world and seriously limits the productivity of agricultural crops. Maize, one of the leading cereal crops in the world, is sensitive to drought stress. Maize harvests are affected by drought stress at different growth stages in different regions. Numerous events in the life of maize crops can be affected by drought stress: germination potential, seedling growth, seedling stand establishment, overall growth and development, pollen and silk development, anthesis silking interval, pollination, and embryo, endosperm and kernel development. Though every maize genotype has the ability to avoid or withstand drought stress, there is a concrete need to improve the level of adaptability to drought stress to address the global issue of food security. The most common biological strategies for improving drought stress resistance include screening available maize germplasm for drought tolerance, conventional breeding strategies, and marker-assisted and genomic-assisted breeding and development of transgenic maize. As a comprehensive understanding of the effects of drought stress, adaptive strategies and potential breeding tools is the prerequisite for any sound breeding plan, this brief addresses these aspects.

This book was first published in 2007. Variable stars are those that change brightness. Their variability may be due to geometric processes such as rotation, or eclipse by a companion star, or physical processes such as vibration, flares, or cataclysmic explosions. In each case, variable stars provide unique information about the properties of stars, and the processes that go on within them. This book provides a concise overview of variable stars, including a historical perspective, an introduction to stars in general, the techniques for discovering and studying variable stars, and a description of the main types of variable stars. It ends with short reflections about the connection between the study of variable stars, and research, education, amateur astronomy, and public interest in astronomy. This book is intended for anyone with some background knowledge of astronomy, but is especially suitable for undergraduate students and experienced amateur astronomers who can contribute to our understanding of these important stars.

This book discusses and addresses the rapidly increasing world population demand for food, which is expected to double by 2050. To meet these demands farmers will need to improve crop productivity, which relies heavily on nitrogen (N) fertilization. Production of N fertilizers, however, consumes huge amounts of energy and the loss of excess N fertilizers to leaching results in the pollution of waterways and oceans. Therefore, increasing plant nitrogen use efficiency (NUE) is essential to help farmers produce more while conserving the environment. This book assembles some of the best work of top researchers from academic and industrial institutions in the area of NUE and provides valuable insight to scholars and researchers by its comprehensive discussion of current and future strategies to improve NUE through genetic manipulation. This book should also be highly valuable to policy makers, environmentalists, farmers, biotechnology executives, and to the hard-core researchers working in the lab.

The discovery of the first case of superluminal radio jets in our galaxy in 1994 from the bright and peculiar X-ray source GRS 1915+105 has opened the way to a major shift in the direction of studies of stellar-mass accreting binaries. The past decade has seen an impressive increase in multi-wavelength studies. It is now known that all black hole binaries in our galaxy are radio sources and most likely their radio emission originates from a powerful jet. In addition to the spectacular events related to the ejection of superluminal jets, steady jets are known from many systems. Compared with their supermassive cousins, the nuclei of active galaxies, stellar-mass X-ray binaries have the advantage of varying on time scales accessible within a human life (sometimes even much shorter than a second). This has led to the first detailed studies of the relation between accretion and ejection. It is even possible that, excluding their "soft" periods, the majority of the power in gal- tic sources lies in the jets and not in the accretion flows. This means that until a few years ago we were struggling with a physical problem, accretion onto compact objects, without considering one of the most important components of the system. Models that associate part of the high-energy emission and even the fast aperiodic variability to the jet itself are now being proposed and jets can no longer be ignored.

The Early Years of Radio Astronomy

A Conference in Honour of K.C. Freeman, FRS

15th Nordic-Baltic Conference on Biomedical Engineering and Medical Physics

The Physics and Astrophysics of Neutron Stars

The Jet Paradigm

Introduction to Particle and Astroparticle Physics

Big Data in Astronomy Scientific Data Processing for Advanced Radio Telescopes Elsevier

This volume presents the Proceedings of the 15th Nordic-Baltic Conference on Biomedical Engineering and Medical Physics. NBC 2011 brought together science, education and business under the motto "Cooperation for health". The topics covered by the Conference Proceedings include: Imaging,

Biomechanics, Neural engineering, Sport Science, Cardio-pulmonary engineering, Medical Informatics, Ultrasound, Assistive Technology, Telemedicine, and General Biomedical Engineering.

This book examines the ways in which attitudes toward astronomy in Australia, China, India, Indonesia, Japan, South Korea, New Zealand, Taiwan, Thailand and Uzbekistan have changed with the times. The emergence of astrophysics was a worldwide phenomenon during the late nineteenth and early twentieth centuries, and it gradually replaced the older-style positional astronomy, which focused on locating and measuring the movements of the planets, stars, etc.. Here you will find national overviews that are at times followed by case studies of individual notable achievements. Although the emphasis is on the developments that occurred around 1900, later pioneering efforts in Australian, Chinese, Indian and Japanese radio astronomy are also included. As the first book ever published on the early development of astrophysics in Asia, the authors fill a chronological and technological void. Though others have already written about earlier astronomical developments in Asia, and about the recent history of astronomy in various Asian nations, no one has examined the emergence of astrophysics, the so-called 'new astronomy' in Asia during the late nineteenth and early twentieth centuries.

This intriguing and motivating book presents the basic ideas and understanding of control, signals and systems for readers interested in engineering and science. Through a series of examples, the book explores both the theory and the practice of control.

Robust Adaptive Beamforming

Drought Stress Tolerance in Plants, Vol 2

Cryogenic Process Engineering

An Amateur Radio Telescope

Golden Years of Australian Radio Astronomy

Galaxies and their Masks

The GNU Astronomy Utilities (Gnuastro) is an official GNU package consisting of separate programs for the manipulation and analysis of astronomical data. All the various utilities share the same basic command line user interface for the comfort of both the users and developers. GNU Astronomy Utilities is written to comply fully with the GNU coding standards so it integrates finely with the GNU/Linux operating system. This also enables astronomers to expect a fully familiar experience in the source code, building, installing and command line user interaction that they have seen in all the other GNU software that they use.

The year 2017 was marked by increasing uncertainty amid mixed signs of progress. The world enjoyed a strong economic recovery, but global hunger increased as conflicts, famine, and refugee crises persisted. With the withdrawal of the United States from major international agreements, Britain's "Brexit," and rising anti-immigration rhetoric in many countries, the world began to step away from decades of global integration that have yielded unprecedented reductions in poverty and malnutrition. This synopsis of the 2018 Global Food Policy Report reviews the events of 2017, including the impact of rising antiglobalism, and looks at how global integration—through trade, investment, migration, open data, developed country policies, and governance—can be harnessed to benefit our global food system.

The concept of using bispecific antibodies for cancer therapy by retargeting immune effector cells was developed several years ago. Initial clinical studies were rather disappointing mainly due to low efficacy, severe side effects and the immunogenicity of the bispecific antibodies. The progress in antibody engineering finally led to the generation of new classes of bispecific antibodies lacking these obstacles. In addition, new applications were established, such as pre-targeting strategies in radioimmunotherapy and dual targeting approaches in order to improve binding, selectivity and efficacy. In this book, the different ways of generating bispecific antibodies are described, with emphasis on recombinant formats. The various applications of bispecific antibodies, e.g. in cellular cancer immunotherapy, radioimmunotherapy and pretargeting strategies are covered, and emerging applications such as dual targeting strategies, which involve the simultaneous inhibition of two targets, are addressed.

This book introduces particle physics, astrophysics and cosmology. Starting from an experimental perspective, it provides a unified view of these fields that reflects the very rapid advances being made. This new edition has a number of improvements and has been updated to describe the recent discovery of gravitational waves and astrophysical neutrinos, which started the new era of multimessenger astrophysics; it also includes new results on the Higgs particle. Astroparticle and particle physics share a common problem: we still don't have a description of the main ingredients of the Universe from the point of view of its energy budget. Addressing these fascinating issues, and offering a balanced introduction to particle and astroparticle physics that requires only a basic understanding of quantum and classical physics, this book is a valuable resource, particularly for advanced undergraduate students and for those embarking on graduate courses. It includes exercises that offer readers practical insights. It can be used equally well as a self-study book, a reference and a textbook.

Wide-Range Antennas

The Growth and Development of Astronomy and Astrophysics in India and the Asia-Pacific Region

Radiotelescopes

Cryogenic Systems

Handbook of Numerical Analysis

Effects, Resistance Mechanisms, Global Achievements and Biological Strategies for Improvement

The Square Kilometre Array (SKA) Project is a global project to design and construct a revolutionary new radio telescope with of order 1 million square meters of collecting area in the wavelength range from 3m to 1cm. It will have two orders of magnitude greater sensitivity than current telescopes and an unprecedented large instantaneous field-of-view. These capabilities will ensure the SKA will play a leading role in solving the major astrophysical and cosmological questions of the day (see the science case at www.skatelescope.org/pages/page)

astronom.htm). The SKA will complement major ground- and space-based astronomical facilities under construction or planned in other parts of the electromagnetic spectrum (e.g. ALMA, JWST, ELT, XEUS,...). The current schedule for the SKA foresees a decision on the SKA site in 2006, a decision on the design concept in 2009, construction of the first phase (international path) from 2010 to 2013, and construction of the full array from 2014 to 2020. The cost is estimated to be about 1000 M. The SKA Project currently involves 45 institutes in 17 countries, many of which are involved in nationally- or regionally-funded state-of-the-art technical developments being pursued ahead of the 2009 selection of design concept. This Special Issue of Experimental Astronomy provides a snapshot of SKA engineering activity around the world, and is based on presentations made at the SKA meeting in Penticton, BC, Canada in July 2004. Topics covered include antenna concepts, software, signal transport and processing, radio frequency interference mitigation, and reports on related technologies in other radio telescopes now under construction. Further information on the project can be found at www.skatelescope.org.

This book reviews the latest advances in multiple fields of plant biotechnology and the opportunities that plant genetics, genomics and molecular biology have offered for agriculture improvement. Advanced technologies can dramatically enhance our capacity in understanding the molecular basis of traits and utilizing the available resources for accelerated development of high yielding, nutritious, input-use efficient and climate-smart crop varieties. In this book, readers will discover the significant advances in plant genetics, structural and functional genomics, trait and gene discovery, transcriptomics, proteomics, metabolomics, epigenomics, nanotechnology and analytical & decision support tools in breeding. This book appeals to researchers, academics and other stakeholders of global agriculture.

Drought is one of the most severe constraints to crop productivity worldwide, and thus it has become a major concern for global food security. Due to an increasing world population, droughts could lead to serious food shortages by 2050. The situation may worsen due to predicted climatic changes that may increase the frequency, duration and severity of droughts. Hence, there is an urgent need to improve our understanding of the complex mechanisms associated with drought tolerance and to develop modern crop varieties that are more resilient to drought. Identification of the genes responsible for drought tolerance in plants will contribute to our understanding of the molecular mechanisms that could enable crop plants to respond to drought. The discovery of novel drought related genes, the analysis of their expression patterns in response to drought, and determination of the functions these genes play in drought adaptation will provide a base to develop effective strategies to enhance the drought tolerance of crop plants. Plant breeding efforts to increase crop yields in dry environments have been slow to date mainly due to our poor understanding of the molecular and genetic mechanisms involved in how plants respond to drought. In addition, when it comes to combining favourable alleles, there are practical obstacles to developing superior high yielding genotypes fit for drought prone environments. Drought Tolerance in Plants, Vol 2: Molecular and Genetic Perspectives combines novel topical findings, regarding the major molecular and genetic events associated with drought tolerance, with contemporary crop improvement approaches. This volume is unique as it makes available for its readers not only extensive reports of existing facts and data, but also practical knowledge and overviews of state-of-the-art technologies, across the biological fields, from plant breeding using classical and molecular genetic information, to the modern omic technologies, that are now being used in drought tolerance research to breed drought-related traits into modern crop varieties. This book is useful for teachers and researchers in the fields of plant breeding, molecular biology and biotechnology.

Cryogenics, a term commonly used to refer to very low temperatures, had its beginning in the latter half of the last century when man learned, for the first time, how to cool objects to a temperature lower than had ever existed naturally on the face of the earth. The air we breathe was first liquefied in 1883 by a Polish scientist named Olszewski. Ten years later he and a British scientist, Sir James Dewar, liquefied hydrogen. Helium, the last of the so-called permanent gases, was finally liquefied by the Dutch physicist Kamerlingh Onnes in 1908. Thus, by the beginning of the twentieth century the door had been opened to a strange new world of experimentation in which all substances, except liquid helium, are solids and where the absolute temperature is only a few microdegrees away. However, the point on the temperature scale at which refrigeration in the ordinary sense of the term ends and cryogenics begins has never been defined. Most workers in the field have chosen to restrict cryogenics to a temperature range below -150°C (123 K). This is a reasonable dividing line since the normal boiling points of the more permanent gases, such as helium, hydrogen, neon, nitrogen, oxygen, and air, lie below this temperature, while the more common refrigerants have boiling points that are above this temperature. Cryogenic engineering is concerned with the design and development of low-temperature systems and components.

The National Radio Astronomy Observatory and Its Impact on US Radio Astronomy

The Lords of Tikal

Current Developments in Biotechnology and Bioengineering

Science With The Cherenkov Telescope Array

Plant Genetics and Molecular Biology

Scientific Data Processing for Advanced Radio Telescopes

Astronomy has traditionally relied on capturing photons from cosmic sources to be able to understand the Universe. During the 20th and 21st centuries, different messengers have been added to the astronomer's toolset: cosmic rays, neutrinos, and most recently gravitational waves. Each of these messengers opens a new window on the Universe, and a modern astronomer must be familiar with them. As multimessenger astronomy becomes part of the mainstream, each messenger must be understood not only as its own astronomical domain, but as part of a whole endeavour. A broad understanding of these messengers and their relationship to each other is the main goal of this book. The unique physics of each messenger is introduced, as well as the physics of their detection and interpretation. An additional focus is the discussion of techniques and topics that are common to

more than one messenger. Treatments of historical background, the effect of the Earth's atmosphere, the transfer of radiation and measurement techniques are aimed at giving the reader a broad understanding of this new way of observing the cosmos. Principles of multimessenger astronomy is designed to be both an introduction and reference to modern astronomy.

The evolution of Australian radio astronomy from 1945 to 1960 has been studied in detail by numerous historians of science in recent years. This Open Access book is the first to present an overview of this remarkable chapter in Australian science. The book begins in the post-war period, as the Radiophysics Laboratory in Sydney switched from secret wartime research on radar to peacetime applications of this new technology. Next follows the detection of radio waves from space and the ensuing transformation of this fledgling science into the dominant research program at the Radiophysics Lab. Drawing from this history, the book shows how by 1960 the Radiophysics Lab had become the largest and most successful radio astronomy group in the world. The final chapter presents an overview of Australian radio astronomy from 1960 to the present day, as Australia prepares to co-host the multi-national, multi-billion-dollar Square Kilometre Array. Nearly 300 high-quality images complement the text, drawn from a wide range of sources including the extensive collection held by the CSIRO Radio Astronomy Image Archive. The book will be an essential reference for readers interested in the scientific and cultural development of radio astronomy. This book is published open access under a CC BY 4.0 license.

Presents applied heat transfer principles in the range of extremely low temperatures. The specific features of heat transfer at cryogenic temperatures, such as variable properties, near critical convection, and Kapitza resistance, are described. This book includes many example problems, in each section, that help to illustrate the applications of t

The latest research and developments in robust adaptive beamforming Recent work has made great strides toward devising robust adaptive beamformers that vastly improve signal strength against background noise and directional interference. This dynamic technology has diverse applications, including radar, sonar, acoustics, astronomy, seismology, communications, and medical imaging. There are also exciting emerging applications such as smart antennas for wireless communications, handheld ultrasound imaging systems, and directional hearing aids. Robust Adaptive Beamforming compiles the theories and work of leading researchers investigating various approaches in one comprehensive volume. Unlike previous efforts, these pioneering studies are based on theories that use an uncertainty set of the array steering vector. The researchers define their theories, explain their methodologies, and present their conclusions. Methods presented include: * Coupling the standard Capon beamformers with a spherical or ellipsoidal uncertainty set of the array steering vector * Diagonal loading for finite sample size beamforming * Mean-squared error beamforming for signal estimation * Constant modulus beamforming * Robust wideband beamforming using a steered adaptive beamformer to adapt the weight vector within a generalized sidelobe canceller formulation Robust Adaptive Beamforming provides a truly up-to-date resource and reference for engineers, researchers, and graduate students in this promising, rapidly expanding field.

Open Skies

From Microquasars to Quasars

Big Data in Astronomy

Cryogenic Heat Transfer

Radiometric Tracking Techniques for Deep-Space Navigation

Phased Arrays for Radio Astronomy, Remote Sensing, and Satellite Communications