THEORY OF GUIDED ELECTROMAGNETIC WAVES, by R. A. Waldron. 520 pages, diagrams, illustr., 6 × 9 in. Van Nostrand Reinhold, London, 1969; New York, 1971. Price, $27.50.

The present plethora of books on electromagnetism has not, as has been often concluded, resulted in endless restatement and repetition. Rather, it constitutes proof of the expansive nature, endless ramifications and exciting variety of a subject that even after decades of exhaustive investigation still holds some surprises in store.

Also there is continuous need to update and refocus the material: depending on the particular exigencies that obtain at a given time. This may in itself be sufficient justification for the appearance of yet another treatment.

Waldron's latest contribution to electromagnetic theory consists of this "middle of the road" book. It is his intention to present a comprehensive treatment of guided wave structures combining the right blend of practical or design information and formal mathematical theory. In most respects he succeeds.

The book begins with a general chapter on the mathematical tools of electromagnetic propagation. It then develops the basic concepts by tracing through electrostatics, magnetostatics and plane waves before it begins treatment of the first true waveguide structure: that of the transmission line. However, it is with the very next chapter, on general waveguide theory, that the author really settles down to the business at hand. Any uneveness that might have been discerned in the introductory exposition henceforth disappears: and it is evident that Waldron is on very familiar grounds.

The chapter on inhomogeneously and anisotropically loaded waveguides, including ferrites and plasmas, is particularly interesting, drawing heavily upon the author's numerous contributions to the theory. One can only regret that more space is not devoted to this topic which itself alone can be expanded into an entire treatise. However, as an introduction to the subject it is eminently satisfactory.

Cavity theory, perturbational and variational techniques make up the rest of the book, which closes with a chapter on nonuniform waveguides. This includes many subtopics not usually found in comparable treatments.

The book is written with care and the reader will find it easy to follow. There is something in it for every taste and background from the elementary to the most advanced. It is indeed a work that combines a successful amalgam of theory and practice; although the author's rather scrupulous adherence to this formula sometimes results in a certain lack of rigor. It is the particularization of guided wave concepts to specific configurations that receives most of the author's attention, with the concomitant amount of phenomenological demonstration.

The purely harmonic approach excludes the discussion of transient phenomena and the valuable physical insights they may impart, especially to the beginner. This and the rather light treatment of open structures, such as the Goubau line, constitute minor drawbacks in what may concisely be described as a very valuable reference work.

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HEAVISIDE OPERATIONAL CALCULUS, AN ELEMENTARY FOUNDATION, by Douglas H. Moore. 152 pages, diagrams, illustr., 6 × 9 in. New York, American Elsevier, 1971. Price, $16.00.

The concepts of this interesting book are concisely summarized on p. xv, where the algebraic structure of Heaviside operational calculus is abstractly given. Except for the fascinating reprint of E. Whittaker's historical sketch of Heaviside's development, the remainder

of the book is an elaboration of the abstract formulation specialized to the cases of engineering interest.

Besides the prefatory material the work contains nineteen chapters. The last one is devoted to applications while the remainder develop discrete and continuous results; the author makes a concerted effort in this development to establish good continuity of ideas from chapter to chapter. The reviewer found Chap. 9 ("From Discrete to Continuous") particularly useful in that it served to clearly summarize the techniques previously applied in setting up the discrete operational calculus while preparing the reader for carrying out similar ones for the continuous operational calculus.

In short, the program carried out in the book is as follows: One selects a set of functions of interest to the situation at hand; these are the operands which are required to form an additive Abelian group; physically the operands are system inputs and outputs. For discrete systems the jump functions (sums of displaced unit step functions) are taken as operands. Next one selects a specific operand, called the unit operand, and develops a set of mappings (endomorphisms) one for each operand g; each of these mappings is on the whole group and maps the unit operand into the chosen operand g. For the discrete calculus the unit step function is the unit operand and the set of mappings is physically interpreted something like the set of all systems which map the unit step function into all jump functions. To develop a calculus the endomorphisms need to obey certain permutability and uniqueness assumptions as given in Chap. 3. In one to one correspondence with the endomorphisms a set of operators is introduced; operators map operands into operands and as such can be physically interpreted as the transformations describing systems; in the discrete case operators are analogous to z-transform transfer functions. After considering the continuous case, where operands are sectionally continuous functions zero before some finite time, a field type embedding is used (Chap. 18) to allow interpretations of impulses, Heaviside's operator p and other such quantities. Convergence is discussed and various tabulations of operators are given throughout the book.

This reviewer found the book refreshingly creative since a new approach is used in developing operational methods. It would have helped most engineers, however, to have given some discussion of the key mathematical terms, such as the meaning of an endomorphism. Because of the novelty in usage of the algebraic approach the treatment will require considerable concentration on the part of engineers. To the author's credit is the considerable effort he has made to render his ideas understandable and available to engineers and applied mathematicians. Certainly Moore's book is a must for anyone wishing to know of the various operational calculus techniques available, and with a good teacher, an excellent grounding in the field could be obtained using this text in a course.

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Dynamics of Nuclear Reactors, by David L. Hetrick. 542 pages, diagrams, 6 x 9 in. Chicago, London, University of Chicago Press, 1971. Price, $18.50.

Students of nuclear science and engineering have long awaited a text which gives a comprehensive, complete and systematic treatment of nuclear reactor dynamics. This book satisfies that need: the author having intended it as an introductory text to the subject, suitable for undergraduate seniors and graduate students of science and engineering who have had at least an introductory course in nuclear reactor theory.

By bridging the gap between the viewpoints of the reactor physicist and the control engineer, Professor Hetrick's book has made a valuable contribution to increased communication between workers in these two fields by joining the language of both together in a unified exposition of nuclear reactor dynamics.

The development of the basic equations and applications of reactor dynamics, control theory and related topics is