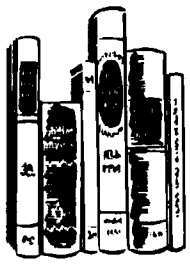

books reviewed

Magnetic Tape Recording

By H. G. M. Spratt. Published (1958) by The Macmillan Co., 60 Fifth Ave., New York 11. 319 pp. incl. indexes and apprendixes. Illus., graphs. 6½ by 8½-in. Price $8.50.

The breadth of coverage by this comparatively small book is quite surprising. In covering such a wide subject area the author has of necessity treated some of the items with dignified brevity. However, this reviewer did not find such brevity to be of any detriment, and that the author is thoroughly versed in the various aspects of tape recording there can be no doubt.

Approximately the first third of the book is devoted to the subjects of Principles of Magnetism, Sound Reproduction and Electro-Acoustics, and Principles of Magnetic Recording. A number of readers will undoubtedly find the first two chapters of the text to be quite elementary. A very brief chapter on Tape Manufacturing Materials is followed by a thorough chapter on the methods and problems of magnetic-tape manufacture, followed in turn by thirty-odd pages of detailed description on the subject of tape testing.

In Chapter 7 (Tape Recording Machines), the author makes some thought-provoking observations, to wit: "The design of tape recording equipment falls naturally under two headings: the electronic circuits and the transport mechanism or mechanical drive. Of the two, the mechanical design is by far the more exacting. Apart from the heads, which have both mechanical and electronic features, the circuits generally follow established practice which in the main differs only to a small degree from the standardized technique in sound engineering. Furthermore, it is not a subject where, by the exercise of outstanding ingenuity, appreciable economies in any particular direction are likely to be effected. As regards the mechanical drive the situation is entirely different. Constancy of drive and starting and stopping requirements, coupled with the fragile nature of the recording medium, call for skilled design of the highest order backed by first-class workmanship. At the same time the established techniques of the kindred subjects, disk recording and cine-film projection, can be applied only to a limited extent, and then with considerable reserve. Finally, in a sense, the mechanical design is the more important of the two since faulty circuits can frequently be corrected without difficulty whereas mechanical weaknesses often demand complete redesign."

This reviewer has not previously seen this point of view expressed so eloquently, in fact does not recall having heretofore seen it expressed in the literature at all. Although such a point of view might cause some raised eyebrows in some strictly electronic circles, that such is in fact true will probably be attested to by all those engineers who have an appreciation for the total overall problems of tape-recorder design. This chapter also includes a number of illustrations and circuit diagrams, covering the studio and portable versions of the professional-type machine, plus the domestic type units. Various parts of the transport mechanism and the electronic circuitry are discussed from the design requirement viewpoint.

Chapter 8 contains many illustrations of commercially manufactured machines, including office dictating machines. Chapters 9 through 12 cover the subjects of Testing Machines, Application of Magnetic Recording, Present Trends and New Developments, and Recording Standardization. The appendixes continue with standardization covering such items as: dimensions of the tape, tape spools — both European and NAB; NAB hub, adapters, tape speed, reel rotation, recording and reproducing characteristics. The problems of abnormal climatic effects are discussed briefly but adequately in Appendix II; Appendix III contains a brief discussion of the basic electrical design of the reproducing head.

All in all an informative book, strictly British with a few exceptions — which may limit its usefulness to the American engineer — but a book with numerous gems of specific information to be gleaned therefrom.—*R. A. White*, GPL Div., General Precision, Inc., Pleasantville, N.Y.

The Physics of Television

By Donald G. Fink and David M. Lutyens. Published (1960) by Anchor Books, Doubleday & Co., Garden City, N.Y. 160 pp. incl. index. Illus. Diagrams. Paperbound. 4 by 7½-in. Price 95 cents.

This little book is one in the science study series written with the avowed purpose of fostering the interest of young students and of laymen in science. It is this reviewer's opinion that several of the books in this series will have precisely this effect. However, the effect of *The Physics of Television* is less easy to predict (possibly because your reviewer is a conservative engineer at heart).

As engineers we all know that in a television system light reflected from a scene is imaged by a lens on a photo-cathode in a camera tube; that by scanning with an electron beam the charge image is converted to a current varying with time; that this varying current is broadcast to distant points through its use to modulate a carrier and through the subsequent demodulation of the carrier; and that a replica of the original image in the camera is produced by scanning over a phosphor with an electron beam, the strength of which is varied by the demodulated signal current. Fink and Lutyens have described these

processes in a very able manner from a very different point of view.

In their treatment Fink and Lutyens discuss each part of a television system from the point of view of a theoretical physicist. The light falling on a scene is emitted in quanta as a result of the change of energy of atoms from an excited state to the ground state. Similarly the absorption and reflection of light from each element of a scene is discussed in terms of energy transitions within the atoms which make up the objects in the scene. And the remainder of a television system is treated in this same manner.

Within this framework, Fink and Lutyens have produced a very readable and interesting text. The television engineer will find the approach refreshing and enlightening. The physicist, however, will be hard put to learn much from the book.

This reviewer is disturbed by the effect this book may have on the naive audience for which it is intended. If its reading arouses his curiosity and drives him to standard texts — well and good. But the naive reader cannot expect that this book will serve as a background for fruitful discussion either with television engineers or theoretical physicists.—*W. T. Wintringham*, Bell Telephone Laboratories, Murray Hill, N.J.

Conductance Design of Active Circuits

By Keats A. Pullen, Jr. Published (1959) by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11. 330 + xiii pages, 6 by 9-in. Price $9.95.

This book is the first textbook published on the use of conductance curves for designing active circuits (both vacuum tube and transistor). The author has been engaged for a number of years in attempts to convince engineers that the use of conductance curves is simpler and more precise than the present concepts. In line with these attempts, triode curves show the plate conductance and transconductance, and gain is found by a formula adapted to the use of these curves. However, the common formula for the gain of a triode amplifier (i.e., gain = $\mu R_L/(r_p + R_L)$ is simpler to use with the data generally supplied by manufacturers. The conductance formula for the gain of a cathode follower is, similarly, somewhat more difficult to use.

In the case of transistors, the g-parameters are perhaps more common; however, most data supplied by the manufacturers make use of the hybrid parameters, thus requiring conversion if conductance principles are to be utilized in circuit design.

The book is well written and informative, and represents a useful addition to a design engineer's library if the user realizes that other methods not only exist but, in many cases, are simpler. With this realization, the conductance design principles form a valuable addition to an engineer's background. The introduction to conductance and the description of the relation between conductance and the more conventional parameters is simple and easily comprehended, and engineers should have no trouble in following the flow of information. In this respect, the book is informative and useful, and represents a worthwhile addition to a library.—*H. W. Mertz*, Haddonfield, N.J.

Basics of Missile Guidance and Space Techniques

By Marvin Hobbs. Published (1959) by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11. 2 Volumes, 144 pp. and 146 pp., 6 by 9-in. Price $7.80 per set.

This pair of volumes (a single volume in the hard-cover edition) is another in the series of Rider publications which are well known for their simplicity and profuse illustrations. This particular book was prepared as a comprehensive basic course in the field of missile guidance and related space systems for both technical and semitechnical personnel.

In Volume I, the author provides an introduction to guidance, its requirements, and the techniques used to satisfy these requirements. The specific systems cited as examples are not by any means new, but are primarily German systems in use or development at the end of World War II. However, the principles exemplified by these systems also apply to more modern systems which may be of a classified nature.

Volume II, also in the "picture book" style common to many Rider publications, discusses space techniques from a general viewpoint, and covers telemetry, electronics and optics in space exploration, various aspects of man-made satellite systems, and electronic components. As in the first volume, the systems cited as examples are not new, but many are still in use. For example, the chapter devoted to electronics and optics in space exploration is primarily concerned with astronomy — both optical and radio — but is quite limited in scope and does not include some of the newer uses of radar in astronomy, such as in the calculation of solar parallax (used as a yardstick for solar system distances).

For the engineer working in the fields of either missile photography or television, the book falls short. For these people, a treatment of such topics as satellite stabilization systems; satellite-borne television, infrared, and optical systems; and relay systems for information transfer would be far more desirable. However, for the person desiring an introduction to the field of guidance and space systems — whether he be engineer, technician or schoolboy — the book fulfills the need for a simplified but accurate presentation. It should, therefore be considered primarily as an informative and interesting addition to a personal or company library, but not one which is likely to be of direct use.— *Harvey W. Mertz*, Haddonfield, N.J.

International Transistor Substitution Guidebook

By Keats A. Pullen, Jr. Published (1961) by John F. Rider Publisher, Inc., 116 W. 14 St., New York 11. 56 + viii pp. Diagrams. 8½ by 5½-in. Paperbound Price $1.50.

Original transistors and corresponding electrical substitutes are tabulated by type numbers. Mechanical differences in case sizes and styles are called out where sufficient to hinder substitution. Dimensions and shapes are shown for all types. Scope of listings is worldwide.— *B. D. Plakun*, GPL Division, General Precision, Inc., Pleasantville, N.Y.

The Technique of Optical Instrument Design

By R. J. Bracey. Published (1960) by English Universities Press Ltd., 102 Newgate St., London, E.C.1, England. 316 pp. incl. index. Diagrams. 5½ by 8½ in. Price 35 shillings.

It is not often nowadays that one finds practical technical details of optical instrument design described in a book. One finds theory, yes, but there is little of an advanced nature on how the theory is used effectively. In part it is because this art is understandably jealous of its trade secrets. In part, however, it is also because of the great complexity of the subject, making of it really an art rather than a science.

Mr. Bracey holds a number of distinctions, among which is having been head of the Optical Department of the British Scientific Instrument Research Association. He analyzes the technique of optical design in three steps: (1) instrument design according to Gaussian optics; (2) instrument design according to third order aberrations; and (3) instrument design adjusted by a trigonometrical survey.

He says, "This last stage in which exact calculations are made, inevitably reflects the personality and available equipment both mental and mechanical of the computer... The individual genius of the computer now becomes apparent in the handling of technical details and the classical scheme is, or should be, merely used as a foundation on which to build appropriately according to one's resources." This is an excellent description of an art. Although the author gives much interesting and useful information on the nature of these "technical details" he does not really betray any deep secrets.

The organization of the book is not wholly around the three steps listed, but they do form a convenient grouping for review.

Mr. Bracey covers his first step in some detail, with thin and thick lenses, and the use of ray traces, including skew rays. For a second part of the first step the author covers chromatic aberrations. He starts with classical achromatic lenses (corrected at two wavelengths) and then goes on to apochromats (corrected at three wavelengths). He indicates the advantages of fluorite glasses, permitting better color correction, yet with the use of lens surfaces of less curvature. The book has been published too soon to note Herzberger's technique of "superchromatisation," where the lens is made practically color-free throughout the visible spectrum by designing with four-parameter analytic dispersion functions for the glasses used.

Mr. Bracey's second step is also treated in some detail. This is a rather lengthy subject, starting with axial aberrations and ending with the analysis and control of the general field aberrations.

By the term "trigonometrical survey" in his third step the author means a precisely calculated ray tracing analysis. He enters this third step by easy stages, starting with the design of eyepieces. Here he indicates final touches to improve the performance of more elementary designs. His last illustration of the third step is the design of photographic objectives, and at this point the reader can hardly expect instructions for a highly sophisticated design. The author follows through a symmetrical, or nearly symmetrical, triplet. With an additional step that he mentions but does not consider in detail this becomes the Tessar. The author concludes this illustration with the statements, "These remarks will have served to outline briefly the extensive field which lies before the designer. The methods described in this book offer a sound foundation on which the reader may base his own technique."

There are two further chapters. One is on "Image Assessment," which leads to the Rayleigh criterion and some data on eye and film characteristics. The final chapter is on "Illumination and Lens Systems," a field which is not always appreciated by designers of unconventional optical systems.

As has already been noted, the reader who masters this book cannot expect to design an *f*/2 photographic objective. But he will be able to do lesser tasks and will have achieved great insight into useful optical design.—*Pierre Mertz*, Lido Beach, L.I., N.Y.

Underwater Photography and Television

By Hans-Ulrich Richter. Published (1958) by Fotokino-Verlag, Halle (Saale), Germany. 337 pp. incl. bibliography. 321 illus. 35 tables. 5¾ by 8½ in. Price DM 38.

Underwater photography is no longer merely a hobby, but opens up the way for new scientific experiments in biology,

oceanography and archaeology and other fields of science. Salvage service may be cited here as only one of its applications. The publication of this book, which presents a comprehensive discussion of the principles and practice pertaining to this field is a welcome addition to the literature. The author is a physicist and for many years has been an enthusiast of underwater photography. In addition, certain sections of the book have benefited from the assistance of other specialists.

The first part discusses the optical prerequisites of underwater photography. By means of numerous tables and diagrams, the book extensively describes the elemental legitimacy of the refraction of light, the reflection and the extinction. Part II describes equipment and the construction of underwater cameras, to conform to special requirements regarding hydrostatic pressure, corrosion, etc. Numerous illustrations show motion-picture and television cameras developed by various countries for special purposes. The practice of underwater photography, is discussed in relation to the apparent shortening of the path of light in the water and the resultant appearances; lenses used for the underwater photography; and film suitable for this purpose. Processing and the light sources are also discussed and necessary filters to be chosen in accordance with the special spectroscopical circumstances of the underwater photography, are described. Reducer formulae are given for the removal of too strong a blue component. Information is also given on swimming and diving techniques and on the use of the breathing devices. A supplementary bibliography with almost 800 references is included—*Dr. Karl Würstlin*, Kodak Aktiengesellschaft, Hedelfinger Strasse 54–60, Stuttgart-Wangen, Germany.

Control System Components

By John E. Gibson and Franz B. Tuteur. Published (1958) by McGraw-Hill Book Co., 330 W. 42 St. New York 36. 494 pp. incl. index. Illus. 6 by 9-in. Price $12.00.

"Transfer Functions of. . ." would have been a very apt and informative preamble to the title of this volume, since transfer function derivation is the major objective of this book. The authors have gathered together, from the literature, the largest existing collection of transfer functions for electronic, electrical, hydraulic and pneumatic control components. This has been achieved by concentrating on theoretical components, avoiding discussion of available hardware, and by avoiding entirely the analysis of complete closed-loop control systems and the associated mathematics. It is therefore necessary that the reader come equipped with a working knowledge of the Laplace transformation and a theoretical knowledge of control systems; if he happens to be an electrical engineer, that will help. This is especially true of the first chapter, where on page one the reader is introduced to the resistor, its construction and color code, and very soon thereafter is led (almost painlessly) through the stages of synthesizing RC and RL networks for particular transfer functions. This is all without reference to Foster or Cauer, and along the way he learns of the asymptotic representation of frequency response on a log-log scale, and by the end of Chapter One, has read one-eighth of the book.

Complete assimilation of Chapter One is, however, not necessary for the understanding of the rest of the book. In fact, many readers may prefer to go directly to the tables of schematic diagrams, transfer functions and associated frequency-response plots to be found in the chapters on mechanical and pneumatic controls, if that is where their main interest lies.

The reader who follows the authors' preferred approach will read the comprehensive analysis and discussion of d-c amplifiers in Chapter Two and will then proceed in order through the topics of a-c amplifiers, thyratrons, magnetic amplifiers, d-c machines, synchros, discriminators and a-c machines, and then on to the mechanical section. The analysis of mechanical components includes the treatment of spring, mass and dashpot combinations and leads to the discussion of a mechanical twin-T network and a lead network. Optimum inertial design of gear trains and a simple analysis of the gyroscope fill out the rest of the mechanical section. Both pump and valve-controlled hydraulic systems are treated next, and some analysis of hydraulic lines, orifices and valves is offered along with a discussion of the pulse-length modulation mode of valve operation. The pneumatic section offers a comparison between electrical, hydraulic and pneumatic systems and tabulates the analysis of a dozen pneumatic devices.

There is in this book something useful for all control engineers, and there is also something for all to bewail. Sensitive readers will be offended at the occasional inaccurate or somewhat irrelevant statement such as "Transistors cannot be used at high radio frequencies, but this is of no consequence in a control system" (p. 85). Practical readers will be unhappy that in the entire mechanical section there are no practical or numerical examples and not even a mention of an ounce, a gram or any other such practical unit. He might also note the absence of any discussion of laboratory measurement of transfer functions or reference to the treatment of nonlinear transfer functions. The authors are aware of some of their omissions and the somewhat arbitrary nature of their selection. They have, however, succeeded in adding to the literature yet another control system book—but one with a difference and a place.—*C. F. Knapp*, Technicolor Research Laboratory, Burbank, Calif.

A 4-page Short Form Catalog #860, available without charge from Allison Laboratories, Inc., 11301 E. Ocean Ave., LaHabra, Calif., describes several new instruments in addition to the regular line of filters, equalizers and analyzers. The catalog presents a brief description of each item, including the price. New products are the Model 532 Octave Band Analyzer, the Model 650 Random Noise Source, and the Model 201 Sub-Audio Variable Filter.