Quick and easy

ELECTRONICS FOR EXPERIMENTERS IN CHEMISTRY, PHYSICS, AND BIOLOGY. By Leon F. Phillips. 266 pp. Wiley, New York, 1966.

by Melvin Daybell

Four years ago there was no up-to-date text of the type indicated by the title of the book under review. Now there are at least three, the other two being Malmstadt, Enke and Toren's *Electronics for Scientists* (W. A. Benjamin, N. Y., 1962), and Donald Hunten's *Introduction to Electronics*, (Holt, Rinehart, and Winston, N. Y., 1964). For physicists, especially those working in high energy or nuclear physics, Raphael Littauer's excellent book *Pulse Electronics*, (McGraw-Hill, N.Y. 1965) should also be mentioned. Leon F. Phillip's new book is midway in level of sophistication between *Electronics for Scientists* and the more advanced *Introduction to Electronics* although, being shorter, its coverage is less complete than either of the older books.

All the usual topics of an elementary electronics course in essentially class A, RC-coupled voltage amplifiers are covered, including a discussion of feedback. In addition, there are sections on dc amplifiers, power supplies, phase-sensitive detection, and a brief but clear section on oscillators and switching circuits. Bandwidth and noise limitations on amplification are the subject of a well written separate chapter, although the effect of bandwidth limitations on feedback stability is nearly ignored, as is that of feedback on noise. The last chapter deals with converting circuit diagrams into functioning hardware, and without this chapter, as the author points out, "the subject is likely to degenerate into an abstract pastime, almost a branch of topology." Layout, soldering, use of test instruments, and how to convert a piece of hardware that exudes "burning smells, unusual frying noises, visible sparks . . ." etc into functional hardware are covered.

Throughout the book, the author demonstrates a ready familiarity with electronics and the problems and solutions that arise in its actual use. Transistors are integrated into the development more smoothly than is the case with the two earlier books. New semiconductor devices are discussed, and enough is said about their characteristics that the reader could probably work with any of them. This is done without first making him a solid-state physicist.

Consistently the reader is able to come away from each new topic introduced with the comfortable feeling that he now understands pretty much what's going on, and that he could now believe in a circuit like that if he ran into one. What's more, no time has been spent going deeper than necessary into an idea. It is the only way to get so much electronics into so few pages, and it is done well.

The book has three faults that are important enough to point out to the prospective user. They are all related to the background expected of the reader, which is, according to the preface, " . . . the usual basic physics course offered to undergraduates majoring in chemistry . . ." (the book is in the "Wiley Paperback Series in Chemistry"). This course had better have included a thorough treatment of ideal voltage and current generators, and Thevenin's theorem. The first chapter of *Electronics for Experimenters* is at best a review of some of these concepts. No mention is ever made of the properties of an ideal voltage or current generator, and equivalent circuits for tubes and transistors are not used. Two other faults beyond this meager first chapter are that there is often a large gap between the material in the text and the level of problem that the reader is asked to do, and that, in order to do some of the problems, and to read some of the text, it is necessary to understand specific electronic terminology not previously (and sometimes not ever) explained by the author.

Thus we must ask, whom is the book intended for? Probably not the physics student, who will buy Hunten or Littauer. The chemistry or biology student? Yes, as a textbook in a formal course where he can ask questions, if he has or is provided with the necessary background. For self study Malmstadt would be a better choice, especially if his physics preparation is rusty or nonexistent. Another group who should definitely consider *Electronics for Experimenters* are those practicing chemists, biologists or physicists who feel that their electronic background needs updating. Here is a quick and easy way to do it.

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Zen physics

THE EIGHTFOLD WAY. Murray Gell-Mann, Yuval Ne'eman, eds. 317 pp. W. A. Benjamin, New York, 1964. Cloth $8.00, paper $3.35

by Elihu Lubkin

This reprint collection, with brief useful introductions is already a standard reference on SU(3) before SU(6). I remark on it as a means for a student to delimit areas he does not know.

The leading "Eightfold Way," heretofore unpublished, anticipates much of the sequel, but confusingly misses the notion of quarks, so I amplify Gell-Mann's warning: read chapter 7, "Triplets and Triality," together with chapter 1. The easy Lie algebra paper is J. J. de Swart's. It ties the book to a Lie algebra background, and unifies much of the physics.

The Yang-Mills idea is too important an early stimulus since logically it singles out the adjoint represen-

tation only for some spin-1 mesons. This objection is recognized and the Yang-Mills apparatus is removed in the last paper (Ne'eman), which should therefore also be read first. But a related idea of how a Lie algebra enters dynamics, now of current-density operators in Hilbert space and their commutation relations, is proposed to clarify the weak interaction. A parity-conserving weak current vector is drawn in 8-dimensional SU (3) space, and a similar parity-violating one in another SU (3) space; even SU (6) appears briefly on page 203. Prior knowledge of theoretical reduction of the weak interactions is useful here.

There is a minimum of debate on assignment of resonances, probably thanks to the Ω^-. The nuclear physics is 3 pages where Oakes tells us that the deuteron belongs to a $\overline{10}$.

The papers on genesis of symmetry breaking are sketchy reviews of dark calculations. Perhaps the clearest is "Octet Enhancement," formally nonleptonic weak, but with remarks on the electromagnetic and nonsymmetric strong interactions.

The book is not a mathematics book, and presumes extensive knowledge of the experimental situation; yet it is a bargain.

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Elihu Lubkin, formerly of Brown University, was recently appointed associate professor at the University of Wisconsin—Milwaukee.

Recapturing the excitement

THE FEYNMAN LECTURES ON PHYSICS. Vol. 3: Quantum Mechanics. By Richard P. Feynman, Robert B. Leighton, Matthew Sands. 21 chapters. Addison-Wesley, Reading, Mass. 1965. $6.75

by R. Bruce Lindsay

One of the most important duties of physicists is to insure their succession by the teaching of their discipline to the young. The most appropriate way of introducing the new student to the fundamental ideas of physics has been the subject of much experimentation over the years, and has resulted in the writing of countless textbooks pointing the way to salvation.

FEYNMAN

Most of this material has been prepared by those who have given primary attention to the teaching of physics and have not become too well known in fields of research. Their books, though often stamped to a certain extent with the personalities of the authors, have tended to be conventional in general character, and understandably so, since books to be widely used must be published and publishers have a natural desire to stay in business. But from time to time physicists with outstanding research reputations have become sufficiently excited over the problems of elementary physics teaching to try to concoct something really new and unconventional in its approach. A good example is provided by *The Feynman Lectures on Physics*, volume 3 of which is the book under review.

These volumes are based on lectures given during the past few years in the introductory course in physics for freshmen and sophomores at the California Institute of Technology. The first two volumes have dealt primarily with mechanics, and electricity and magnetism respectively. The third is devoted to quantum mechanics. Some may question the appropriateness of presenting a treatment of the most advanced of physical theories and to this degree of sophistication to sophomores, even at an institution of the level of the California Institute of Technology. It is certainly an unconventional procedure! Its justification presumably lies in the fact that quantum mechanics is the most powerful tool for understanding modern physical experience, and the future physicist should get hold of it as soon as he reasonably can.

How well has the author succeeded in his treatment? With great skill he guides the neophyte from an introductory description of what quantum phenomena are all about in terms of the wave-particle dualism on through the development of the concepts of state and probability amplitude with matrix analysis to the actual evaluation of the energy states of atomic systems. He uses a lot of words interspersed with clear diagrams of experiments, both mental and actual. He introduces frequent practical illustrations like the maser to sustain the students' interest. Throughout there is an air of breezy informality presumably designed to recapture the excitement of the lectures and the exuberance of the lecturer. To the mature physicist the development is indeed fascinating. Its impact on the elementary student is more questionable. Many will feel that the author is asking the student to think faster and more deeply than most are prepared to do at this stage of development. For most young people a grasp of fundamental physical ideas comes slowly, and though recipes can often be learned quickly, understanding of what they mean is a more gradual acquirement.

The reviewer has found some sections of particular interest, notably those on electron transmission through a crystal lattice and on the relation between the concept of symmetry and conservation laws. On the other hand he regrets that the author has seen fit to stress the probabilistic interpretation of quantum mechanics so emphatically as to give the impression that no change in this picture is ever possible. This gives the philosophy of the subject an unfortunate dogmatic twist, neither necessary nor desirable.

Without question this volume