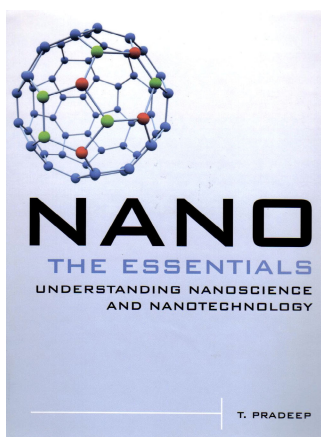


BOOK REVIEW

Nano: The Essentials / Understanding Nanoscience and Nanotechnology

T. Pradeep, 432 pages, ISBN 978-0-07-154829-8, McGraw-Hill (2008), US\$79.95, hardcover.

Reviewed by Muhammad Z. Numan, Indiana University of Pennsylvania, Department of Physics, Indiana, PA 15701, USA, mznuman@iup.edu



The book provides a broad overview of the tools and techniques of nanoscience and nanotechnology for non-specialists and aims to elicit an appreciation for the diversity and pervasiveness of nanosystems and their interfaces with various disciplines. With chapter-leading learning objectives, suggested-reading lists, and comprehensive review questions at the end of each chapter, the book is designed to serve as a textbook in an advanced undergraduate elective or introductory graduate survey course in a nanotechnology program. The reader is expected to have some background in modern physics; reference is freely made to Lorentz force, de Broglie equation, photoelectric effect, relativistic mass, metal work function, diffraction of electrons, quantum mechanical tunneling, etc. in explaining experimental techniques. The author uses black and white diagrams, and color plates illustrating various nanosystems from ancient times to the

present also augment the text. The book is accessible to science-savvy lay readers interested in the developments in this emerging field.

The sixteen chapters of the book are grouped into five thematic parts. The first part is a brief popular-science-style introduction to nanoscale science and technology, juxtaposed to the superb efficiency of nature in organization and functionality, in the context of the historical evolution of technologies and society – a theme revisited in the culminating chapter (part five) of the book.

Part two, spanning seventy pages, provides fairly detailed descriptions of analytical tools used in investigating nanoscale materials at the comprehension level of an undergraduate in science or engineering. Scanning electron microscopy is treated in some detail as the foundation of electron microscopy, with a brief treatment of transmission electron microscopy and other similar techniques. Typically, a page or two is devoted to the experimental aspects of most forms of microscopy covered in this chapter, with slightly greater coverage (over four pages) allotted to photoelectron spectroscopy and X-ray diffraction.

Part three, entitled *Diversity in nanosystems*, comprises eight chapters covering fullerenes, carbon nanotubes, self-assembled monolayers, gas-phase clusters, semiconductor quantum dots, monolayer-protected nanoparticles, core-shell nanoparticles, and nanoshells. This part is the longest of the book (171 pages) and covers fabrication, characterization, physiochemical and optical properties, and applications of these nanomaterials. The chapter

on fullerenes was originally published as a review article; others, of shorter length, are written in a similar style.

Part four deals with hybrid fields of nanobiology, nanosensors, nanomedicines, molecular nanomechanics, and nanotribology. Applications of nanomaterials in several areas are described. Some of these chapters were contributed heavily by author's graduate students.

The final part, comprising a single chapter, is devoted to societal implication of nanoscience and technology with brief mentions of political, ethical, and environmental issues, with some consideration of the future prospects for the developing world. It was originally published in the journal *Current Science* in 2006. A historical timeline of milestones and developments in nanoscience and technology from 1959 (Feynmann's oft-quoted lecture about "room at the bottom") through 2005 is included in the appendix (40 pages) with references to original publications. These and the additional readings listed at the end of each chapter provide ample resources for in-depth exploration of specific topics by interested readers.

In closing, this book fulfils a niche void in the reference library of popular nanotechnology tracts.