recognized leader in the field, has dealt with neutron scattering studies of magnetic phenomena over his scientific career of roughly 30 years.

Collins divides the book into three parts: In part I he introduces the reader to critical phenomena, progressing from the simplest ideas expressed in the Landau theory, through scaling and on to the concepts of the renormalization group. These first nine chapters can be viewed as a summary of the comprehensive treatment given by Eugene Stanley in his book *Introduction to Phase Transitions and Critical Phenomena* (Oxford U. P., Oxford, UK, 1971).

In part II, Collins discusses neutron scattering with emphasis on its magnetic interaction. This section can be compared to the book by Gordon Squires, *Introduction to the Theory of Thermal Neutron Scattering* (Cambridge U. P., New York, 1978). Chapter 11, on the correlation function formalism, is especially well done.

The third part of the book presents results of measurements of magnetic critical scattering on a personally selected list of materials. Collins proceeds logically up the dimensional ladder from one to three dimensions and ends with the more complicated discussion of multicritical phenomena, dilution and random field effects. It is extremely useful to have in a concise format a listing of systems studied, the measured critical exponents and the predicted theoretical numbers.

Because of the logical division of the text, the book is a useful starting point for anyone interested in critical phenomena and a must for anyone doing neutron scattering. The only fault I find with this monograph is the choice of examples in part III. The studies are rather dated and the newer aspects of critical behavior, such as solitons in one-dimensional systems and the study of incommensurate systems, are only lightly treated. Even in the studies of transition elements, Collins stays away from controversy by not discussing the nature of the paramagnetic state: Are there spin waves above T_c? There have been several often conflicting neutron experiments done on iron and nickel.

The book is written in an almost outline form—19 chapters in 169 pages—but despite its economy of words, the book achieves a good physical insight into the physics and the technique. There is ample use of figures, and the list of references is comprehensive. The book may be too sketchy to be used by itself as a graduate level text, but if the supplemental reading at the end of each chapter were also included it would serve well for a course. However it will mainly be used by practitioners of neutron scattering and those studying critical phenomena: This little book has already filled an empty space on my bookshelf.

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Physics of Semiconductor Devices

Michael Shur
Prentice–Hall, Englewood Cliffs, New Jersey, 1990. 680 pp. $60.40 hc ISBN 0-13-666496-2

Electronic device research has been going through a boom period over the last decade—a boom that promises to continue for a while. A three-pronged driving force made up of new materials, new device concepts and shrinking processing dimensions has given the field such momentum that it is hard for electrical engineers and physicists to keep up. While all these developments have greatly excited the research scientist, it is becoming increasingly difficult for the average engineer to comprehend and make intelligent decisions on which direction to take. The dilemma is exacerbated by the lack of comprehensive textbooks that address these issues and develop adequate background in semiconductor physics, device technology and device requirements.

Lacking such knowledge, solid-state electronics engineers are often led astray by the hype over new concepts and unproven technologies—often with disastrous consequences. The current need for a good textbook is not simply to provide an education on existing devices, but also to somehow impart decision-making skills to the student who in a few years may have to make multi-million-dollar decisions on which path to follow out of a possible dozen. This places a heavy burden on any author. Michael Shur is eminently suited to handle such a task, and it is gratifying to see that he has attempted to harness his many years of experience as a leading device physicist, first at the University of Minnesota and now at Virginia, to develop a textbook.

Shur's textbook takes a big step in the right direction in the evolution of new textbooks. By devoting about 20% of the textbook to basic semiconductor device physics issues such as concepts of band structure, phonons, heterostructures and comparisons of various semiconductor properties, he sets the pace and orientation of the book. Such effort is not often undertaken in most textbooks on devices.

Another area in which the book distinguishes itself is the very good treatment of photonic devices, particularly semiconductor lasers. An electrical engineering student should have a good basis for comprehending modern day photonic devices after reading this chapter. One often has to use specialized books on lasers to get this kind of understanding.

Inclusion of novel transistor structures is one of the strong suits of the book. This discussion presents a good overview of how device physicists are using new heterostructure concepts. The chapter, however, does not provide the reader with much basis for determining if these new ideas are worthwhile or not. (This is rather important to establish for reasons I mentioned above.) It is possible that Shur did not want to bias the reader as to the merits of these new developments, but I think a more useful approach is to discuss the needs of a technology and thus judge a particular device, as Robert Keyes does in his book *The Physics of VLSI Systems* (Addison–Wesley, Redwood City, Calif., 1987).

Most of the rest of the book is devoted to the physics of the standard solid-state devices, such as bipolar and heterojunction bipolar transistors, various field-effect transistors, transfer electron devices and so on. These discussions are quite good and give the reader a very good idea of the important issues in these devices. Shur's treatment of issues in submicron technology is quite useful because few electrical engineers will deal with long-channel devices. Discussions of amorphous semiconductor devices are also extremely good. In addition the book includes a software package that can be used by a reader to carry out several important numerical calculations: This is a most welcome addition because most people in the field know the importance of working with real numbers in device physics.

Areas that are becoming increasingly important and have not been addressed in the book are strained channel devices, which have become the fastest commercial devices, and Si–Ge heterojunction bipolar transistors, which are creating new excitement in silicon technology. However, this is not a serious drawback in the textbook because the book contains the basic concepts governing these advances. The exclusion of charge-coupled devices is somewhat disappointing because they have played such an important role in the videocamera industry.

I believe Michael Shur's book fills an important void in the availability of good textbooks on modern devices. It is a useful book for students as well as for practicing electrical engineers and physicists interested in device physics.

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Beyond the Atom: The Philosophical Thought of Wolfgang Pauli

K. V. Laurikainen
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A psychologist, a philosopher or any other representative of the humanities or the arts who expresses his views on transcendental philoso-