REVIEWS

Modern Geometrical Optics—Pure and Applied Mathematics. Vol. VIII. By Max Herzberger. (Interscience Publishers, New York). 1958. Pp. xii + 504. Price $ 15.00.

With the rapid development in the manufacture of precision optical instruments, the need has arisen for a comprehensive and authoritative book on the theory of lenses and optical systems which will be useful not only to the designers who make them but also to the research workers who use them. The author, Max Herzberger of Eastman Kodak Company, is well known in this field and every chapter in the book bears testimony to the years of experience that lie behind the writing.

The book is divided into eight parts with divisions of chapters which develop the subject of theoretical lens technology in a systematic manner, deriving and recasting the formulæ in a form suitable for use with the modern high speed electronic computers to obtain the data required by the designers.

Part I deals with the methods of ray tracing through different types of optical systems. Part II deals with Gaussian optics whose laws are strictly applicable to axial rays: the deviations of these laws for actual rays constitute the conventional aberrations. Part III is of great theoretical interest as it deals with the most important discovery in geometrical optics, namely, the Hamilton equation which contains implicitly all the laws of optical image formation, and can be adapted to any special problem. As we pass from single ray tracing through an optical system, to tracing a manifold of rays, Hamilton's equation becomes of particular significance. According to this the laws of image formation by an optical system can be expressed through a single characteristic function, the Eikonal function. The remaining parts of the book deal with some of the rigorous laws of image formation, the third and fifth-order image-error theory and the methods of drawing and analysing "spot diagrams" which give a record of the distribution of light over selected image planes and are of great significance in lens design.

The mathematical methods, some of them new, which are used in the book are explained in the appendix in a way easily understandable to the practical designer. It contains a chapter on vector analysis and one dealing with matrices, least squares, Gaussian brackets and polynomical approximations.

A numerical example of tracing of skew rays, astigmatism and asymmetry through a simple lens in air, is given as the last chapter of the Appendix. The problem looks apparently easy, but a glance through the fourteen pages of the chapter shows the formidable amount of calculation involved (simplified though by electronic computers) with figures to seven places of decimals, and the reader is left to wonder whether after all designing lenses is not more of an art than a science.

The book ends with an interesting historical chapter in which are mentioned the contributions to the science of geometrical optics of Rene Descartes, Huygens, Newton, Hamilton and Gullstrand. There is also an extensive bibliography.

From the students' point of view, the title may be somewhat misleading. It is not intended to be a text-book, but fulfils the special need of those who are interested in the problems of geometrical optics in general and in the design of lenses in particular.

A. S. G.

Philips Technical Library: *(1) Multivibrator Circuits*, by A. H. Bruinsma, 1959. Pp. 65. Price Rs. 5·00.; *(2) Practical Robot Circuits*, by A. H. Bruinsma, 1959. Pp. 125. Price Rs. 12·00. (India: Philips India Ltd., Calcutta-20.)

The so-called multivibrator, in its simplest form, is a two-stage amplier whose output is connected to the input and has several modifications. The output voltage of the multivibrator is a square wave whose width, amplitude and shape are controlled by the circuit elements. Sharp triggering pulses often called spike voltages can be derived by differentiating the square wave with an R.C. network. These have wide applications in fast electronic switching and pulse techniques. Among the variations of multivibrator circuits, monostable and bistable circuits have important applications. Much use is made of the latter circuit in binary electronic counting. The publication under review brings within its fold a practical discussion of the fundamentals of the so-called free running multivibrator and several of its modifications mentioned above. Use of pentodes in multivibrators is treated at some length. The reviewer warmly recommends this publication to those who are in search of a simple but precise introduction to multivibrator circuits.

The second publication under review is devoted to a description of two robot systems developed as demonstration models, the one resembling a dog capable of imitating to some extent its living counterpart when stimulated by an external agency, and another stationary robot capable of reasoning to the extent of playing the simple game of noughts and crosses. A double photoelectric cell with the associated circuits providing stereoscopic vision, stereophonic microphone circuit for hearing, and an acoustic radar system for sensing objects constitute the principal electronic organs of the robot animal. The electronic brain circuits incorporated interpret the stimuli received from these and order the action elements which are in this case motors to function as demanded by the situation. The concerned circuits and the fundamental principles of their operation are discussed with numerous illustrations. The mechanical aspects of the design of the robot are described. Under the title "Electronic Intelligence", the second mentioned robot is discussed. Starting with the analysis of the game, the chapter passes on to a description of the robot and how it plays the game. Since multivibrator circuits are made use of frequently in the two robots dealt with, the author's publication on 'Multivibrator Circuits' reviewed above would serve as a useful introduction. The book is highly interesting and will suggest to the seeking mind, numerous other applications of the circuits described.

A. J.

A Course of Pure Mathematics. Tenth Edition. By G. H. Hardy. (Cambridge University Press), 1958. Pp. xii + 509. Price 22 *sh.* 6 *d.* net.

A Course of Pure Mathematics by G. H. Hardy has established itself as a standard text-book for students of the honours level for a long time and is such a popular book that it hardly needs any introductory review. The present volume is a paper bound tenth edition of the book, the appearance of the first edition being in the year 1908. Much progress has been made in the subject since the book was first published and Analysis is now being steadily dominated by ideas of Measure Theory and Topology. The book, however, has a charm and vitality of its own and its usefulness to University students still remains undiminished. The present edition of the book will be warmly welcomed by all.

V.

Potential Theory of Unsteady Supersonic Flow. By J. W. Miles. (Cambridge University Press, London N.W. 1), 1959. Pp. xii + 220. Price 45 *sh.*

The present monograph is one of the first attempts to survey the scattered literature that has grown during the last decade or so in the field of the application of the potential flow theory to the prediction of ærodynamic forces acting on thin wings and slender bodies in unsteady supersonic flight. The investigation of unsteady aerodynamic phenomena becomes increasingly important as we approach supersonic speeds. This monograph, therefore, will be specially valuable to those engaged in research in unsteady flow and to aerodynamicists concerned with stability and flutter problems.

After discussing the basic equations of unsteady potential flow in their exact and approximate forms, the author develops the available methods of solution and applies them to supersonic wings, slender bodies and wing-body combinations. The author has included in the present monograph the interesting non-linear form of the "Piston theory" for hypersonic problems developed by Lighthill in 1953.

Both harmonic as well as transient motions have been considered to illustrate the principles of unsteady aerodynamic phenomena.

The bibliography which contains over 300 references will be valuable to research workers.

S. Dhawan.

Tube and Semiconductor Selection Guide, 1958-59. Second Revised Edition. Compiled by Th. J. Kroes. (Philips Technical Library.)

This volume lists together all electron tubes and semiconductor diodes and transistors available in the market, that fall within the Philips manufacturing range or which can be replaced by equivalent Philips types. All these are put into seven categories and dealt with in separate sections : tubes for radio receivers and amplifiers, cathode ray tubes, transmitting tubes, tubes for microwave equipment, industrial tubes, miscellaneous tubes and semiconductors. The sections follow a uniform pattern of presentation, comprising a table that gives information on direct or near equivalent of the types listed, a table of preferred types for varied functions, tables that group the tubes according to their most important properties, a table for replacement purposes, a guide for replacement of obsolete types, data on tube bases and sockets and details of tube designation systems.

In addition to the commonly encountered tubes, there are listed a variety of special tubes in the various categories, such as tuning indicators, secondary emission tubes, radar and television tubes, flying spot scanners, image orthicons, ignitrons, photo-sensitive devices, radiation counters, thermocouples, trigger tubes, etc. The wide range covered is typical of the Philips organisation, which, by its scale of operations, ingenuity and skill, has become a world-leader in the design and construction and use of electron tubes.

The aim of this compilation is stated to be 'to enable the user of electron tubes to determine quickly which tube is to be preferred in the case in question'. This volume will admirably serve this purpose. It has an additional interest in this country, in view of the collaboration with Philips that has been set in motion, with the object of laying the foundation for the electron tube industry in India.

S. SAMPATH.

Antibiotics Annual 1958-59. Edited by Henry Welch, Ph.D. and Felix Marti-Ibanez, M.D. Medical Encyclopedia Ins., New York, N.Y. Distributed outside U.S.A., by Interscience Publishers Inc., New York, N. Y. Pp. xvii + 1107. Price $ 12.00.

This is the record of the Proceedings of the Sixth Annual Symposium on Antibiotics held on October 15-17, 1958, in Washington, D.C. Though most of the 180 papers are from U.S.A., there are contributions from 14 other countries. We find one from Peru and we hope that soon there would be papers "from China to Peru" embracing the whole world where "antibiotics culture" is holding sway. The antibiotics dealt with are: penicillin V, spiramycin, tetracycline-oleandromycin combination, erythromycin propionate, ristocetin, leucomycin, triacetyloleandromycin, actinobolin, streptovitacin A and B, vancomycin, kanamycin, etc. The long acting sulphonamides, nitrofuranes and quaternary compounds have also got into the company of the antibiotics. The two Panel Discussions "The current status of erythromycin, kanamycin, novobiocin, oleandromycin, ristocetin and vancomycin with particular reference to their use in staphylococcal diseases" and "Causation, prevention and control of staphylococcal diseases in hospitals" are of interest. The symposium being held 30 years after the discovery by Fleming and 10 years after the broad spectrum antibiotics, there was an interesting historical session where some of the makers of the modern antibiotic era had their say in retrospect. These 44 pages constitute interesting reading. Marti-Ibanez rides the "winged Pegasus" himself in his characteristic vein and sets us thinking about "how antibiotics might have changed the course of history" had they been available to Henry VIII, Charles V and Lenin! Florey dispels "many myths and distortions" spun around penicillin. The reviewer cannot agree that his not patenting of the process of extraction of penicillin by the Oxford group was a "cardinal error". Waksman says the bitter truth about those who describe "each fresh culture....and a fresh isolate as a new species" that it is "scientifically inaccurate, logically unsound and hardly proper from any point of view". Keefer pleads for more fundamental researches; "the usefulness of useless knowledge must never be overlooked" is sound advice to those who cannot see beyond their noses. The words of Dowling "The history of the broad spectrum antibiotics reveals no single hero. It is the history of many men and women thinking together, planning together, working together, studying, communicating and achieving together" should be inscribed at the entrance of the Antibiotics Institutes.

The *Antibiotic Annual* has become an indispensable companion to all those interested in antibiotics.

K. GANAPATHI.

The Uterus. (*Annals of the New York Academy of Sciences*, Vol. 75), 1959. Pp. 385-1040. Price $ 7.00.

Many facets of the physiology of uterus and endocrinology of reproductions still remain an enigma. The application of newer techniques and the concerted efforts of scientists of numerous disciplines, particularly the biochemists during the last two decades, while advancing our knowledge of human reproduction has posed many new problems. To obtain effective leads for further investigation, a reappraisal of the present status of our knowledge has now become essential.

This voluminous monograph on uterus dealing with such diverse topics as historical and morphogenetic considerations, biochemistry and histochemistry, problems in uterine tumours, blood coagulations in pregnancy, aspects of gravid uterus, uterine contractions, menstruation and menstrual disorders, structural and functional aspects of the placenta and evaluation of non-steroidal ovarian hormones has admirably fulfilled this objective though in the limited field of uterine physiology.

The significant role of relaxin 'a non-steroidal ovarian hormone' in pregnancy and parturition, the influence of placental hormones on fœtal development, Electrohysterography and the quantitative analysis of amniotic fluid in unravelling the nature of contractility in pregnant uterus, the complex and dynamic muscular, vascular and fluid mechanisms utilized by the gravid uterus, mechanism involved in the fibrinogenopenic accidents of pregnancy and delivery, the application of histochemical techniques for enzyme determinations of placenta and malignant endometria are some of the salient features lucidly discussed in this monograph.

M. SIRSI.

Some Aspects of Food Technology in India. Edited by H. A. B. Parpia, R. C. Bhutiani, K. L. Radhakrishnan, A. N. Sankaran and B. V. Subbarayappa. (Central Food Technological Research Institute, Mysore-2), 1959. Pp. viii + 160.

The publication under review was brought out by the CFTRI, Mysore, on the occasion of the F.A.O. Regional Seminar on Food Technology for Asia and the Far East which was held at the Institute from August 1-8, 1959. It is essentially a compilation of the contributions made by the members of the CFTRI in the field of food science and technology and gives a broad survey of the results of investigations with which the Institute has been actively engaged in recent years. Among the topics presented in the publication are Rice Substitutes, Insect Infestation in Stored Foodstuffs, Fish Technology, Chemistry and Technology of Fruit Products, Dehydration of Vegetable and Animal Foods, Storage Techniques, Processed Protein Foods, Spices and Aromatics in Indian Dietary, Researches in Coffee and Tea.

The chief object of this publication is, as pointed out in the Prefatory note by the Director of the Institute, to bring to the notice of the delegates from other countries attending the Seminar certain aspects of scientific and technological work which if adequately developed would be of value to those countries which are similarly placed as India. There is no doubt that this informative monograph more than adequately fulfils the above object and it will serve not only as a reference but also as a guide to those who have programmes of work to solve similar problems in food technology.

Developmental Cytology, Sixteenth Growth Symposium. Edited by Dorthea Rudnick. (Ronald Press), 1959. Pp. v + 215. Price $ 7.00.

The co-ordinated cellular differentiation in different directions during morphogenesis has intrigued biologists for several decades. It is not surprising, therefore, that the Sixteenth Symposium of the Society for the Study of Development and Growth is centred round the problem of Cellular Differentiation. The title of the volume, *Developmental Cytology* is, as the Editor seems to be aware, slightly misleading, since the papers presented discuss only certain aspects of differentiation in cell types like Paramœcia, Algæ, Fern prothallia, Cnidoblasts of Hydra, chlorophyll containing tissues of normal and etiolated plants, salivary glands of insects and malignant tissues of vertebrates and man. The cell organelles discussed range from nuclei and chromosomes to chloroplasts, mitochondria, endoplasmic reticula and michrosomes. The possibility of a heteroploid transformation and a concomitant shift to malignancy of normal tissues when grown in culture, reported by Hsu, and the role of the nucleus as supplying the starter molecules for later amplification by the cytoplasm suggested by Stich are interesting.

The volume is attractively got up, but the lack of concordance between the text and the legend of Fig. 8 (p. 37) could have been avoided. The price of the volume is prohibitive for workers in India.

M. K. SUBRAMANIAM.

Books Received

Exploring the Structure of Matter. By Jean-Jacques Trillat. (George Allen & Unwin Ltd., 40, Museum Street, London W.C. 1), 1959. Pp. 214. Price 30 *sh.*

A History of Embryology, Second Edition. By J. Needham. (Cambridge University Press, London N.W. 1), 1959. Pp. 304. Price 52 *sh.* 6 *d.*

The Vertebrate Story. By A. S. Romer. (The University of Chicago Press, Chicago-37; Cambridge University Press, London N.W. 1), 1959. Pp. vii + 437. Price 52 *sh.* 6 *d.*

Elements of Wave Mechanics. By N. F. Mott. (Cambridge University Press, London N.W. 1), 1958. Pp. ix + 156. Price 15 *sh.*

Elements of Solid State Theory. By G. H. Wannier. (Cambridge University Press, London N.W. 1), 1959. Pp. vii + 270. Price 35 *sh.*

The Clonal Selection Theory of Acquired Immunity. By Sir M. Burnet. (Cambridge University Press, London N.W. 1), 1959. Pp. ix + 208. Price 22 *sh.* 6 *d.*

Utilization of Nitrogen and its Compounds by Plants. (Symposia of the Society for Experimental Biology, No. XIII.) (Cambridge University Press, London N.W. 1), 1959. Pp. vii + 385. Price 50 *sh.*

The Temperature of British Fish during Distribution in Summer. (Torry Research Station—Paper 1). By G. H. D. Burgess, R. M. Cockburn, C. L. Cutting and W. B. Bobb. (Department of Scientific and Industrial Research, 5-11, Regent Street, London S.W. 1), 1959. Pp. iv + 54. Price 3 *sh.* 6 *d.*

Human Nutrition and Dietetics. By Sir Stanley Davidson, A. P. Meiklejohn and R. Passmore. (E. & S. Livingstone Ltd., 16-17, Tevist Place, Edinburgh), 1959. Pp. xii + 844. Price 84 *sh.*

Elementary Statistics with Applications in Medicine and the Biological Sciences. By F. E. Croxton. (Dover Publications Inc., New York-15 N.Y.), 1959. Pp. vii + 376. Price $ 1.95.

Evolution of Nervous Control from Primitive Organisms to Man. Edited by Allan D. Bass. (American Association for the Advancement of Science, Washington D.C.), 1959. Pp. vii + 231. Price $ 5.75.

Lectures in Applied Mathematics, Vol. 1. (*Probability and Related Topics in Physical Sciences*.) By Mark Kac, G. E. Vhlenbeck, A. R. Hibbs and B. Vander Pol. (Interscience Pub., New York-1), 1959. Pp. xiii + 266. Price $ 5.60.

SCIENCE NOTES AND NEWS

Central Botanical Laboratory, Allahabad

Dr. G. S. Puri succeeds Dr. E. K. Janaki Ammal as the Director of the Laboratory.

Award of Research Degree

The Annamalai University has awarded the Ph.D. Degree in Chemistry to Mr. R. Varadachari for his thesis entitled "Synthesis and Ultraviolet Absorption Spectra of Some Sulphoxides and Sulphones".

UNESCO Regional Training Courses

A regional training course on the use of Radioisotopes in agricultural research, organized jointly by the Ministry of Food and Agriculture, Government of India, FAO, International Atomic Energy Agency and UNESCO South Asia Science Co-operation Office, will be held at the Indian Agricultural Research Institute, New Delhi, from 20th January to 17th February 1960.

The syllabus of the course will deal with the role of radiation in cytology and genetics, radioisotope techniques as applied to problems in soil fertility, fertilizer application and plant biochemistry and radiation as a protective agent. A maximum of 25 participants will be admitted to the course.

A regional training course on 'High Vacuum Techniques', sponsored jointly by the National Physical Laboratory, New Delhi, and the UNESCO South Asia Science Co-operation Office, will be held at the National Physical Laboratory, from 18th Januuary to 12th February 1960.

The syllabus will relate especially to the developments in high vacuum techniques in science and industry during the last 20 years. The course will be directed by Prof. A. L. Reimann, Research Professor of Physics, University of Queensland, Brisbane (Australia), who will be assisted by Dr. J. H. Leck of Liverpool and members of the NPL staff (New Delhi). A maximum of 20 participants will be admitted.

Enquiries about the training courses should be addressed to the UNESCO South Asia Science Co-operation Office (SASCO), 21, Curzon Road, New Delhi, India, of the Indian National Commission for UNESCO, Ministry of Education, Government of India, New Delhi.

Improved Grain Storage Structure for Village Conditions

Messrs. S. Pradhan, P. B. Mookherjee and G. C. Sharma, Division of Entomology, Indian Agricultural Research Institute, New Delhi, write: It is the common practice in villages to store grains in earthen structures. However in this type of storage the grains are often found to be infested with insect pests. It is found that the storage effect is improved if the mud wall of the structure is built with a thin sheet