chapters to a more complete form and left out the earlier ones, one could then recommend the book highly.

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Gravity, Particles, and Astrophysics

Paul S. Wesson
196 pp. Reidel, Hingham, Mass., 1980. \$34.00

Here we have a valuable but flawed review of theories involving a time-varying gravitational "constant" and observational tests of them. Wesson, a theorist active in the field, addresses his book to advanced undergraduate and graduate students and to scientists in other fields who want to know just what is the current status of variable-G theories. The book's extensive bibliography and its thorough theoretical discussion are its strong points. The treatment of observations is much weaker.

Is variable G worth bothering with anyway? Someone surveying the Great Plains of astrophysics will see stampeding buffalo herds of young theorists charging in a random-walk pattern toward goals that change with the fashions of the time. Five years ago it was accretion disks; last year it was massive neutrinos; and now it is gravitational lenses. But there are a few isolated mavericks who have shown that the idea of a variable G is considerably more plausible than it seemed a few years ago. New theories, most particularly Vittorio Canuto's scale-covariant theory, do not require that stellar luminosities increase as G increases. Thus variable G does not have to have a young sun that blasts away and boils off the primeval oceans. Yes, it is worth bothering with variable G, and a review of the field is quite useful.

There are surprisingly many gravitational theories with varying G, and the book's strong point is its complete catalog of them. It is the first review of alternative theories of gravity that has appeared in several years. Wesson classifies the different theories to guide the reader and also possibly to guide future observational tests. The distinction between Dirac's ideas and more recent treatments is clearly drawn.

Wesson falters when it comes to the observational and experimental tests. Positive, in contrast to non-negative, evidence for changes in G comes from claimed changes in the size of the lunar orbit and in the radius of the earth. The book mentions Thomas Van Flandern's work on the lunar orbit many times, but cites error bars only once and lacks the detailed, critical discussion that readers need to judge it. Such discussions can be found elsewhere, in a review by J. Derral Mulholland [*Rev. Geophys. and Space Phys.* **18**, 54 (1980)] and in a book by Kurt Lambeck [*The Earth's Variable Rotation*, Cambridge U. P. (1980)]. I share Mulholland's and Lambeck's view that the uncertainties in the tidal contribution to the evolution of the lunar orbit are now too big for the lunar work to be used to prove that G varies. Similar shortcomings affect Wesson's discussion of the data on the expansion of the earth.

Despite this book's flaws, libraries should have it. Cosmologists with at least a passing interest in unconventional ideas will find its theoretical discussion and its bibliography useful. The book is a valuable reminder that we still aren't absolutely positive that the constants of Nature are, in fact, constant.

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Solar Energy Conversion: The Solar Cell

R. C. Neville
297 pp. Elsevier, New York, 1978. \$49.50

In the last paragraph of his book, Richard Neville writes "that it would be the height of folly to state that all possible photovoltaic conversion schemes have been outlined here or that all possible solar cell configurations have been delineated." While this statement would be understandable in an introductory text, the merit of a book covering a given subject is determined by how wisely the author selects the topics to be included in the book. It is in this crucial matter that Neville falls short.

For example, he devotes substantial space to a discussion of calculations of the reverse saturation current of solar cells, yet he does not include any reference to the use of back surface fields and high–low emitter junctions to reduce the reverse saturation current below the values theoretically obtainable from more conventional designs such as those he considers. Nowhere in the book does he discuss minority carrier transport in illuminated p/n junctions or calculations of the fraction of minority carriers that are collected in a given solar cell. He devotes no space to the theory of polycrystalline solar cells and the dependence of various important cell parameters on grain dimensions and fails to discuss amorphous semiconductors and cells made from them. Neither does he cover the theory of high-efficiency cascade-cell systems, which have the potential for highest solar energy conversion efficiency.

Given that the omission of these topics constitutes a fundamental flaw in the book, how well does the author treat the subjects he has chosen to include? The book begins with a good though conventional overview of US and world energy needs and energy sources. It has a good chapter covering the potentials for collecting solar energy by no-tracking, east–west tracking and ideal tracking systems.

In the third chapter, Neville introduces semiconductors. Unfortunately this chapter contains many oversimplifications and many imprecise and even misleading statements, such as these: "the overall usefulness of an intrinsic semiconductor is small"; "the difference in energy $E_c - E_d$ is on the order of KT" (true for room temperature, but how about 4 °K?). Such errors are not confined to Chapter III. One of many examples occurs in his section on light absorption, where he asserts "that processing technology . . . reduces the lifetime of hole–electron pairs near the optical (front) surface of the solar cell." In fact some processing technologies can affect lifetime throughout the cell and others may leave the lifetime unchanged even in the near-surface region. I am therefore hard pressed to recommend this book to the novice even thought the solar cell expert may find that it provides a useful outline for a course on solar cells and contains a good bibliography.

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Transport Theory

J. J. Duderstadt, W. R. Martin
613 pp. Wiley, New York, 1979. \$36.00

It is sadly apparent to anyone who has worked in transport theory and has attended "interdisciplinary" conferences on the subject that there is a vast gulf in communication among people working in different corners of the field. James Duderstadt and William Martin make a valiant and ambitious effort in their book to overcome this gap and are, to a large extent, successful. I recommend the book to anyone with a serious or passing interest in transport theory.

The authors demonstrate in an exceptionally clear manner the essential unity of the field, giving applications from neutron transport, astrophysics, gas dynamics, plasmas and hydrodynamics. They even manage to insert a brief but clear discussion of the passage from the Liouville equation to Langevin-type equations and various transport equations, with emphasis on projection operator methods. Throughout, the approach is that of a physicist.

Duderstadt and Martin have attempted to make the book largely self-contained, accessible to a graduate student in physics or a mathematically oriented engineering graduate student. I think they have largely succeeded.