Other, equally interesting, applications to electromagnetism, and so on are not treated.

The second part, entitled "Probabilistic Problems," contains chapters on prediction (Wiener), game theory (Bohnenblust), operations research (King), dynamic programming (Bellman), and Monte Carlo methods (Brown).

The third part, entitled "Computational Considerations," treats matrices, with applications to engineering problems (Pipes); functional transformations (Barnes); conformal mapping (Beckenbach); nonlinear (Morrey), relaxation (Forsythe), and steep descent methods (Tompkins); and, finally, high-speed computing devices (Lehmer).

Most of the authors are well-known masters of their subjects, and they give excellent presentations, which, though condensed, are intelligible and stimulating. It is not to be expected that the chapters will form a homogeneous unit. The requirements for intelligent reading vary from elementary advanced calculus to Lebesgue integration. The chapters can be read independently and contain references for further reading. One of the authors states, disarmingly, that he is a pure mathematician with very little contact with engineering problems. Most of the authors, however, have had extensive experience in applied mathematics and specific engineering applications. On the whole, the volume is warmly recommended to the modern engineer who has a good mathematical background.

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Astronomical Optics and Related Subjects. Proceedings of a Symposium. Zdenek Kopal, Ed. North-Holland, Amsterdam; Interscience, New York, 1956. 428 pp. Illus. $12.50.

It is unfortunate that this excellent volume has a rather misleading title. To be sure, all the subjects treated apply to the problems of modern astronomy, but, more than that, most of them apply more broadly, to optics in general. As a matter of fact, many of the contributors to the volume would not designate themselves astronomers.

This is the proceedings of a four-day symposium held at the University of Manchester, England, in April 1955. The aim of the symposium was twofold: to provide a forum for the discussion of certain fields in optics of timely interest and astronomical significance and to strengthen further the liaison between astronomy and optics by bringing current astronomical desiderata to the attention of contemporary optical experts. The symposium was attended by 105 persons from five European countries; America was not represented. In all, 61 papers were presented, and 46 of them are published here, with an excellent 12-page introduction by the editor, Zdenek Kopal, who is professor of astronomy at Manchester, and with brief concluding remarks by J. Rösch of the Observatoire du Pic du Midi. Most of the text is in English, but ten of the papers are in French and two are in German; each of the 12 papers is preceded by a short abstract in English. There is an author index, but no subject index, alas. There are numerous line-drawing illustrations and several excellent plates; the typography is excellent.

The book is divided into seven main sections corresponding to the several sessions of the symposium. Each section contains from four to ten short papers. The subject matter of the first three sections is definitely in the "general physical optics" category: information theory and optics; optical images and diffraction; interferometry and coherence problems. The last four sections are devoted to topics of more special application to astronomy: electronic devices in astronomical optics (including both photoelectric photometry and the new and promising television techniques) that are supplanting photography in many applications; resolution problems and scintillation or "seeing" as the deleterious, irregular refraction by the earth's atmosphere is commonly called; wide-angle optical systems and aspheric surfaces, of such practical importance in modern astronomical telescopes; and filter photography, in which both dye filters and interference (thin film) filters are used. The interest in this last topic surely extends to fields other than astronomy.

An indication of the newness that has come into optics, changing it so radically from a formulism of classical physics, is given by D. Gabor of Imperial College, London, when he states that "optics was always considered as a good didactical preparation for wave mechanics; now it appears that quantum mechanics is not a bad preparation for optics" (page 30). Although it would appear that leadership in the "new optics" has come from Great Britain, France, Holland, Germany, and Italy, the contributions of the Americans Claude Shannon, Norbert Wiener, and Otto Schade are often mentioned by our colleagues overseas. In October 1951 a symposium on optical image evaluation was held at the National Bureau of Standards in Washington, attended by participants from many countries, and in June 1955 a symposium on the formation and evaluation of images was held at the University of Rochester. Several Americans attended the international conference in September 1954 in Florence, Italy, on "Problems in Contemporary Optics," which was, in a scientific sense, the forerunner of the Manchester symposium.

This volume is highly recommended to those who wish to become more familiar with the extent of modern optics and especially to astronomers and other optical folk who are interested in extracting the maximum amount of information to be obtained from the diffraction pattern that is called an optical image.

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Social Characteristics of Urban and Rural Communities, 1950. A volume in the *Census Monograph Series*. Otis D. Duncan and Albert J. Reiss, Jr. Wiley, New York; Chapman & Hall, London, 1956. 421 pp. $6.50.

The volume is an amplification and illumination of materials from the 1950 census dealing with the social characteristics of different-sized communities. The authors consider 11 classes of places, ranging from urbanized areas of three million or more inhabitants to sparsely settled farm regions. They set forth some interesting characteristics of these various bands in the sociological spectrum. Women outnumber men in cities and other incorporated places, but in the extremely rural regions the male animal predominates. The urban population in general is characterized by a higher median age, a lower fertility ratio, smaller families, higher percentages of separated and divorced persons, a larger percentage of women in the labor force, more years of education, higher incomes, and so on. These urban-rural differences might be easily surmised or discovered from other sociological writings, but their extent is here definitely stated and graphically illustrated. The authors have made an instructive and commendable contribution to social science.

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The Human Brain. From Primitive to Modern. A. M. Lassek. Thomas, Springfield, Ill., 1957. viii + 242 pp. $4.75.

The purpose of this book, the author says, "has been to try to portray the significance and impact of the long, past environment upon that dynamic organ, the human brain, and what it may mean to us in the middle of the 20th Century." The description of the brain itself and of the patterns of its working is brief

and schematic. The embryological and evolutionary development of the brain and its definitive structure as of today are given less than a sixth of the text, and this perhaps is adequate for Lassek's purpose. The rest of the book is devoted mainly to a survey of human cultures, drawn from the literature of cultural anthropology. The history of the evolution of the human mind is divided into four overlapping stages, represented by presavage, savage, barbarian, and civilized man.

The book is simply and clearly written and well indexed. There are a few errors and some infelicities of style. On page 13 we read that "the human race can be traced back with some degree of surety, only to about 5,000 B.C." I do not find the word "archtype" (pages 46, 51) in my dictionary. The frequent use of the word "data" as a singular noun in current literature is no justification for this barbarism. If "this data' (page 32) and "the data is" (page 67) may be regarded as good English, must we not also grant that "this datum are" would be equally acceptable?

For several reasons it is difficult to explain in vernacular language either the technical details or the general principles of cerebral structure and function. Lassek does not attempt to do this, but has chosen a different way to quicken popular interest in brains as the organs of civilization and in how they got that way. This he does by describing the ways of life in successive stages of cultural evolution.

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Books Reviewed in The Scientific Monthly, December

Discovery of the Universe, G. de Vancouleurs (Macmillan). Reviewed by S. L. Lippincott.

The Next Hundred Years, H. Brown, J. Bonner, J. Weir (Viking). Reviewed by P. M. Stern.

The Life of Arthur Stanley Eddington, A. V. Douglas (Nelson). Reviewed by M. H. Wrubel.

The Direction of Research Establishments (H. M. Stationery Office).

Margarine and Other Food Fats, M. K. Schwitzer (Interscience). Reviewed by L. Voris.

Health and Medical Care in New York City (Harvard University Press). Reviewed by H. N. Pratt.

Rocks and Minerals, H. S. Zim and P. R. Shaffer (Simon and Schuster).

Reptiles, A. d'A. Bellairs (Hutchinson's University Library). Reviewed by R. F. Inger.

Annual Epidemiological and Vital Statistics, 1954 (World Health Organization).

Lascaux and Carnac, G. Daniel (Macmillan). Reviewed by F. de Laguna.

Plant Classification, L. Benson (Heath). Reviewed by K. L. Chambers.

A Textbook of Plant Virus Diseases, K. M. Smith (Little, Brown). Reviewed by W. C. Boyd.

Modern Science and the Nature of Life, W. S. Beck (Harcourt, Brace). Reviewed by M. Bates.

New Books

Organic Syntheses. An annual publication of satisfactory methods for the preparation of organic chemicals. vol. 37. James Cason, Ed. Wiley, New York; Chapman & Hall, London, 1957. 109 pp. $4.

Psychological Disorder and Crime. W. Lindesay Neustatter. Philosophical Library, New York, 1957. 248 pp. $6.

Calcium Metabolism. J. T. Irving. Methuen, London; Wiley, New York, 1957. 177 pp. $2.75.

Cities and Society. The revised reader in urban sociology. Paul K. Hatt and Albert J. Reiss, Jr. Free Press, Glencoe, Ill., 1957. 860 pp. $7.50.

The Social System of the High School. A study in the sociology of adolescence. C. Wayne Gordon. Free Press, Glencoe, Ill., 1957. 195 pp. $4.

Human Motivation. Probability and meaning. Fred T. Schreier. Free Press, Glencoe, Ill., 1957. 277 pp.

The Osteodontokeratic Culture of Australopithecus Prometheus. Memoir No. 10. Raymond A. Dart. Transvaal Museum, Pretoria, 1957. 113 pp.

Essentials of Human Anatomy. Russell T. Woodburne. Oxford University Press, New York, 1957. 628 pp. $12.50.

Nonparametric and Shortcut Statistics in Social, Biological, and Medical Statistics. Merle W. Tate and Richard C. Clelland. Interstate Printers and Publishers, Danville, Ill., 1957. 180 pp.

Laboratory Workbook for Principles of Zoology. John A. Moore, Oxford University Press, New York, 1957. 122 pp. $2.75.

Introduction to General Embryology. A. M. Dalcq. Translated by Jean Medawar. Oxford University Press, London, 1957. 184 pp.

Cahiers de Synthèse Organique. vol. II. Methodes et tableaux d'application. Jean Mathieu and André Allais. Masson, Paris, 1957. 322 pp.

Exploring Earth and Space. The story of the I.G.Y. Margaret O. Hyde. Whittlesey House, McGraw-Hill, New York, 1957. 160 pp. $3.

Integrating the Approaches to Mental Disease. Two conferences held under the auspices of the Committee on Public Health of the New York Academy of Medicine. H. D. Kruse, Ed. Hoeber-Harper, New York, 1957. 408 pp. $10.

Practical Astronomy. A new approach to an old science. W. Schroeder. Philosophical Library, New York, 1957. 217 pp. $6.

Quantum Mechanics. F. Mandl. Academic Press, New York; Butterworths, London, ed. 2, 1957. 277 pp. $6.50.

The Pacific Lowlands of Colombia. A Negroid area of the American tropics. Robert C. West. Louisiana State University Press, Baton Rouge, 1957. 292 pp. $5.

Poison on the Land. The war on wild life, and some remedies. J. Wentworth Day. Philosophical Library, New York, 1957. 256 pp. $6.

Parapsychology. Frontier science of the mind. A survey of the field, the methods, and the facts of ESP and PK research. J. B. Rhine and J. G. Pratt. Thomas, Springfield, Ill., 1957. 229 pp. $4.75.

High Energy Nuclear Physics. Proceedings of the seventh annual Rochester Conference, 15–19 April 1957. Compiled and edited by G. Ascoli, G. Feldman, L. J. Koester, Jr., R. Newton, W. Resenfeld, M. Ross, R. G. Sachs. Distributed by Interscience, New York, 1957. 491 pp. Paper, $4.50.

Contributions to the Theory of Games. vol. III. M. Resher, A. W. Tucker, P. Wolfe. Princeton University Press, Princeton, N.J., 1957. 441 pp. $5.

World Directory of Medical Schools. World Health Organization, Geneva, ed. 2, 1957 (order from Columbia University Press, New York). 314 pp. $5.

Higher Oxo Alcohols. Lewis F. Hatch. Wiley, New York, 1957. 130 pp. $4.50.

Body Water in Man. The acquisition and maintenance of the body fluids. Maurice B. Strauss. Little, Brown, Boston, 1957. 305 pp. $7.

The Hangover. A critical study in the psychodynamics of alcoholism. Benjamin Karpman. Thomas, Springfield, Ill., 1957. 554 pp. $9.50.

Methods of Biochemical Analysis. vol. 5. David Glick, Ed. Interscience, New York, 1957. 513 pp. $9.50.

A Concise Guide to Plastics. Herbert R. Simonds. Reinhold, New York; Chapman & Hall, London, 1957. 329 pp. $6.95.

The Patient and the Mental Hospital. Milton Greenblatt, Daniel J. Levinson, Richard H. Williams, Eds. Free Press, Glencoe, Ill., 1957. 676 pp. $6.

Atom Harvest. A British view of atomic energy. Leonard Bertin. Freeman, San Francisco, 1957. 253 pp. $3.25.

How to Know Freshwater Fishes. Pictured keys for identifying all of the freshwater fishes of the United States and also including a number of marine species which often enter freshwater. Samuel Eddy. Brown, Dubuque, Iowa, 1957. 259 pp. Cloth, $3.25; spiral bound paper, $2.75.

The Friendly Fungi. A new approach to the eelworm problem. C. L. Duddington. Faber and Faber, London, 1957 (order from Macmillan, New York). 188 pp. $4.50.

Dangerous Properties of Industrial Materials. A completely revised and enlarged edition of *Handbook of Dangerous Materials.* N. Irving Sax. Reinhold, New York; Chapman & Hall, London, ed. 2, 1957. 1472 pp. $19.50 (beginning Jan. 1958, $22.50).

The Economics of Communist Eastern Europe. Nicholas Spulber. Technology Press of Massachusetts Institute of Technology and Wiley, New York; Chapman & Hall, London, 1957. xxviii + 553 pp. $12.50.