Ob'edkov, R. K. Janev in *Vth ICPEAC, Abstracts of Papers*, **1967**, 342–345.
[8] The correct equation is $E_{CM} = \left(E_e^{1/2} - E_+^{1/2}\right)^2$.
[9] R. Johnsen, *Int. J. Mass Spec. Ion Phys.* **1987**, 81, 67.
[10] S. L. Guberman, *J. Chem. Phys.* **2004**, *120*, 9509.
[11] M. Larson, A. E. Orel, *Phys. Rev. A* **2001**, *64*, 062701.
[12] S. L. Guberman, *Phys. Rev. A* **1994**, *49*, R4277.
[13] All six rate constants should be referenced as Guberman 2003c[f] in Table 6.2.
[14] B. R. Rowe, F. Vallée, J. L. Queffelec, J. C. Gomet, M. Morlais, *J. Chem. Phys.* **1988**, *88*, 845.
[15] A. Petrignani, P. U. Andersson, J. B. C. Pettersson, R. D. Thomas, F. Hellberg, A. Ehlerding, M. Larsson, Wim J. van der Zande, *J. Chem. Phys.* **2005**, *123*, 194306–1–11.
[16] A. I. Florescu-Mitchell, J. B. A. Mitchell, *Phys. Rep.* **2006**, *430*, 277.

Quantum Nanoelectronics—An Introduction to Electronic Nanotechnology and Quantum Computing

By *E. L. Wolf.*

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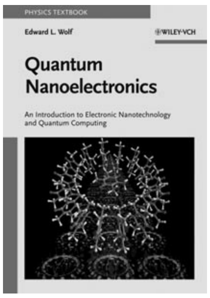
Moore's law states that the number of transistors that can be placed on a circuit doubles every two years, but this is, in fact, an empirical observation of industrial relevance, not a law of nature. And, in its essence, it is quite an optimistic observation, with the size of electronic devices shrinking quickly, we are coming closer and closer to the point where quantum effects will rule their functioning. Quantum physics can be staggeringly different from its classical version, and some known concepts will have to be dropped, while new ones can be introduced. Whether this will be a smooth transition or whether we "will face an abrupt collision with the future", to cite A. Toffler, remains to be seen.



Whatever the case, this shift will also change the knowledge required to develop working devices and compete in electronics and related areas. At least basic notions of quantum mechanics and how it can be used for practical purposes will be needed at both R&D and decision-making levels, for the development of new devices and the concomitant managing activity.

While this is common knowledge for physicists, and the transition has already begun at the fundamental level, there will be soon the need to teach the basics of quantum electronics to a wider audience, with a more applicative and entrepreneurial approach. And this knowledge will soon need to reach synthetic chemists too, whose role is becoming increasingly important, as the size of the devices shrinks.

This is where the book "Quantum Nanoelectronics" by E. L. Wolf comes into play. Indeed, as stated by the author, the book presumes only elementary college physics and should be accessible to most readers with a very generic formation in scientific or technical disciplines. This choice of readership is, of course, both a point of strength and a limit of the book.

First of all it confers a pretty unique layout to the text, with about 40% of the book devoted to an introductory part about basic quantum mechanics and solid-state physics. All these concepts are approached with simplicity and an applicative mindset, illustrating the fundamental results more than the conceptual background of the quantum world. Examples of applications of the concepts to devices are often provided, sometimes with their commercial success or expected performance. The second part of the book provides an overview of the tools of the trade of a nanoscientist, covering the most common building blocks of nanodevices and the applicable fabrication methods of nanoelectronic systems. The practical explanation of how all this becomes very relevant for industrial and technological purposes is contained in the third part, which covers a broad spectrum of systems of current interest in nanotechnology. In particular, the nano-equivalents of diodes and transistors are discussed in some detail, as well photovoltaic solar cells and quantum information devices.

All this affords a nice overview of this lively and rapidly evolving technological scenario. It can be an interesting and stimulating read to anybody who, having a higher education, wants to have an idea of how nanotechnology can alter the way we perceive and design electronic devices. In particular there is a motivating attention to what does not work or still remains to be done. The reader will promptly discover that, far from the hype of journalists and fiction writers, the nanoworld is promising, but suffers from a still limited control and understanding of what we can do.

And here, come the drawbacks of this book layout. As the reader is not intended to have a strong scientific background in the fundamentals of physics and chemistry, the book also offers limited tools to go beyond what is explained. Given the large collection of examples afforded, several important details (and sometimes not-so-details) are necessarily skipped, referencing the interested reader to the original papers. Only a few introductory articles are cited at the end of each chapter, even when excellent ones exist. This strategy could prove stimulating for a good student, a scientist or a very committed reader, but I somewhat feel the original papers will likely be inaccessibly complicated for a reader with a thin fundamental background. As the devil often is in the detail, this might prove an important drawback.

Moreover the discussion on some advanced subjects, like quantum computation and graphene, necessarily becomes so vague that the reader will likely fail to grasp the true fundamental importance of such topics. Thus, as a side effect, the book contents can sometime appear like a collection of technological possibilities, while a feeling of the fundamental scientific importance of the subjects treated is not fully conveyed.

Eventually chemists and materials scientists should notice that the fabrication part mostly covers physical methods. Chemical bottom-up fabrication methods, which are acquiring more and more importance in the field, are largely overlooked, as well as the chemical design of the devices, which is often a fundamental point. This is a non-minor shortcoming in a strongly interdisciplinary field like nanotechnology. A few interesting examples are provided, and this will not cause chemists and material scientists to lose their interest in the subjects covered.

This said, such shortcomings are likely intrinsic in a book aiming at such a vast readership. Moreover they are likely not an obstacle for the reader with some experience in the field or a genuine interest in the subject. The entrepreneurial approach will definitely appeal to professionals interested in changing field and certainly helps in conveying a sense of solidity of the field as well as a perspective that is not easily available in any other book on the subject. The target students, likely with an engineering or technical background, will certainly find an appealing textbook with more advanced ideas than what generally available, and the feeling of a still-open thriving field. This book, likely the first with this attitude, is probably the proof that the field of nanoelectronics is really becoming a subject of public and economic importance, and which will likely constitute one of the first areas where quantum physics is fully used for technological applications. In its ambition of making all this available to a wider audience, this is a courageous book, which will likely see a following. Let us hope that it will help softening some near-future impacts, maybe with the help of a pinch of chemical ingenuity.

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