of their faith. But to go back to those groping days, and then to study not the full success of "mechanics of the vacuum," which is admittedly hard, but rather—because it is easy—the feeble infancy of the theory of the electromagnetic field is to give up the task of making physics meaningful to the literate man of today It is an attractive notion, and it may work in some less mature fields of science, but in Case History 8 it does not come off. The epilogue of two pages, in which the modern unity of the one- and two-field theories into ionic and electronic conduction is sketched, ought to be a prologue, a prologue to the victories of the time since Coulomb, the battles of Laplace, Gauss, Faraday, Maxwell, Rowland, Hertz, Lorentz, and Dirac. This story is *Hamlet* without the Danish prince.

High Energy Radiation. Volume I of Radiation Biology. Parts I and II. Edited by Alexander Hollaender, with the cooperation of Austin M. Brues, Hermann J. Muller, Berwind P. Kaufmann, and Lauriston S. Taylor. 1265 pp. McGraw-Hill Book Company, Inc., New York, 1954. $17.50 (not sold separately). *Reviewed by Joseph G. Hoffman, Roswell Park Memorial Institute.*

This is the first volume of a projected three volume series on the general subject of radiation biology. It is printed in two parts and deals with high energy radiation: the designation "high" being in reference to the lower energy ultraviolet radiations which according to the jacket will be taken up in Volume II, and light radiations in Volume III. The present volume deals with a rapidly expanding subject inasmuch as x-rays and nuclear radiations are becoming more and more part of industrial and scientific activity. It is therefore necessary to note that all of the eighteen chapters were closed by December 1952.

This promises to be an important volume in the history of radiobiology. Its magnitude alone would bear this out: Part I has 626 pages and includes the first 8 chapters, the remaining 10 chapters are in Part II which has 640 pages. In the total of 1265 pages there is treated a wide diversity of aspects of radiation biology by twenty different essayists. The first 3 chapters are devoted to the fundamental physics involved in radiobiology. The first chapter deals with radiological physics which includes a concise evaluation of target theory. The second deals with methods of measuring ionizing radiations for biological purposes; and the third reviews physical principles underlying photochemical, radiation-chemical, and radiobiological reactions.

The next 3 chapters describe the basic processes set in motion when radiations are absorbed in living systems. Chapter 4 deals with mechanisms in radiation biochemistry, and Chapter 5 with the effects of x-rays on systems of biological importance. The role played by linear energy transfer is discussed in Chapter 6. One high-light of this section is found in Zirkle's single table 15 pages long which summarizes much literature on linear energy transfer and relative biological effectiveness. Thus, the first 6 chapters of this volume provide a broad review of basic knowledge of physical and chemical phenomena. These alone form an essential addition to the biophysicist's library.

The remaining 12 chapters are devoted to the description of biological effects produced by penetrating radiations. In broad outlines these center about genetic changes, mutations, chromosomal aberrations in plant and in animal cells, effects on the division, morphology, and viability of cells, disturbances of mammalian prenatal development, radiation injury in mammals, hematologic effects, histological changes, and carcinogenesis. Each of these major subjects of radiobiology is reviewed in detail. For instance, there are 3 chapters on genetic effects, 2 chapters on chromosome aberrations, and 2 chapters on pathological physiology of radiation injury.

The jacket points out that this volume is a work of reference. Accordingly each chapter is thoroughly documented with an extensive bibliography. These necessary references occasionally trip the flow of the text. Nevertheless, the contributors have succeeded in providing a very readable and stimulating account. In this connection must be mentioned the two chapters written by H. J. Muller. The titles of the chapters are indicative of their material. Chapter 7 is "The Nature of the Genetic Effects Produced by Radiation"; and Chapter 8, by the same author, is "The Manner of Production of Mutations by Radiation". The two chapters are classic. They cover 275 pages, and in them Muller elucidates clearly many ideas about the genetic substance which must be of fundamental interest to physicists, chemists, and biologists alike.

The chapters on genetics, along with the two on chromosome aberrations, provide reviews of material which can be especially pointed out to biophysicists. The mechanical maneuverings of chromosomes during cell division or in the process of crossing-over during meiosis present many intriguing problems for the physicist to contemplate. The two chapters on chromosome aberrations show very well how radiation has been employed as a tool for the study of the behavior of chromosomes.

A major portion of the second part is devoted to a description of injuries produced by radiation. The last 6 chapters taken together compromise a review of this subject which is a matter of interest to everyone ranging from the abstract scientist to the practicing physician and even to the nontechnical public. It is a noteworthy feature that for the first time there is gathered in a single reference text so much material on so many different aspects of injury reactions.

This volume is highly recommendable. It is a compendium of radiobiology in the form of timely reviews. Each contributor has without doubt performed here a worthwhile service to the subject of radiobiology. The text is supported by an ample number of diagrams and photographs, along with a generous supply of data in the many tables. The format and type are excellent.