Chapter 6 Meissner Effect In A Superconductor

Ceramic materials have proven increasingly important in industry and in the fields of electronics, communications, optics, transportation, medicine, energy conversion and pollution control, aerospace, construction, and recreation. Professionals in these fields often require an improved understanding of the specific ceramics materials they are using.

Two-dimensional materials created ab initio by the process of condensation of atoms, molecules, or ions, called thin films, have unique properties significantly different from the corresponding bulk materials as a result of their physical dimensions, geometry, nonequilibrium microstructure, and metallurgy. Further, these characteristic features of thin films can be drasti cally modified and tailored to obtain the desired and required physical characteristics. These features form the basis of development of a host of extraordinary active and passive thin film device applications in the last two decades. On the one extreme, these applications are in the submicron dimensions in such areas as very large scale integration (VLSI), Josephson junction quantum interference devices, magnetic bubbles, and integrated optics. On the other extreme, large-area thin films are being used as selective coatings for solar thermal conversion, solar cells for

photovoltaic conver sion, and protection and passivating layers. Indeed, one would be hard pressed to find many sophisticated modern optical and electronic devices which do not use thin films in one way or the other. With the impetus provided by industrial applications, the science and technology of thin films have undergone revolutionary development and even today continue to be recognized globally as frontier areas of RID work. Major technical developments in any field of science and technology are invariably accompanied by an explosion of published literature in the form of scientific publications, reviews, and books.
World-leading researchers, including Nobel Laureates, explore the most basic questions of science, philosophy, and the nature of existence.
This iconoclastic book proposes that superconductivity is misunderstood in contemporary science and that this hampers scientific and technological development. Superconductivity is the ability of some metals to carry electric current without resistance at very low temperatures. Properly understanding superconductivity would facilitate finding materials that superconduct at room temperature, providing great benefits to society.The conventional BCS theory of superconductivity, developed in 1957 and awarded the Nobel Prize in 1972, is generally believed to fully explain the lower temperature 'conventional superconductors' but not the more recently discovered 'high temperature

superconductors', for which the charge carriers are positive holes rather than negative electrons. Instead, this book proposes the holistic view that holes are responsible for superconductivity in all materials. It explains in simple terms how the most fundamental property of all superconductors, that they expel H-fields (the Meissner effect), can be understood with hole carriers and cannot be explained by BCS. It describes the historical development of the conventional theory and why it went astray, and credits pre-BCS researchers for important insights that were forgotten after BCS but are in fact relevant for the proper understanding of superconductivity.

Nanotechnology is a 'catch-all' description of activities at the level of atoms and molecules that have applications in the real world. A nanometer is a billionth of a meter, about 1/80,000 of the diameter of a human hair, or 10 times the diameter of a hydrogen atom. Nanotechnology is now used in precision engineering, new materials development as well as in electronics; electromechanical systems as well as mainstream biomedical applications in areas such as gene therapy, drug delivery and novel drug discovery techniques. This new book presents the latest research from around the world on nanorods, nanotubes and nanomaterials.

Progress in Low Temperature Physics

A concise, accessible, and up-to-date introduction to solid state physics Solid state physics is the foundation of many of today's technologies including LEDs, MOSFET transistors, solar cells, lasers, digital cameras, data storage and processing. Introduction to Solid State Physics for Materials Engineers offers a guide to basic concepts and provides an accessible framework for understanding this highly application-relevant branch of science for materials engineers. The text links the fundamentals of solid state physics to modern materials, such as graphene, photonic and metamaterials, superconducting magnets, high-temperature superconductors and topological insulators. Written by a noted expert and experienced instructor, the book contains numerous worked examples throughout to help the reader gain a thorough understanding of the concepts and information presented. The text covers a wide range of relevant topics, including propagation of electron and acoustic waves in crystals, electrical conductivity in metals and semiconductors, light interaction with metals, semiconductors and dielectrics, thermoelectricity, cooperative phenomena in electron systems, ferroelectricity as a cooperative phenomenon, and more. This important book: Provides a big picture view of solid state physics Contains examples of basic concepts and applications Offers a highly accessible text that fosters real understanding Presents a wealth of helpful worked examples Written for students of materials science, engineering, chemistry and physics, Introduction to Solid

State Physics for Materials Engineers is an important guide to help foster an understanding of solid state physics.

University Physics is designed for the two- or three-semester calculus-based physics course. The text has been developed to meet the scope and sequence of most university physics courses and provides a foundation for a career in mathematics, science, or engineering. The book provides an important opportunity for students to learn the core concepts of physics and understand how those concepts apply to their lives and to the world around them. Due to the comprehensive nature of the material, we are offering the book in three volumes for flexibility and efficiency. Coverage and Scope Our University Physics textbook adheres to the scope and sequence of most two- and three-semester physics courses nationwide. We have worked to make physics interesting and accessible to students while maintaining the mathematical rigor inherent in the subject. With this objective in mind, the content of this textbook has been developed and arranged to provide a logical progression from fundamental to more advanced concepts, building upon what students have already learned and emphasizing connections between topics and between theory and applications. The goal of each section is to enable students not just to recognize concepts, but to work with them in ways that will be useful in later courses and future careers. The organization and pedagogical features were developed and vetted with feedback from science educators dedicated to the project. VOLUME III Unit 1: Optics Chapter 1: The

Nature of Light Chapter 2: Geometric Optics and Image Formation Chapter 3: Interference Chapter 4: Diffraction Unit 2: Modern Physics Chapter 5: Relativity Chapter 6: Photons and Matter Waves Chapter 7: Quantum Mechanics Chapter 8: Atomic Structure Chapter 9: Condensed Matter Physics Chapter 10: Nuclear Physics Chapter 11: Particle Physics and Cosmology

Even Though Thin Solid Films Have Found Tremendous Applications In Electronic, Optical And Other Industries The Basic Concepts About Them Have Often Been Taken Similar To Those Of The Bulk Materials From Which Films Are Prepared And These Need Not Be So. This Book Is Intended To Serve As A Guide To Students, Beginners And Research Workers Interested In This Field.The Basic Science Behind Thin Solid Films Has Been Described With Special Reference To Nucleation, Structures Of Films, Their Growth Process, Phase Transitions, Behaviour Of Films Under Electrical, Electromagnetic And Other Fields With Film Thickness, Temperatures Etc. Characteristic Behaviour Of Films, Different From Bulk, Can Often Be Related To Nearly Two-Dimensional Nature Of Films And Also To The Presence Of Factors Such As Surface States, Contact Potential, High Defect Concentration, Creation Of New Energy Levels, In-Homogeneities, Discontinuities Or Gaps, Etc. Which Are More Often Less Significant In Bulk Materials. Special Techniques Used For Measuring Thin Film Properties And Also Precautions To Be Taken Have Been Given In Details. This Book Also Includes Many Useful Relations Otherwise Scattered In Literatures And Also A

Good Number Of References Though Not Complete But Relevant To The Topics Discussed.

Superconductivity is the ability of certain materials to conduct electrical current with no resistance and extremely low losses. High temperature superconductors, such as La2-xSrxCuOx (Tc=40K) and YBa2Cu3O7-x (Tc=90K), were discovered in 1987 and have been actively studied since. In spite of an intense, world-wide, research effort during this time, a complete understanding of the copper oxide (cuprate) materials is still lacking. Many fundamental questions are unanswered, particularly the mechanism by which high-Tc superconductivity occurs. More broadly, the cuprates are in a class of solids with strong electron-electron interactions. An understanding of such "strongly correlated" solids is perhaps the major unsolved problem of condensed matter physics with over ten thousand researchers working on this topic. High-Tc superconductors also have significant potential for applications in technologies ranging from electric power generation and transmission to digital electronics. This ability to carry large amounts of current can be applied to electric power devices such as motors and generators, and to electricity transmission in power lines. For example, superconductors can carry as much as 100 times the amount of electricity of ordinary copper or aluminium wires of the same size. Many universities, research institutes and companies are working to develop high-Tc superconductivity applications and considerable progress has been made. This volume brings together new leading-edge research in the field.

Superconductivity is among the most fascinating properties that a material can have. Below the transition temperature T_c, electrons condensate into a macroscopic quantum mechanical state and flow without dissipation. The quantum nature of the superconducting state also manifests in its magnetic properties. Superconductors fully expels magnetic field in a weak applied field, referred as Meissner effect. In an intermediate field, superconductors often contain microscopic whirlpools of electrons that carry quantized magnetic flux, called vortices. In this thesis, I present magnetic-force-microscopy (MFM) studies of unconventional superconductors both in the Meissner state and in the mix state. We extend the application of MFM beyond the conventional imaging mode and use it for quantitative analysis. In the mix state, we use MFM manipulating individual vortices with a high level of control and a known force to study the mechanics and dynamics of a single vortex in cuprate superconductors. In the Messiner state, we establish MFM as a novel local technique to measure the magnetic penetration depth λ and implement it to study the pairing mechanism of iron-pnictide superconductors. Chapter 1 contains a brief introduction of MFM and its conventional application of imaging. We demonstrate high-spatial resolution images of isolated superconducting vortices. We show that by integrating images of isolated vortices at consecutive heights we are able to reconstruct the force between the MFM tip and vortices. We can also obtain the force by using a tip-vortex model. The two methods agree and both allow us to obtain the force used in vortex manipulation discussed in Chapter 2 and Chapter 3. Chapter 2 discusses the behavior of individual vortices in fully doped YBa$_2$Cu$_3$O$_{7-\delta}$ when subject to a local force. Because the anisotropy of fully doped YBa$_2$Cu$_3$O$_{7-\delta}$ is moderate, the vortex motion can be well described as an elastic string moving through a uniform three dimensional pinning landscape. We find an unexpected and marked enhancement of the response of a vortex to pulling when we wiggle it transversely. In addition, we find enhanced vortex pinning anisotropy that suggests clustering of oxygen vacancies in our sample. We demonstrate manipulation at the nanoscale with a level of control far beyond what has been reported before. We show that a dragged vortex can be used to probe deep into the bulk of the sample and to interact with microscopic structures much smaller than the tip size. Chapter 3 shows the vortex behavior in another limit. In an very underdoped YBa$_2$Cu$_3$O$_{6+x}$ single crystal, a cuprate superconductor with strong anisotropy, a vortex can be regarded as a stack of two-dimensional pancakes with weak interlayer Josephson coupling. We use the MFM tip to split the pancake stacks composing a single vortex and to produce a kinked structure. Our measurements highlight the discrete nature of stacks of pancake vortices in layered superconductors. We also measure the required force in the process, providing the first measurement of the interlayer coupling at the single vortex level. The discovery of iron-pnictide superconductors in 2008 motivates my efforts to locally measure the magnetic penetration depth λ, one of the two fundamental length scales in superconductors and known to be difficult to measure. Chapter 4 discusses the methodology of measuring λ by MFM, which is based on the time-reversed mirror approximation an analytical model of the MFM tip-superconductor interaction in the Meissner state. A calibration run was performed on \YBCO\ single crystals with known λ. The same time-reversed mirror approximation can be applied to scanning SQUID sysceptometry (SSS) to measure the temperature variation of penetration depth $\Delta\lambda(T)\equiv\lambda(T)-\lambda(0)$. Chapter 5 includes brief introduction of the iron-pnictide superconductors. The multiple conduction bands and the vicinity of the superconducting phase to magnetic phase give additional challenges in λ measurements. We demonstrated in this chapter on single crystals of Ba(Fe$_{0.95}$Co$_{0.05}$)$_2$As$_2$ that MFM can measure the absolute value of λ, as well as obtain its temperature dependence and spatial homogeneity. We observe that $\Delta\lambda(T)$ varies 20 times slower with temperature than previously reported by bulk techniques, and that $\rho_s(T)$ over the full temperature range is well described by a clean two-band fully gapped model, consistent with the proposed $s\pm$ pairing symmetry. Chapter 6 extends the measurements of $\rho_s(T)$ to the family Ba(Fe$_{1-x}$Co$_x$)$_2$As$_2$ with Co doping level x across the superconducting dome. We observe systematic evolution of $\rho_s(T)$ with x that can be summarized as three main trends. First, $\rho_s(0)$ falls more quickly with T_c on the underdoped side of the dome than on the overdoped. Second, the temperature variation of $\rho_s(T)$ at low temperature increases away from optimal doping. Third, $\rho_s(T)$ increases sharply with cooling through the superconducting transition temperature T_c of both optimally doped and underdoped compounds. These observations hint an interplay between magnetism and superconductivity.

This book introduces the physical principles behind levitation with superconductors, and includes many examples of practical magnetic levitation demonstrations using superconducting phenomena. It features more than twenty examples of magnetic levitation in liquid nitrogen using high temperature superconductors and permanent magnets, all invented by the author. The book includes the demonstration of suspension phenomenon induced by magnetic flux pinning as well as magnetic levitation by the Meissner effect. It shows how superconducting magnetic levitation and suspension phenomena fire the imagination and provide scientific insight and inspiration. This book will be a useful experimental guide and teaching resource for those working on superconductivity, and a fascinating text for undergraduate and graduate students.

This book provides the reader with a detailed theoretical treatment of the key mechanisms of superconductivity, up to the current state of the art (phonons, magnons, plasmons). In addition, the book describes the properties of key superconducting compounds that are of most interest for science and its applications today. For many years there has been a search for new materials with higher values of the main parameters, such as the critical temperature and the critical current. At present, the possibility to observe superconductivity at room temperature has become perfectly realistic. The book is especially concerned with high Tc systems, such as the high Tc oxides, hydrides with record values of the critical temperature under high pressure, nanoclusters, etc. A number of interesting novel superconducting systems have been discovered recently. Among them: topological materials, interface systems, intercalated graphene. The book contains rigorous derivations, based on statistical mechanics and many-body theory. The book is also providing qualitative explanations of the main concepts and results, which makes it accessible and interesting for a broader readership.

New Volume 2C edition of the classic text, now more than ever tailored to meet the needs of the struggling student.

This book provides a comprehensive and up-to-date description of the Josephson effect, a topic of never-ending interest in both fundamental and applied physics. In this volume, world-renowned experts present the unique aspects of the physics of the Josephson effect, resulting from the use of new materials, of hybrid architectures and from the possibility of realizing nanoscale junctions. These new experimental capabilities lead to systems where novel coherent phenomena and transport processes emerge. All this is of great relevance and impact, especially when combined with the didactic approach of the book. The reader will benefit from a general and modern view of coherent phenomena in weakly-coupled

superconductors on a macroscopic scale. Topics that have been only recently discussed in specialized papers and in short reviews are described here for the first time and organized in a general framework. An important section of the book is also devoted to applications, with focus on long-term, future applications. In addition to a significant number of illustrations, the book includes numerous tables for comparative studies on technical aspects.
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Sensor technologies have experienced dramatic growth in recent years, making a significant impact on national security, health care, environmental improvement, energy management, food safety, construction monitoring, manufacturing and process control, and more. However, education on sensor technologies has not kept pace with this rapid development ... until now. Resistive, Capacitive, Inductive, and Magnetic Sensor Technologies examines existing, new, and novel sensor technologies and—through real-world examples, sample problems, and practical exercises—illustrates how the related science and engineering principles can be applied across multiple disciplines, offering greater insight into various sensors’ operating mechanisms and practical functions. The book assists readers in understanding resistive, capacitive, inductive, and magnetic (RCIM) sensors, as well as sensors with similar design concepts, characteristics, and circuitry. Resistive, Capacitive, Inductive, and Magnetic Sensor Technologies is a complete and comprehensive overview of RCIM sensing technologies. It takes a unique approach in describing a broad range of sensing technologies and their diverse applications by first reviewing the necessary physics, and then explaining the sensors’ intrinsic mechanisms, distinctive designs, materials and manufacturing methods, associated noise types, signal conditioning circuitry, and practical applications. The text not only covers silicon and metallic sensors but also those made of modern and specialized materials such as ceramics, polymers, and organic substances. It provides cutting-edge information useful to students, researchers, scientists, and practicing professionals involved in the design and application of sensor-based products in fields such as biomedical engineering, mechatronics, robotics, aerospace, and beyond.

This book talks about a novel way of arranging the atomic structure of a substance so that it can be made thousands of times stronger than in its native state. It is often used to make duranium a further ten thousand times stronger. Thus, a lump of duranium can be made over ten million times stronger than the equivalent block of titanium. A one dimensional fullerene (a convex cage of atoms with only hexagonal and/ or pentagonal faces) with a cylindrical shape. Carbon nanotubes discovered in 1991 by Sumio Iijima resemble rolled up graphite, although they can not really be made that way. Depending on the direction that the tubes appear to have been rolled (quantified by the 'chiral vector'), they are known to act as conductors or semiconductors. Nanotubes are proving to be useful as molecular components for nanotechnology. This book assembles and presents new and important research in the field.

According to the syllabus of 1st semester University of Mumbai.

It’s widely accepted that Transcendental Meditation (TM) can create peace for the individual, but can it create peace in society as a whole? And if it can, what could possibly be the mechanism? In An Antidote to Violence Barry Spivack and Patricia Saunders examine the peer-reviewed research and suggest that TM can influence the collective consciousness of a society which leads to a decrease in negative social trends, such as a decline in war fatalities, and to an increase in cooperation between nations. Weaving together psychology, sociology,

philosophy, statistics, politics, physics and meditation, An Antidote to Violence provides evidence that we have the knowledge to reduce all kinds of violence in society.
"Intended mainly for physicists and mathematicians...its high quality will definitely attract a wider audience." ---Computational Mathematics and Mathematical Physics This work acquaints the physicist with the mathematical principles of algebraic topology, group theory, and differential geometry, as applicable to research in field theory and the theory of condensed matter. Emphasis is placed on the topological structure of monopole and instanton solution to the Yang-Mills equations, the description of phases in superfluid 3He, and the topology of singular solutions in 3He and liquid crystals.

The field of superconductivity has tremendous potential for growth and further development in industrial applications. The subject continues to occupy physicists, chemists, and engineers interested in both the phenomena itself and possible financially viable industrial devices utilizing the physical concepts. For the past five years, within the publications of the American Physical Society, for example, 40%-60% of all articles submitted to major journals in the area of Solid State Physics have been on the subject of superconductivity, including the newer, extremely important subfield of high temperature superconductivity (high Tc). The present volume is the first handbook to address this field. It covers both "classic" superconductivity-related topics and high Tc. Numerous properties, including thermal, electrical, magnetic, mechanical, phase diagrams, and spectroscopic crystallographic structures are presented for many types of superconductors. Critical fields, critical currents, coherence lengths, penetration depths, and transition temperatures are tabulated. First handbook on Superconductivity Coherence lengths and depths are tabulated Crystallographic structures of over 100 superconductor types Main results of several theories are submitted Phase diagrams for synthesizing new superconductors are included Statistical physics is a core component of most undergraduate (and some post-graduate) physics degree courses. It is primarily concerned with the behavior of matter in bulk-from boiling water to the superconductivity of metals. Ultimately, it seeks to uncover the laws governing random processes, such as the snow on your TV screen. This essential new textbook guides the reader quickly and critically through a statistical view of the physical world, including a wide range of physical applications to illustrate the methodology. It moves from basic examples to more advanced topics, such as broken symmetry and the Bose-Einstein equation. To accompany the text, the author, a renowned expert in the field, has written a Solutions Manual/Instructor's Guide, available free of charge to lecturers who adopt this book for their courses. Introduction to Statistical Physics will appeal to students and researchers in physics, applied mathematics and statistics.

Superconductivity: Physics and Applications brings together major developments that have occurred within the field over the past twenty years. Taking a truly modern approach to the subject the authors provide an interesting and accessible introduction. Brings a fresh approach to the physics of superconductivity based both on the well established and convergent picture for most low-Tc superconductors, provided by the BCS theory at the microscopic level, and London and Ginzburg-Landau theories at the phenomenological level, as well as on experiences gathered in high-Tc research in recent years. Includes end of chapter problems and numerous relevant examples Features brief interviews with key researchers in the field A prominent feature of the book is the use of SI units throughout, in contrast to many of the current textbooks on the subject which tend to use cgs units and are considered to be outdated Superfluidity – and closely related to it, superconductivity – are very general phenomena that can occur on vastly different energy scales. Their underlying theoretical mechanism of spontaneous symmetry breaking is even more general and applies to a multitude of physical systems. In these lecture notes, a pedagogical introduction to the field-theory approach to superfluidity is presented. The connection to more traditional approaches, often formulated in a different language, is carefully explained in order to provide a consistent picture that is useful for students and researchers in all fields of physics. After introducing the basic concepts, such as the two-fluid model and the Goldstone mode, selected topics of current research are addressed, such as the BCS-BEC crossover and Cooper pairing with mismatched Fermi momenta.

Starting from first principles, this book introduces the closely related phenomena of Bose condensation and Cooper pairing, in which a very large number of single particles or pairs of particles are forced to behave in exactly the same way, and explores their consequences in condensed matter systems. Eschewing advanced formal methods, the author uses simple concepts and arguments to account for the various qualitatively new phenomena which occur in Bose-condensed and Cooper-paired systems, including but not limited to the spectacular macroscopic phenomena of superconductivity and superfluidity. The physical systems discussed include liquid 4-He, the BEC alkali gases, "classical" superconductors, superfluid 3-He, "exotic" superconductors and the recently stabilized Fermi alkali gases. The book should be accessible to beginning graduate students in physics or advanced undergraduates.

Drawn from the author's introductory course at the University of Orsay, Superconductivity of Metals and Alloys is intended to explain the basic knowledge of superconductivity for both experimentalists and theoreticians.

These notes begin with an elementary discussion of magnetic properties of Type I and Type II superconductors. The microscopic theory is then built up in the Bogolubov language of self-consistent fields. This text provides the classic, fundamental basis for any work in the field of superconductivity.

Quantum Theory of Solids presents a concisely-structured tour of the theory relating to chemical bonding and its application to the three most significant topics in solid state physics: semiconductors, magnetism, and superconductivity--topics that have seen major advances in recent years. This is a unique treatment that develops the concepts of quantum theory for the solid state from the basics through to an advanced level, encompassing additional quantum mechanics techniques, such as the variational method and perturbation theory. Written at the senior undergraduate/masters level, it provides an exceptional grounding in the subject.

Engineering Physics is designed to cater to the needs of first year undergraduate engineering students. This book assimilates the best practices of conceptual pedagogy, dealing at length with various topics such as crystallography, principles of qu

First published in 1969. CRC Press is an imprint of Taylor & Francis.

Introduction to Superconductivity differs from the first edition chiefly in Chapter 11, which has been almost completely rewritten to give a more physically-based picture of the effects arising from the long-range coherence of the electron-waves in superconductors and the operation of quantum interference devices. In this revised second edition, some further modifications have been made to the text and an extra chapter dealing with ""high-temperature"" superconductors has been added. A vast amount of research has been carried out on these since their discovery in 1986 but the results, both theoretical and experimental, have often been contradictory, and seven years later there remains little understanding of their behavior. This book comprises 14 chapters, with the first focusing on zero resistance. Succeeding chapters then discuss perfect diamagnetism; electrodynamics; the critical magnetic field; thermodynamics of the transition; the intermediate state; and transport currents in superconductors. Other chapters cover the superconducting properties of small specimens; the microscopic theory of superconductivity; tunneling and the energy gap; coherence of the electron-pair wave; the mixed state; critical currents of type-II superconductors; and high-temperature superconductors. This book will be of interest to practitioners in the fields of superconductivity and solid-state physics.

Theory of Superconductivity is primarily intended to serve as a background for reading the literature in which detailed applications of the microscopic theory of superconductivity are made to specific problems.

What is matter? Matter is the stuff from which we and all the things in the world are made. Everything around us, from desks, to books, to our own bodies are made of atoms, which are small enough that a million of them can fit across the breadth of a human hair. Inside every atom is a tiny nucleus and orbiting the nucleus is a cloud of electrons. The nucleus is made out of protons and neutrons, and by zooming in further you would find that inside each there are even smaller particles, quarks. Together with electrons, the quarks are the smallest particles that have been seen, and are the indivisible fundamental particles of nature that have existed since the Big Bang, almost 14 billion years ago. The 92 different chemical elements that all normal matter is made from were forged billions of years ago in the Big Bang, inside stars, and in violent stellar explosions. This Very Short Introduction takes us on a journey from the human scale of matter in the familiar everyday forms of solids, liquids, and gases to plasmas, exotic forms of quantum matter, and antimatter. On the largest scales matter is sculpted by gravity into planets, stars, galaxies, and vast clusters of galaxies. All the matter that that we normally encounter however constitutes only 5% of the matter that exists. The remaining 95% comes in two mysterious forms: dark matter, and dark energy. Dark matter is necessary to stop the galaxies from flying apart, and dark energy is needed to explain the observed acceleration of the expansion of the universe. Geoff Cottrell explores the latest research into matter, and shows that there is still a lot we don't know about the stuff our universe is made of. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.