Book Reviews

Electromagnetic Theory, Vols. I, II, and III. Reprint. Oliver Heaviside. New York: Dover, 1950. 386 pp. $7.50.

Oliver Heaviside developed elementary vector analysis as we know it and published the first text on the subject (as a long chapter in *E. M. T.*), invented one form of operational analysis which has had wide influence, was the first to emphasize the use of semidivergent series in the solution of physical problems, developed the theory of the uniform two-conductor transmission line *in extenso,* made major contributions in the field of electromagnetic theory, predicted the existence of the ionosphere, introduced many now-commonplace terms such as "impedance," and raised such effective cry against the classical electric and magnetic units that the echo was still present when the MKS-ampere system came into vogue years later.

Dover's fine reprint of Heaviside's 3-volume *Electromagnetic Theory* on the hundredth anniversary of his birth offers an occasion to glance at this work from the vantage point of the present. The ardent but not uncritical disciple of Maxwell, who combined great creative ability with intense desire for simplicity and lucidity, gathered here many of his papers which were often written with an eye to continuity, the disjointedness of the usual volume of papers not being nearly so evident. What is evident is the up-to-dateness of Heaviside, a modern in whose work the past intrudes but quietly, and seldom commands. Dealing with fields in which great changes have taken place in the past 50 years, some major sections of *E. M. T.* could easily be used as textbooks for graduate courses today.

Heaviside received numerous honors during his lifetime, and saw many of his views accepted to such an extent that few today can conceive the shaking down over the years which was required to achieve this. His time of greatest productivity (1880–1905) was one in which Maxwell's theory was passing from possibility to probability, and in which the great industries "associated" with electromagnetic theory (power, communication) were rapidly broadening the bases on which the current giants were built. It is fascinating to follow technical growth as reflected in *E. M. T.* To take but one example, Heaviside was probably led to his development of the elementary vector analysis (which he was later accused of plagiarizing from Gibbs) to his operational calculus, and to his simplification of the basic equations by use of new units, by his desire to present and extend Maxwell's theory for the benefit of workers in the field. Yet later well-known books in electromagnetic theory (e.g., Jeans') practically disregarded vector analysis, the operational calculus had to be revived years afterward by Carson and Wagner, and units were not revised for many years. Numerous other examples from *E. M. T.* of technical growth via a Heaviside base, followed by neglect, reaction, or rejection, followed by acceptance and expansion, might be cited.

A word about specific aspects of the present edition is called for. Ernst Weber has contributed an excellent introduction, and the format is unusually good. Printed on 9×12 pages, 4 pages of the original are reproduced photographically on one page of the new, with little reduction, so that 386 new pages cover 3 volumes of the original. Since most technical magazines—at least in engineering and physics—are now printed in approximately the same page size, why should technical books not be likewise? The ease of cross-referencing and of consulting figures with the large page would seem to more than compensate for the increased bulkiness.

And, quite incidentally, photographic reproduction leads to duplication of errors in the original (few, in the case of *E. M. T.*) and to its own errors—of a line that missed the camera, for example. The typographical errors in Professor Weber's typeset introduction are rather unfortunate.

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Cell Growth and Cell Function: A Cytochemical Study. Torbjoern O. Caspersson. New York: Norton, 1950. 185 pp. $5.00.

This work is based on the author's Salmon Memorial Lectures given in 1948. The title is too big for this little book which is, at best, an outline guide to the extensive publications of Caspersson and co-workers on the subject of microspectrophotometry of biological materials and the function of nucleoprotein systems in cells. It deals primarily with the techniques and results in the ultraviolet spectrophotometry of cells. The subject is developed in six short chapters, with ninety-four illustrations. There is no index.

For the uninitiated the text is too brief. For example, Chapter II covers a wide range of complex physical problems in the ultraviolet microscopy of cellular components whose dimensions are near the theoretical limit of resolving power of any optical system. The reader is given a rapid outline of the principles and techniques developed in Dr. Caspersson's pioneering work. But the careful reader will find it necessary to refer to the original papers, to which there are ample references in this outline discussion. The critical biophysicist will wish there were more quantitative data given—for example, on the energy flux through the specimen—since quantitative figures usually enhance a concise presentation.

The jacket glibly says that this book presents "for the first time in book form the results of studies in cell processes made by quantitative cytochemical procedures." For those who eagerly read (and still have before them)

the *Acta Radiologica Supplement* of 1944 by Caspersson and Santesson on the protein metabolism of tumors, this statement must evoke a wry smile. However, this book does mention the tumor material of the 1944 book under the heading of "disturbed systems for protein metabolism," after having described the undisturbed systems in normal metazoan cells. It covers the subject of protein synthesis in a general sense by including a description of the process in bacteria and in viruses. Dr. Caspersson's diagrams showing protein reproduction, and virus reproduction, are thought-provoking and help enormously, along with the generous number of graphs and photographs, to supplement the sketchy text.

By virtue of its brevity this is a stimulating book in that it sets forth ideas in concise form about the mystery of the everyday creation of cells. Although incomplete, these ideas are important now; for there is a great need of new concepts about the fundamental mechanism of cell reproduction. The newcomer to the subject of microspectrometry of cells will find here a quick introduction and survey of the subject. The expert will hope that this book may become the starting point for a more detailed "treatise" on living matter.

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The Cerebral Cortex of Man: A Clinical Study of Localization of Function. Wilder Penfield and Theodore Rasmussen. New York: Macmillan, 1950. 248 pp. $6.50.

Penfield and his associates have given us a series of important papers and monographs concerning cerebral function, and this study is another important contribution. It covers some old ground by presenting evidence concerning epileptic attacks and cortical ablation in different areas of the cortex and in describing some effects of electrical stimulation of the cortex in conscious human patients. It is the first time, however, that we have a relatively complete account of stimulation-work for a wide variety of cortical areas. It is this fact, and the conclusions that come out of it, that make this monograph truly valuable.

The Cerebral Cortex of Man describes the many observations that have been made during brain surgery of the perceptions, memories, and thoughts evoked in patients by electrical stimulation of different cortical points. The method confirms and elaborates what we already know about the position and organization of the primary somatic and motor areas. When these areas are stimulated, patients give simple movements or report primitive sensations. The monograph further tells, however, of the existence of a second motor area at the foot of the central sulcus along the rostral border of the lateral fissure. And it reveals that there is a supplementary motor area in the dorsal and medial part of the frontal lobe just in front of the classical motor points for the feet and toes.

The monograph also throws some light on the mechanisms of aphasia. It describes the prompt arrest of speech when either the supplementary motor area or the sensorimotor regions representing speech are stimulated. More important is the fact that an aphasic arrest may be produced by stimulating three different areas: a frontal area approximately the same as Broca's classical area, a parietal area at the posterior end of the lateral fissure, and a temporal area in the occipitotemporal region.

Extremely interesting to neurologists and psychologists alike are observations that complex perceptions and memories can be elicited by stimulating some of the "association" areas of the cortex. Stimulating the secondary sensory areas evokes complex sensations or perceptions, and stimulating the temporal lobe produces relatively complex sequences of memory.

Penfield and Rasmussen put forth some interesting interpretations of their data. Among them is the idea that memory patterns are localized primarily in the temporal lobe and that the elaboration of thought is a function of the frontal lobe. They also argue that the center for the integration of consciousness and complex processes is not in the cerebral cortex but in the diencephalon, and they have good evidence to bolster this notion.

This is not the place to give further details of this monograph. Suffice it to say that this is an extremely important contribution, because it presents new and convincing evidence about cortical function and new hypotheses about the physiological mechanisms of perception, memory, thought, and consciousness.

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Scientific Book Register

The Anatomy of the Gorilla. The Henry Cushier Raven memorial volume; a collaborative work of The American Museum of Natural History and Columbia University. William King Gregory, Ed. New York: Columbia Univ. Press, 1950. 259 pp. $15.00.

Dementia Praecox or the Group of Schizophrenias. Eugen Bleuler; translated by Joseph Zinkin. New York: International Universities Press, 1950. 548 pp. $7.50.

Chemistry and Biology of Proteins. Felix Haurowitz. New York: Academic Press, 1950. 374 pp. $5.50.

The Climate near the Ground. Rudolf Geiger. Translated from 2nd ed. of "Das Klima der Bodennahen Luftschicht" by Milroy N. Stewart *et al.* Cambridge, Mass.: Harvard Univ. Press, 1950. (For the Blue Hill Meteorological Observatory.) 482 pp. $5.00.

The Primeval Atom: An Essay on Cosmogony. Georges Lemaître; trans. by Betty H. and Serge A. Korff. New York: Van Nostrand, 1950. 186 pp. $3.00.

Cell and Psyche: The Biology of Purpose. Edmund W. Sinnott. Chapel Hill, N. C.: Univ. North Carolina Press, 1950. 121 pp. $2.00.

German-English Technical and Engineering Dictionary. Louis de Vries. New York: McGraw-Hill, 1950. 928 pp. $20.00.