

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 (1890-1905) 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.

J. G. BRAINERD

Moore School of Electrical Engineering
University of Pennsylvania

Cell Growth and Cell Function: A Cytochemical Study. Torbjørn 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)