
The Oxford Solid State Basics

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Verdict of The Oxford Solid State Basics

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FINAL THOUGHT

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The Oxford Solid State Basics *Oxford University Press*

This is a first undergraduate textbook in Solid State Physics or Condensed Matter Physics. While most textbooks on the subject are extremely dry, this book is written to be much more exciting, inspiring, and entertaining.

The Oxford Solid State Basics *OUP Oxford*

The study of solids is one of the richest, most exciting, and most successful branches of physics. While the subject of solid state physics is often viewed as dry and tedious this new book presents the topic instead as an exciting exposition of fundamental principles and great intellectual breakthroughs. Beginning with a discussion of how the study of heat capacity of solids ushered in the quantum revolution, the author presents the key ideas of the field while emphasizing the deep underlying concepts. The book begins with a discussion of the Einstein/Debye model of specific heat, and the Drude/Sommerfeld theories of electrons in solids, which can all be understood without reference to any underlying crystal structure. The failures of these theories force a more serious investigation of microscopics. Many of the key ideas

about waves in solids are then introduced using one dimensional models in order to convey concepts without getting bogged down with details. Only then does the book turn to consider real materials. Chemical bonding is introduced and then atoms can be bonded together to crystal structures and reciprocal space results. Diffraction experiments, as the central application of these ideas, are discussed in great detail. From there, the connection is made to electron wave diffraction in solids and how it results in electronic band structure. The natural culmination of this thread is the triumph of semiconductor physics and devices. The final section of the book considers magnetism in order to discuss a range of deeper concepts. The failures of band theory due to electron interaction, spontaneous magnetic orders, and mean field theories are presented well. Finally, the book gives a brief exposition of the Hubbard model that undergraduates can understand. The book presents all of this material in a clear fashion, dense with explanatory or just plain entertaining footnotes. This may be the best introductory book for learning solid state physics. It is certainly the most fun to read.

The Oxford Solid State Basics *OUP Oxford*

This is a first undergraduate textbook in Solid State Physics or Condensed Matter Physics. While most textbooks on the subject are extremely dry, this book is written to be much more exciting, inspiring, and entertaining.

Condensed Matter Physics *John Wiley & Sons*

Now updated—the leading single-volume introduction to solid state and soft condensed matter physics This Second Edition of

the unified treatment of condensed matter physics keeps the best of the first, providing a basic foundation in the subject while addressing many recent discoveries. Comprehensive and authoritative, it consolidates the critical advances of the past fifty years, bringing together an exciting collection of new and classic topics, dozens of new figures, and new experimental data. This updated edition offers a thorough treatment of such basic topics as band theory, transport theory, and semiconductor physics, as well as more modern areas such as quasicrystals, dynamics of phase separation, granular materials, quantum dots, Berry phases, the quantum Hall effect, and Luttinger liquids. In addition to careful study of electron dynamics, electronics, and superconductivity, there is much material drawn from soft matter physics, including liquid crystals, polymers, and fluid dynamics. Provides frequent comparison of theory and experiment, both when they agree and when problems are still unsolved Incorporates many new images from experiments Provides end-of-chapter problems including computational exercises Includes more than fifty data tables and a detailed forty-page index Offers a solutions manual for instructors Featuring 370 figures and more than 1,000 recent and historically significant references, this volume serves as a valuable resource for graduate and undergraduate students in physics, physics professionals, engineers, applied mathematicians, materials scientists, and researchers in other fields who want to learn about the quantum and atomic underpinnings of materials science from a modern point of view.

Advanced Solid State Physics *Cambridge University Press*

Introduces students to the key research topics within modern solid state physics with the minimum of mathematics.

Modern Condensed Matter Physics *Cambridge University Press*

Comprehensive and accessible coverage from the basics to advanced topics in modern quantum condensed matter physics.

Principles of the Theory of Solids *Cambridge University Press*

Professor Ziman's classic textbook on the theory of solids was first published in 1964. This paperback edition is a reprint of the second edition, which was substantially revised and enlarged in 1972. The value and popularity of this textbook is well attested by reviewers' opinions and by the existence of several foreign language editions, including German, Italian, Spanish, Japanese, Polish and Russian. The book gives a clear exposition of the elements of the physics of perfect crystalline solids. In discussing the principles, the author aims to give students an appreciation of the conditions which are necessary for the appearance of the various phenomena. A self-contained mathematical account is given of the simplest model that will demonstrate each principle. A grounding in quantum mechanics and knowledge of elementary facts about solids is assumed. This is therefore a textbook for advanced undergraduates and is also appropriate for graduate courses.

Band Theory and Electronic Properties of Solids *OUP Oxford*

This book provides an introduction to band theory and the electronic properties of materials at a level suitable for final-year

undergraduates or first-year graduate students. It sets out to provide the vocabulary and quantum-mechanical training necessary to understand the electronic, optical and structural properties of the materials met in science and technology and describes some of the experimental techniques which are used to study band structure today. In order to leave space for recent developments, the Drude model and the introduction of quantum statistics are treated synoptically. However, Bloch's theorem and two tractable limits, a very weak periodic potential and the tight-binding model, are developed rigorously and in three dimensions. Having introduced the ideas of bands, effective masses and holes, semiconductor and metals are treated in some detail, along with the newer ideas of artificial structures such as superlattices and quantum wells, layered organic substances and oxides. Some recent 'hot topics' in research are covered, e.g. the fractional Quantum Hall Effect and nano-devices, which can be understood using the techniques developed in the book. In illustrating examples of e.g. the de Haas-van Alphen effect, the book focuses on recent experimental data, showing that the field is a vibrant and exciting one. References to many recent review articles are provided, so that the student can conduct research into a chosen topic at a deeper level. Several appendices treating topics such as phonons and crystal structure make the book self-contained introduction to the fundamentals of band theory and electronic properties in condensed matter physics today.

Magnetism in Condensed Matter *OUP Oxford*

An understanding of the quantum mechanical nature of magnetism has led to the development of new magnetic

materials which are used as permanent magnets, sensors, and information storage. Behind these practical applications lie a range of fundamental ideas, including symmetry breaking, order parameters, excitations, frustration, and reduced dimensionality. This superb new textbook presents a logical account of these ideas, starting from basic concepts in electromagnetism and quantum mechanics. It outlines the origin of magnetic moments in atoms and how these moments can be affected by their local environment inside a crystal. The different types of interactions which can be present between magnetic moments are described. The final chapters of the book are devoted to the magnetic properties of metals, and to the complex behaviour which can occur when competing magnetic interactions are present and/or the system has a reduced dimensionality. Throughout the text, the theoretical principles are applied to real systems. There is substantial discussion of experimental techniques and current research topics. The book is copiously illustrated and contains detailed appendices which cover the fundamental principles.

The Physics of Solids *Oxford University Press*

This comprehensive text covers the basic physics of the solid state starting at an elementary level suitable for undergraduates but then advancing, in stages, to a graduate and advanced graduate level. In addition to treating the fundamental elastic, electrical, thermal, magnetic, structural, electronic, transport, optical, mechanical and compositional properties, we also discuss topics like superfluidity and superconductivity along with special topics such as strongly correlated systems, high-temperature superconductors, the quantum Hall effects, and graphene.

Particular emphasis is given to so-called first principles calculations utilizing modern density functional theory which for many systems now allow accurate calculations of the electronic, magnetic, and thermal properties.

Solid State Theory *Courier Corporation*

DIVThorough, modern study of solid state physics; solid types and symmetry, electron states, electronic properties and cooperative phenomena. /div

Introduction to Solid State Physics

The Solid State

An Introduction to the Physics of Solid...

Solid State Physics

An Introduction *John Wiley & Sons*

A must-have textbook for any undergraduate studying solid state physics. This successful brief course in solid state physics is now in its second edition. The clear and concise introduction not only describes all the basic phenomena and concepts, but also such advanced issues as magnetism and superconductivity. Each section starts with a gentle introduction, covering basic principles, progressing to a more advanced level in order to present a comprehensive overview of the subject. The book is providing qualitative discussions that help undergraduates understand concepts even if they can't follow all the

mathematical detail. The revised edition has been carefully updated to present an up-to-date account of the essential topics and recent developments in this exciting field of physics. The coverage now includes ground-breaking materials with high relevance for applications in communication and energy, like graphene and topological insulators, as well as transparent conductors. The text assumes only basic mathematical knowledge on the part of the reader and includes more than 100 discussion questions and some 70 problems, with solutions free to lecturers from the Wiley-VCH website. The author's webpage provides Online Notes on x-ray scattering, elastic constants, the quantum Hall effect, tight binding model, atomic magnetism, and topological insulators. This new edition includes the following updates and new features: * Expanded coverage of mechanical properties of solids, including an improved discussion of the yield stress * Crystal structure, mechanical properties, and band structure of graphene * The coverage of electronic properties of metals is expanded by a section on the quantum hall effect including exercises. New topics include the tight-binding model and an expanded discussion on Bloch waves. * With respect to semiconductors, the discussion of solar cells has been extended and improved. * Revised coverage of magnetism, with additional material on atomic magnetism * More extensive treatment of finite solids and nanostructures, now including topological insulators * Recommendations for further reading have been updated and increased. * New exercises on Hall mobility, light penetrating metals, band structure

Condensed Matter Field Theory *Cambridge University Press*

Modern experimental developments in condensed matter and ultracold atom physics present formidable challenges to theorists. This book provides a pedagogical introduction to quantum field theory in many-particle physics, emphasizing the applicability of the formalism to concrete problems. This second edition contains two new chapters developing path integral approaches to classical and quantum nonequilibrium phenomena. Other chapters cover a range of topics, from the introduction of many-body techniques and functional integration, to renormalization group methods, the theory of response functions, and topology. Conceptual aspects and formal methodology are emphasized, but the discussion focuses on practical experimental applications drawn largely from condensed matter physics and neighboring fields. Extended and challenging problems with fully worked solutions provide a bridge between formal manipulations and research-oriented thinking. Aimed at elevating graduate students to a level where they can engage in independent research, this book complements graduate level courses on many-particle theory.

Elementary Solid State Physics

Principles and Applications *Pearson Education India*

Introduction to Solid State Physics

Understanding Solid State Physics *CRC Press*

Keeping the mathematics to a minimum yet losing none of the required rigor, *Understanding Solid State Physics*, Second Edition

clearly explains basic physics principles to provide a firm grounding in the subject. This new edition has been fully updated throughout, with recent developments and literature in the field, including graphene and the use of quasicrystalline materials, in addition to featuring new journalistic boxes and the reciprocal lattice. The author underscores the technological applications of the physics discussed and emphasizes the multidisciplinary nature of scientific research. After introducing students to solid state physics, the text examines the various ways in which atoms bond together to form crystalline and amorphous solids. It also describes the measurement of mechanical properties and the means by which the mechanical properties of solids can be altered or supplemented for particular applications. The author discusses how electromagnetic radiation interacts with the periodic array of atoms that make up a crystal and how solids react to heat on both atomic and macroscopic scales. She then focuses on conductors, insulators, semiconductors, and superconductors, including some basic semiconductor devices. The final chapter addresses the magnetic properties of solids as well as applications of magnets and magnetism. This accessible textbook provides a useful introduction to solid state physics for undergraduates who feel daunted by a highly mathematical approach. By relating the theories and concepts to practical applications, it shows how physics is used in the real world. Key features: Fully updated throughout, with new journalistic boxes and recent applications Uses an accessible writing style and format, offering journalistic accounts of interesting research, worked examples, self-test questions, and a helpful glossary of frequently used terms Highlights various technological

applications of physics, from locomotive lights to medical scanners to USB flash drives

Solid-State Physics

Introduction to the Theory *Springer Science & Business Media*

While the standard solid state topics are covered, the basic ones often have more detailed derivations than is customary (with an emphasis on crystalline solids). Several recent topics are introduced, as are some subjects normally included only in condensed matter physics. Lattice vibrations, electrons, interactions, and spin effects (mostly in magnetism) are discussed the most comprehensively. Many problems are included whose level is from "fill in the steps" to long and challenging, and the text is equipped with references and several comments about experiments with figures and tables.

Solid State Physics: Essential Concepts *Pearson Education India*

Semiconductor Nanostructures

Quantum States and Electronic Transport *Oxford University Press*

This introduction to the physics of semiconductor nanostructures and their transport properties emphasizes five fundamental transport phenomena: quantized conductance, tunnelling transport, the Aharonov-Bohm effect, the quantum Hall effect and the Coulomb blockade effect.

Soft Condensed Matter *Oxford University Press*

This text offers an introduction to the properties and behaviour of soft matter. It begins with a treatment of the underlying principles, then discusses how the properties of certain substances and systems are treated within this framework.

Feynman Diagram Techniques in Condensed Matter Physics *Cambridge University Press*

An introduction to the application of Feynman diagram techniques for researchers and advanced undergraduate students in condensed matter theory and many-body physics.

Quantum Transport**Introduction to Nanoscience** *Cambridge University Press*

Quantum transport is a diverse field, sometimes combining seemingly contradicting concepts - quantum and classical, conduction and insulating - within a single nanodevice. Quantum transport is an essential and challenging part of nanoscience, and understanding its concepts and methods is vital to the successful fabrication of devices at the nanoscale. This textbook is a comprehensive introduction to the rapidly developing field of quantum transport. The authors present the comprehensive theoretical background, and explore the groundbreaking experiments that laid the foundations of the field. Ideal for graduate students, each section contains control questions and exercises to check readers' understanding of the topics covered. Its broad scope and in-depth analysis of selected topics will appeal to researchers and professionals working in nanoscience.

An Introduction to Thermal Physics *Oxford University Press, USA*

This is a textbook for the standard undergraduate-level course in thermal physics. The book explores applications to engineering, chemistry, biology, geology, atmospheric science, astrophysics, cosmology, and everyday life.

Biology**The Core, Books a La Carte Edition****Basic Aspects of the Quantum Theory of Solids****Order and Elementary Excitations** *Cambridge University Press*

Aimed at graduate students and researchers, this book covers the key aspects of the modern quantum theory of solids, including up-to-date ideas such as quantum fluctuations and strong electron correlations. It presents in the main concepts of the modern quantum theory of solids, as well as a general description of the essential theoretical methods required when working with these systems. Diverse topics such as general theory of phase transitions, harmonic and anharmonic lattices, Bose condensation and superfluidity, modern aspects of magnetism including resonating valence bonds, electrons in metals, and strong electron correlations are treated using unifying concepts of order and elementary excitations. The main theoretical tools used to treat these problems are introduced and explained in a simple way, and their applications are demonstrated through concrete examples.

Laser Physics *OUP Oxford*

An up-to-date perspective on laser technology for students at advanced undergraduate or introductory graduate level. The principles of operation and applications of modern laser systems are analysed in detail. The text has over 300 diagrams and each chapter is accompanied with questions (solutions available on application).

Spin Physics in Semiconductors *Springer Science & Business Media*

The purpose of this collective book is to present a non-exhaustive survey of sp- related phenomena in semiconductors with a focus on recent research. In some sense it may be regarded as an updated version of the Optical Orientation book, which was entirely devoted to spin physics in bulk semiconductors. During the 24 years that have elapsed, we have witnessed, on the one hand, an extraordinary development in the wonderful semiconductor physics in two dimensions with the accompanying revolutionary applications. On the other hand, during the last maybe 15 years there was a strong revival in the interest in spin phenomena, in particular in low-dimensional semiconductor structures. While in the 1970s and 1980s the entire world population of researchers in the field never exceeded 20 persons, now it can be counted by the hundreds and the number of publications by the thousands. This explosive growth is stimulated, to a large extent, by the hopes that the electron and/or nuclear spins in a semiconductor will help to accomplish the dream of factorizing large numbers by quantum computing and eventually to develop a new spin-based electronics, or

“spintronics”. Whether any of this will happen or not, still remains to be seen. Anyway, these ideas have resulted in a large body of interesting and exciting research, which is a good thing by itself. The field of spin physics in semiconductors is extremely rich and interesting with many spectacular effects in optics and transport.

Quantum Theory of Materials *Cambridge University Press*

An accessible overview of the concepts and tools essential to the physics of materials, with applications, exercises, and color figures.

Solid State Physics *John Wiley & Sons*

The ideal companion in condensed matter physics - now in new and revised edition. Solving homework problems is the single most effective way for students to familiarize themselves with the language and details of solid state physics. Testing problem-solving ability is the best means at the professor's disposal for measuring student progress at critical points in the learning process. This book enables any instructor to supplement end-of-chapter textbook assignments with a large number of challenging and engaging practice problems and discover a host of new ideas for creating exam questions. Designed to be used in tandem with any of the excellent textbooks on this subject, Solid State Physics: Problems and Solutions provides a self-study approach through which advanced undergraduate and first-year graduate students can develop and test their skills while acclimating themselves to the demands of the discipline. Each problem has been chosen for its ability to illustrate key concepts, properties, and systems, knowledge of which is crucial in developing a

complete understanding of the subject, including: * Crystals, diffraction, and reciprocal lattices. * Phonon dispersion and electronic band structure. * Density of states. * Transport, magnetic, and optical properties. * Interacting electron systems. * Magnetism. * Nanoscale Physics.

Optics F2f

From Fourier to Fresnel *Oxford University Press, USA*

This textbook on optics provides an introduction to key concepts of wave optics and light propagation. It uniquely makes extensive use of Fourier methods and the angular-spectrum approach, especially to provide a unified approach to Fraunhofer and Fresnel diffraction. A recurring theme is that simple building blocks such as plane and spherical waves can be summed to construct useful solutions. The text pays particular attention to analysing topics in contemporary optics such as propagation, dispersion, laser beams and wave guides, apodisation, tightly-focused vector fields, unconventional polarization states, and light-matter interactions. Throughout the text, the principles are applied through worked examples, and the book is copiously illustrated with more than 240 figures. The 200 end-of-chapter exercises offer further opportunities for testing the reader's understanding.

Solid State Materials Chemistry *Cambridge University Press*

A modern and thorough treatment of the field for upper-level undergraduate and graduate courses in materials science and chemistry.

Introduction to Quantum Mechanics *Cambridge University Press*

Changes and additions to the new edition of this classic textbook include a new chapter on symmetries, new problems and examples, improved explanations, more numerical problems to be worked on a computer, new applications to solid state physics, and consolidated treatment of time-dependent potentials.

Solid State and Semiconductor Physics

Solid State Chemistry

An Introduction *CRC Press*

"A comprehensive guide to solid-state chemistry which is ideal for all undergraduate levels. It covers well the fundamentals of the area, from basic structures to methods of analysis, but also introduces modern topics such as sustainability." Dr. Jennifer Readman, University of Central Lancashire, UK "The latest edition of Solid State Chemistry combines clear explanations with a broad range of topics to provide students with a firm grounding in the major theoretical and practical aspects of the chemistry of solids." Professor Robert Palgrave, University College London, UK Building a foundation with a thorough description of crystalline structures, this fifth edition of Solid State Chemistry: An Introduction presents a wide range of the synthetic and physical techniques used to prepare and characterise solids. Going beyond this, this largely nonmathematical introduction to solid-state chemistry includes the bonding and electronic, magnetic, electrical, and optical properties of solids. Solids of particular

interest—porous solids, superconductors, and nanostructures—are included. Practical examples of applications and modern developments are given. It offers students the opportunity to apply their knowledge in real-life situations and will serve them well throughout their degree course. New in the Fifth Edition A new chapter on sustainability in solid-state chemistry written by an expert in this field Cryo-electron microscopy X-ray photoelectron spectroscopy (ESCA) Covalent organic frameworks Graphene oxide and bilayer graphene Elaine A. Moore studied chemistry as an undergraduate at Oxford University and then stayed on to complete a DPhil in theoretical chemistry with Peter Atkins. After a two-year postdoctoral position at the University of Southampton, she joined the Open University in 1975, becoming a lecturer in chemistry in 1977, senior lecturer in 1998, and reader in 2004. She retired in 2017 and currently has an honorary position at the Open University. She has produced OU teaching texts in chemistry for courses at levels 1, 2, and 3 and written texts in astronomy at level 2 and physics at level 3. She was team leader for the production and presentation of an Open University level 2 chemistry module delivered entirely online. She is a Fellow of the Royal Society of Chemistry and a Senior Fellow of the Higher Education Academy. She was co-chair for the successful Departmental submission of an Athena Swan bronze award. Lesley E. Smart studied chemistry at Southampton University, United Kingdom. After completing a PhD in Raman spectroscopy, she moved to a lectureship at the (then) Royal University of Malta. After returning to the United Kingdom, she took an SRC Fellowship to Bristol University to work on X-ray crystallography. From 1977 to 2009, she worked at the

Open University chemistry department as a lecturer, senior lecturer, and Molecular Science Programme director, and she held an honorary senior lectureship there until her death in 2016. At the Open University, she was involved in the production of undergraduate courses in inorganic and physical chemistry and health sciences. She served on the Council of the Royal Society of Chemistry and as the chair of their Benevolent Fund.

A Journey into Reciprocal Space

A Crystallographer's Perspective *Morgan & Claypool Publishers*

The concept of reciprocal space is over 100 years old, and has been of particular use by crystallographers in order to understand the patterns of spots when x-rays are diffracted by crystals. However, it has a much more general use, especially in the physics of the solid state. In order to understand what it is, how to construct it and how to make use of it, it is first necessary to start with the so-called real or direct space and then show how reciprocal space is related to it. Real space describes the objects we see around us, especially with regards to crystals, their physical shapes and symmetries and the arrangements of atoms within: the so-called crystal structure. Reciprocal space on the other hand deals with the crystals as seen through their diffraction images. Indeed, crystallographers are accustomed to working backwards from the diffraction images to the crystal structures, which we call crystal structure solution. In solid state physics, one usually works the other way, starting with reciprocal space to explain various solid-state properties, such as thermal

and electrical phenomena. In this book, I start with the crystallographer's point of view of real and reciprocal space and then proceed to develop this in a form suitable for physics applications. Note that while for the crystallographer reciprocal space is a handy means of dealing with diffraction, for the solid-state physicist it is thought of as a way to describe the formation and motion of waves, in which case the physicist thinks of reciprocal space in terms of momentum or wave-vector k -space. This is because, for periodic structures, a characteristic of normal crystals, elementary quantum excitations, e.g. phonons and electrons, can be described both as particles and waves. The treatment given here, will be by necessity brief, but I would hope that this will suffice to lead the reader to build upon the concepts described. I have tried to write this book in a suitable form for both undergraduate and graduate students of what today we call "condensed matter physics."

Materials Modelling Using Density Functional Theory

Properties and Predictions *Oxford University Press*

The book explains the fundamental ideas of density functional theory, and how this theory can be used as a powerful method for explaining and even predicting the properties of materials with stunning accuracy.

Atomic Physics *Oxford University Press*

This book describes atomic physics and the latest advances in this field at a level suitable for fourth year undergraduates. The numerous examples of the modern applications of atomic physics include Bose-Einstein condensation of atoms, matter-wave interferometry and quantum computing with trapped ions.

The Coding Manual for Qualitative Researchers *SAGE*

The Second Edition of Johnny Saldaña's international bestseller provides an in-depth guide to the multiple approaches available for coding qualitative data. Fully up to date, it includes new chapters, more coding techniques and an additional glossary. Clear, practical and authoritative, the book: -describes how coding initiates qualitative data analysis -demonstrates the writing of analytic memos -discusses available analytic software -suggests how best to use The Coding Manual for Qualitative Researchers for particular studies. In total, 32 coding methods are profiled that can be applied to a range of research genres from grounded theory to phenomenology to narrative inquiry. For each approach, Saldaña discusses the method's origins, a description of the method, practical applications, and a clearly illustrated example with analytic follow-up. A unique and invaluable reference for students, teachers, and practitioners of qualitative inquiry, this book is essential reading across the social sciences.