

Transistor Technology

Vol. 3. Edited by F. J. Biondi. (The Bell Telephone Laboratories Series.) Pp. xiii+416. (Princeton, N.J.: D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1958.) 94s.

DOUBTS were cast in the review of Vol. 1 and 2 of "Transistor Technology"—a review (see *Nature* of January 10, p. 72) written before the third and final volume was available—of the likelihood of the three volumes satisfactorily filling a serious gap left in the coverage of text-books and reference books. The doubts are largely dispelled by Vol. 3, however. It is only little more than half the size of either of the two earlier volumes, but it contains by far the best descriptions yet given of most of the modern techniques for making junctions and triode structures—many of them brilliantly conceived, carefully worked out and adaptable to large-scale production. It should appeal as strongly to newcomers seeking more than a superficial understanding of the techniques as to the more experienced research workers, technologists and teachers (though as yet this part of the subject is apparently little taught).

The book opens with chapters which classify the methods used to control impurity distributions and to form junctions in germanium and silicon, and show how the several ideas based on liquid-phase freezing and on diffusion in the solid can be exploited. The processes which monocrystalline semiconductors undergo in becoming diodes or transistors are next described. Some chemical processes and the making of ohmic contacts apply widely; others are more specialized, for example, jet etching, alloying and diffusion, the last two being treated in the detail warranted by their importance to-day. The last quarter of the book is on other branches of the subject. Some of the methods for measuring the rate of recombination of minority carriers, both in the bulk semiconductor and at the surface, are described; and a basis for designing equipment to measure selected parameters of transistors is analysed, in terms of ease, accuracy and value to the user. A few pages are devoted to reliability, a subject which is gaining importance.

The presentation of all three volumes conforms with the high standard of the series. It is to be hoped that we can look forward to further volumes, at intervals of a few years, keeping us up to date on material preparation and on device design, fabrication and performance.

J. R. TILMAN

Studies in the Mathematical Theory of Inventory and Production

By Kenneth J. Arrow, Samuel Karlin and Herbert Scarf. (Stanford Mathematical Studies in the Social Sciences, No. 1.) Pp. x+340. (Stanford, Calif.: Stanford University Press; London: Oxford University Press, 1958.) 70s. net.

THIS book consists of a series of interrelated research papers. The results have been obtained during the past three years and are now published as the first volume of the new series of Stanford Mathematical Studies in the Social Sciences. Most of the research was carried out at Stanford University, largely under the auspices of the Office of Naval Research.

The quantitative study of inventory and production is a relatively new branch of applied mathematics; hence about the first fifty pages of the book are taken

up with the historical background, the nature and structure of inventory problems, and summaries of the results of succeeding chapters. It is essential for the reader to study this part of the book, in order to grasp the general mathematical concepts which are developed later in special contexts. Part 2 consists of four papers covering the determination of optimal policies in the case of deterministic processes. One relates to production with marginal cost increasing with time, another to production planning with no storage facilities, and a third is concerned with the smoothing of production. Part 3 relates to stochastic processes and includes several papers on various aspects of the Arrow-Harris-Marschak dynamic model, and a paper relating to a hydroelectric model. The last part of the book is concerned not with the determination of optimal policies but with the operating characteristics of given 'simple' policies, and this is realistic in cases where it is impossible or too difficult to determine the optimal policy. There is a very important and interesting chapter on the application of renewal theory, including recent results of L. Takács.

It is only fair for the reviewer to point out that the present work involves advanced mathematics in every paper, and it is not likely to be understood by either managers or operational research workers who have only taken mathematics as a subsidiary subject at a university. It is certain that results of practical significance are implicit at various points throughout the book. But a good deal of sifting and simplification are necessary before the operational research man can find a result which he can take away and use at once.

L. S. GODDARD

Looking and Finding

By Geoffrey Grigson. Pp. 120. (London: Phoenix House, Ltd., 1958.) 9s. 6d. net.

ALTHOUGH well known as a writer on poetry, art, history and archaeology, this is Geoffrey Grigson's first book for young people. The subtitle describes it as a help to "looking and finding and collecting and reading and investigating and much else". This breathless approach is continued throughout the whole of the not extensive text in which young people are advised how to start with maps and charts; how to use books and read them in "skipping and picking and jumping"; how to make discoveries about the houses they live in and what this has to do with inscriptions and phoenixes and salamanders; about yew trees and green men in churchyards; how boys and girls can make maps of their own manors with the fields, mills and ponds, and how to find, in the country, pack-bridges, toll-houses, tithe barns, wells, springs, withy beds, canals and locks, lime-kilns and many footpaths. In addition, young people are advised where to make archaeological and palaeontological discoveries and how to make use of museums. For those who wish there are also hints about how to make and manage their own art galleries.

Mr. Grigson's object in writing a book of this sort is wholly admirable, and parts of it will appeal considerably to some extraordinary children with somewhat unusual parents. The majority will find its pace too rapid, its frequent change of direction too violent, and its repeated exhortation to go and do something not so inviting as those sections where the author takes time off to show them what they should look for.

T. H. HAWKINS