



Nano: The Essentials – Understanding Nanoscience and Nanotechnology. T. Pradeep. Tata McGraw-Hill, New Delhi. 2007. 432 pp. Price not mentioned.

For any new technology, public perception plays a critical role in its eventual deployment and commercial acceptance. Nanotechnology is not an exception, despite being considered by many as the newly emerging, ultimate technology with abundant promises to solve all sorts of problems faced by humanity. On the other hand, opponents accuse this as being too 'far-fetched' and fictitious with undue publicity and this has been widely criticized as a mere waste of public money with inherent dangers of the unjustified hype by the invisible nanoworld. Irrespective of these opposing views, there has been plenty of excitement with new fundamental phenomena and in this respect, the book by Pradeep brilliantly exposes some of the overriding concerns of both the scientific community and the public at large, although written primarily for undergraduate students.

This book has four parts dealing with various aspects of nanoscience and nanotechnology, while a fifth part highlights societal implications. Public opinion on nanotechnology is at its infancy and the potential benefits are generally considered to outweigh the risks. More debate is desired in many of these areas, and some of the important concerns raised in this book have far-reaching consequences to address wider sociological issues related to 'exaggerated benefits for fund accumulation', 'hyped applications for political advantages', 'unethical practice of science and technology for personal benefits', etc. This book, I believe, will elicit such responses, at least from a large group of students and teachers, interested in nanotechnology.

The author provides an elegant introduction in the first part with beautiful photographs of the celebrated gold nanoparticles prepared by Faraday and also

the Lycurgus cup made in the 4th century AD. Many important points about the uniqueness of nanotechnology are, however, missing in the introduction and statements like 'Everything one purchases today has an integrated circuit in it' (p. 8) are gross simplifications. This chapter is followed by a concise (though not essentially exclusive) description of popular techniques used for nanolevel manipulation and characterization, which will be useful for students. The third part displays the up-to-date diversity in nanosystems along with their relevance to specific applications. These three parts are organized in such a way that even a novice could relish the concepts of nanotechnology. Next comes the fourth part, which could really serve as a handbook of interdisciplinary applications of nanotechnology. In particular, the chapters on nanobiology (chapter 11) and nanomedicine (chapter 13) are written well with minimum jargon, to expose a general reader understand the latest developments. However, in p. 264 (chapter 11), the five categories could have, in principle be merged into three, although in the text, it is written as 'four major aspects'. In addition, this chapter has many errors, suggesting that it was written in a hurry.

One of the major highlights of the book is that it provides a detailed history of nanoscience and nanotechnology along with a glossary in the appendix. This is a unique feature, hardly found in any other textbooks in this field, which is indeed essential to popularize an interdisciplinary field like nanotechnology among the public. Nevertheless, several errors, typographic and otherwise, are present and the author should correct them in the second edition. Many portions of this book, especially part three, could be effectively used by researchers and students working on the preparation and characterization of a variety of metallic and semiconducting nanoparticles, fullerenes, carbon nanotubes, gas-phase clusters and core-shell particles. But, for others working in metallurgy and ceramic oxides, this will be of only marginal interest. Further, the selection of chapter topics indicates a strong bias, as crucial information on the importance of nano electromechanical systems (NEMS) and smart or intelligent materials designed by the effective use of nanostructured functional materials is missing.

In summary, this book provides useful information on most of the essential aspects of nanoscience and nanotechnology.

Hence I recommend it as an excellent resource book for both students and teachers interested in nanotechnology. Since nanotechnology, at least in principle, could solve many problems of today, this book has succeeded in bringing out the relevance of the field to the scientific community.

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'I have met people who believed they knew at a very early age what they wanted to do in their lives. I envied them, but my own life was not like that' is a statement made by H. Gobind Khorana (*Science*, 2000, **287**, 810). In the lead article of the 2006 edition of the *Annual Review of Microbiology*, in his memoirs, the author Dale Kaiser states, 'My career in microbiology has been a journey – a journey whose destination was never clear along the way'. Such bold statements are inspirational and a reminder that one could do science for the fun of it, and one could let the experiments take the enquiring mind onto a road whose destination was not already decided. Dale Kaiser made classic contributions to the biology of bacteriophage λ . His subsequent studies on the morphogenesis of myxobacteria have been equally rewarding in identifying the mechanisms of multicellular development in *Mixococcus xanthus* and cell to cell signalling which directs development of fruiting body in this organism. In his write-up, Dale Kaiser has presented a summary of these works as he recalls his days from graduate studies at Caltech, his days as a post-doctoral associate with Jacob and Wollman in Paris, and then on to his first job at Washington University Medical School from where he moved to Stanford University, his present place, in 1959. It was a delight to read through this interestingly written yet highly motivating arti-