

Since the book is a summary of a study, it has not been written with the student in mind. There are essentially no explanations of how various devices, such as a Tokamak, work. There is very little physics, chemistry, or engineering discussed in any detail. While this may be a disappointment for those who might wish to use the book in the classroom, it has the advantage that those without a technical background can read and understand the book.

One aspect of the study that I found rather frustrating was the adoption by the Committee of scenarios for discussing the various paths that the future energy supply and demand might take. The scenarios ranged from the most drastic (or pessimistic) to the most optimistic. In effect all bets were being covered. While no individual or even a committee of experts has the ability to predict the future, it would have been helpful to have more discussion on which of the various scenarios seem more likely given the history of the United States, the economic realities, and the political climate. There are also occasional errors in the text although it is clear that the book has been very carefully edited. One mistake, for example, occurs in the discussion of gasohol, where it is stated that "it is unclear, whether the use of grain is a net producer of liquid fuels in the United States." Be-

cause of the important use of coal and natural gas in agriculture it is unclear whether the use of grain is a net producer of energy when all fuels are considered. However, it is clear that it is a net producer of liquid fuels.

The conclusions of the study are summarized in the first chapter entitled "overview." The assessment given of the energy picture for the years 1985–2010 is not one that is hopelessly pessimistic but it is one that requires initiatives to be taken now by the U.S. government stressing energy conservation, near term solutions for the fluid fuel supplies, a balanced combination of coal and nuclear power for electricity generation with the breeder option kept open, and the importance of research and development investments for the long-term energy needs. One hopes that the new administration in Washington will take full advantage of this study as the message is of vital importance to us all.

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Superposition and Interaction: Coherence in Physics.

Richard Schlegel. 302 pp. The University of Chicago Press, Chicago, 1980. Price: \$22.50. (Reviewed by James L. Park.)

There is a curious asymmetry in the relation between the two revolutions in physics in this century—quantum mechanics and the special theory of relativity. The latter (STR) is commonly regarded as the final chapter of classical physics, while the former (QM) is thought to present a radically new construction of physical reality. Yet as Professor Schlegel observes, historically STR had a profound impact on the development even of elementary QM; but QM has had virtually no reciprocal influence on STR. The pervasive theme of this book is the search for a deeper unification of these two theories.

In this quest Schlegel masterfully leads the reader through the necessary corridors of both physics and the philosophy of physics. Along the way many controversial issues from antiquity to the present are confronted, analyzed, and woven into the context of the work. Among these are the paradoxes of Zeno, the clock paradox in STR, the problem of infinite divisibility, the Einstein–Podolsky–Rosen paradox of QM, Schrödinger’s cat, Wigner’s friend, Bohr’s complementarity, Bell’s inequality, and Everett’s splitting universe. In addition to such technical matters there are several broader discourses on man and nature, including in particular a clever and rather eloquent epilog written in literary style as a reminiscence of an informal but scholarly conversation about reality.

The centerpiece of the book is Schlegel’s own contribution to the unification of QM and STR—the “interaction hypothesis,” a refinement in the interpretation of STR which restricts application of the Lorentz transformations to situations where there is physical interaction between system and observer. This view has empirical implications which are carefully explained; however, Schlegel believes that no experiment capable of yielding a crucial judgment about the interaction hypothesis has yet been performed.

This interpretation of STR seems to have been inspired in part by Bohr’s continual allusions in his philosophical writings to the “wholeness” of quanta transferred in interactions. In this and other more mathematical ways Schlegel’s theory can be seen as removing the asymmetry mentioned earlier; i.e., the interaction hypothesis embodies an alteration of STR due to QM.

Another novel idea that contributes to the establishment of symmetry between QM and STR is Schlegel’s notion of “external superposition,” in which all the states that a relativistic system may present to external observers are superposed in a sense analogous to but distinct from the well-known superpositions of QM.

Still another span in Schlegel’s bridge between QM and STR is an interesting proposal concerning those quantal superposition states involving macroscopic apparatus which have long bedeviled measurement theorists. To resolve the celebrated measurement problem of QM, he offers a new principle called the “restricted superposition hypothesis,” which is in effect a superselection rule based in part upon the Lorentz transformations. Like the other theoretical innovations in the work this makes fascinating reading.

Obviously this book is no mere compendium of standard material, and experts will disagree with Schlegel and of course among themselves regarding the detailed logic of his connecting links between QM and STR. For example, it might be argued that his sometimes nonstatistical interpretation of quantal uncertainty relations in connection with STR, though rooted in historical practice, is just algebraic legerdemain without physical significance. Similarly, objections might be lodged against his characterization of quantum states as superpositions of “classical” states and against his particular interpretation of Margenau’s conception of measurement. In short the book is indeed stimulating as well as informative.

A variety of readers will find this work to be very worthwhile. Seniors and graduate students in search of a wider perspective than that afforded by normal courses can

reap considerable educational benefit from reading such a well-written book of this type. Because it is so well annotated with credit duly given to sources, it also has value as a reference tool even though there is no formal bibliography. Finally, given the subtlety of many of the issues Schlegel discusses, the book will undoubtedly be received with great

interest by specialists in the foundations of physics.

James L. Park, professor of physics at Washington State University and presently visiting professor at MIT, is interested in the foundations of quantum theory and thermodynamics.

BOOKS RECEIVED

- Applications of Mössbauer Spectroscopy.** Vol. 11. Edited by Richard L. Cohen. 433 pp. Academic, New York, 1980. Price: \$53.00. ISBN 0-12-178401-0.
- Atoms and Molecules.** (Student edition.) Mitchel Weissbluth. 713 pp. Academic, New York, 1980. Price: \$24.50.
- Characterization of Crystal Growth Defects by X-Ray Methods.** (NATO Advanced Study Institutes Series, B63.) Edited by Brian K. Tanner and D. Keith Bowen. 589 pp. Plenum, New York, 1981. Price: \$65.00. ISBN 0-306-40628-4.
- Encyclopedia of Physics.** Rita G. Lerner and George L. Tripp with foreword by Walter Sullivan of *The New York Times*. 1157 pp. Addison-Wesley, Reading, MA, 1980. Price: \$99.50.
- Experimental High-resolution Electron Microscopy.** (Monographs on the Physics and Chemistry of Materials.) J.C.H. Spence. 370 pp. Oxford, New York, 1981. Price: \$74.00. ISBN 0-19-851365-8.
- Harmonic Analysis and Representations of Semisimple Lie Groups.** (Mathematical Physics and Applied Mathematics, Vol. 5.) Edited by J. A. Wolf, M. Cahen, and M. DeWilde. 495 pp. Reidel, Boston, 1981. Price: \$66.00. ISBN 90-277-1042-2.
- Introduction to Perturbation Techniques.** Ali Hasan Hayfeh. 519 pp. Wiley, Somerset, NJ, 1981. Price: \$29.95. ISBN 0471-08033-0.
- Lasl Phemex Data.** Vol. 3 (Los Alamos Series on Dynamic Material Properties.) Edited by Charles L. Mader. 527 pp. University of California, New York, 1981. Price: \$39.50. ISBN 0-520-04011-2.
- Nuclear Reactor Engineering.** 3rd ed. Samuel Glasstone and Alexander Sesonske. 805 pp. Van Nostrand-Reinhold, New York, 1981. Price: \$39.50. ISBN 0-442-20057-9.
- Phenomenal Physics.** Clifford E. Swartz, 741 pp. Wiley, Somerset, NJ, 1980. Price: \$24.95.
- Positron Annihilation.** (Proceedings of the National Symposium on Positron Annihilation held at Delhi, India April 2-4, 1979.) Edited by P. C. Jain and R. M. Singru. 359 pp. South Asian, New Delhi, 1980. Price not given.
- Quarks and Leptons: Cargèse 1979.** (NATO Advanced Study Institutes Series, B61.) Edited by Maurice Levy, Jean-Louis Basdevant, David Speiser, Jacques Weyers, Raymond Gastmans, and Maurice Jacob. 720 pp. Plenum, New York, 1981. Price: \$75.00. ISBN 0-306-40560-1.
- Radiationless Processes.** (NATO Advanced Study Institutes Series, B62.) Edited by Baldassare DiBartolo. 545 pp. Plenum, New York, 1981. Price: \$65.00. ISBN 0-306-40577-6.
- Some Strangeness in the Proportion: A Centennial Symposium to Celebrate the Achievements of Albert Einstein.** Harry Woolf. 539 pp. Addison-Wesley, Reading, MA, 1980. Price: \$43.50.

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