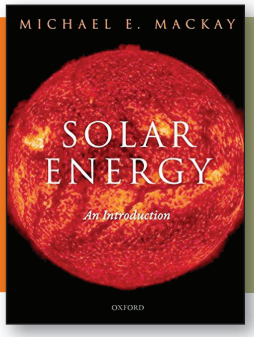


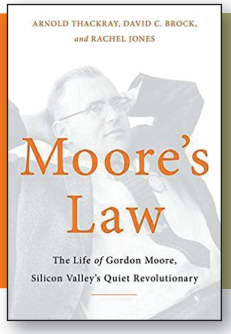
Solar Energy: An Introduction
Michael E. Mackay
Oxford University Press, 2015
336 pages, $98.50
(paperback $49.95, e-book $48.99)
ISBN 978-0-19-965210-5

This book provides an introduction to all aspects of solar energy, from photovoltaic devices to active and passive solar thermal energy conversion. Its main characteristic is that it helps to gain an overview on these topics and at the same time provides some detailed knowledge with emphasis on the quantitative approach.

The book deals with both photovoltaics (PV) and solar thermal energy processes. The first chapter explains why it is important to use solar energy, the current energy usage on Earth, and the practical advantages of using PV technologies. Chapter 2 describes the reactions taking place in the core of the sun and producing solar light, and calculates through earth-sun geometric relations the amount of solar light reaching the earth's atmosphere and what part of the irradiation arrives on a terrestrial device. The third chapter provides the basic principles used in the rest of the book, such as the laws of thermodynamics and explanations of the properties of the optimal materials for PV and for solar thermal applications. Chapter 4 discusses semiconductor physics that is fundamental to a deep understanding of device functionality. The fifth chapter covers absorption and explains how much radiation can be absorbed by a semiconductor to generate current (in a solar cell) or heat energy (in solar thermal devices), depending on the material electronic structure. The next chapter describes how a solar cell works and what the electrical characteristics look like; the diode equation is derived, the important parasitic effects—such as shunt and series resistance—are determined, and their effect on cell performance is illustrated. Next, the author discusses solar towers where heated air is channeled into a chimney to power a turbine (chapter 7), a topic not easily found in other books, and on the solar energy collector to heat fluids (chapter 8). In the last chapter, the energy generation from solar thermal is discussed in terms of the thermodynamic cycle to explain the heat to work transformation, the so-called Rankine cycle.

The book is clear and, despite its small size, very dense in information. It stimulates learning by tackling the subject from many points of view. The flow of the book is the result of the author's lectures on solar energy to undergraduate and graduate students, and for this reason the text used in paragraphs, exercises, examples, etc. seems a verbal discussion—the language is fluid but rigorous, reasoned, and with many numerical examples. The author's approach is that it is not as important to learn the notions as it is to learn a method of study that enables you to deal with new difficult topics and problems. The figures and schematics are very useful, but the focus is placed on the text. A list of exercises is offered at the end of each chapter, and many examples are reported in each paragraph. The book can be useful to researchers who want to design or improve their devices, and to students, but definitely much more to professors who want to be inspired to prepare stimulating review lessons.

***Reviewer: Rosaria A. Puglisi** of the Institute for Microelectronics and Microsystems of the National Research Council in Catania, Italy.*



Moore's Law: The Life of Gordon Moore, Silicon Valley's Quiet Revolutionary
Arnold Thackray, David C. Brock, and Rachel Jones
Basic Books, 2015
530 pages, $35.00
ISBN 978-0-465-05564-7

Five decades ago, Gordon Moore, who would go on to co-found Intel Corporation, made a prescient observation about the exponential advancement of semiconductor technology with a corresponding decrease in device cost. His prediction about the pace of doubling the number of transistors in an integrated circuit came to be known eponymously as Moore's Law and has held true for 50 years. He also foresaw, way back in 1965, the development of home computers, electronic controls in automobiles, portable communications systems, and electronic wristwatches. Moore's fascinating life, characterized by relentless innovation, charity, and breathtaking humility, is the subject of this comprehensive authorized biography. The enthralling narrative is the product of collaboration between an academic (Thackray), a technology historian (Brock), and a journalist (Jones), and draws its material from numerous interviews, Moore's meticulously maintained notes and professional records, personal papers, industry data, published volumes, and news accounts.

The book has 11 chapters sandwiched between a prelude that offers a peek at Moore's brilliance and a coda. The narrative begins with the westward migration of Moore's great grandfather from Missouri to California in the mid-19th century just before the Gold Rush, the

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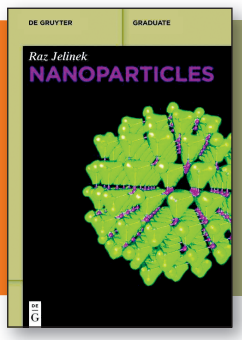
pioneer life of Moore's ancestors, and the birth of Gordon Moore at the start of the Great Depression (chapter 1). The text breezes through Moore's boyhood and early interest in chemicals and explosives (chapter 2), the very practical courtship of Gordon Moore and Betty Whitaker, and the young couple's life while Moore pursued chemistry at the University of California–Berkeley and the California Institute of Technology (chapter 3). Later chapters cover Moore's recruitment by William Shockley and the subsequent departure of Moore, Robert Noyce, and six others—the Traitorous Eight—to form Fairchild Semiconductor (chapter 4); the development of the planar transistor at Fairchild (chapter 5); the publication of Moore's prediction for silicon transistors (chapter 6); the departure of Moore and Noyce from Fairchild to co-found Intel (chapter 7); revolutionary engineering at Intel that led to widespread adoption of microprocessors, the commitment to innovation that increased complexity while driving down cost, brutal competition from Japanese manufacturers, and the emergence of the Microsoft Windows and Intel (Wintel) monopoly (chapters 8–10). The book ends with a discussion of Moore's gradual transition to retirement and his emergence as one of the greatest philanthropists in American history (chapter 11), and an assessment of his legacy (coda).

The authors do a masterful job of treating the chemistry, materials science, and engineering of device fabrication at just the right level of detail to make the story captivating. They elegantly explain the complex processes involved in crystal growth, wafering, dopant diffusion, etching, metallization, packaging, and testing using language that makes semiconductor technology accessible to the general public. It is clear that Moore's inspiration and guidance were vital to the perfection of silicon planar transistor technology, development of the silicon-gate metal oxide semiconductor memory chip (Intel 1101), and the dawn of the modern computing era starting with the iconic Intel 4004 microprocessor in 1971. Technology, history, economics, and human conflicts come together seamlessly. Historical events, such as the launch of Sputnik, the campus unrest of the 1960s and 1970s, the oil embargo, and the rise of Apple and Microsoft, take place in the background as the saga of Gordon Moore unfolds.

The authors begin the discussion of Moore's legacy by pointing to his success as a family man. Much of the credit for his stable and committed family life should go to Betty Moore, who has toiled in the shadows over six decades, shielded the conflict-averse Moore from domestic confrontations, and exerted considerable influence on his philanthropy. The portrait of Gordon and Betty Moore's humility, frugality, and decency painted by the authors is just as absorbing as the discussion of Moore's technological wizardry. Moore comes through as an unassuming genius, like Paul Allen and Steve Wozniak, who partnered with a flamboyant leader to co-found a major American technology company and influence the lives of people all across the globe.

Reviewer: Ram Devanathan *is Technical Group Manager of Reactor Materials and Mechanical Design, Pacific Northwest National Laboratory, USA.*



Nanoparticles
Raz Jelinek
De Gruyter, 2015
283 pages, $98.00 (e-book $98.00)
ISBN 978-3-11-033002-1

This book is an excellent starting point for undergraduate students who are interested in nanoparticle science and technologies. It covers the fundamentals and applications of nanoparticles and not nanoscale materials in a broader perspective. The remarkable progress of nanoparticle technology in physics, chemistry, materials science, and medicine, and its ability to expand their boundaries are discussed. This book will encourage further exploration of this exciting field.

The first chapter gives a short introduction about the history of nanoparticle technology with the help of band diagrams. The second chapter talks about the evolution of nanoparticle technology in semiconducting materials and its application in solar energy, biological imaging, etc. Pictorial representations of band models help the reader to visualize different types of materials such as metals, semiconductors, and insulators. Synthesis and applications of quantum dots in solar panels, photonic applications, and biological applications are discussed with beautiful images and experimental setups. Physical properties and applications of metal nanoparticles are discussed in the third chapter. Properties and applications of gold and silver nanoparticles in different fields such as molecular sensors, electrochemical sensors, catalytic applications, and biomedical applications are discussed extensively. Scanning electron microscopy (SEM) images showing the evolution of silver/gold nanomaterials into different morphologies are attractive. Synthesis and the physical properties of metal alloy nanomaterials are discussed in the second part of the third chapter. The fourth chapter talks about metal oxide nanoparticles such as Fe_3O_4, silicon oxide, titanium oxide, zinc oxide, and rare-earth oxide nanoparticles. Synthesis of magnetic oxide nanoparticles and their application in antitumor therapy is beautifully explained with appropriate SEM morphology images and cartoons. Rare-earth oxides such as CeO and Gd_2O_3 preparation and applications are discussed in

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