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RADIATION BIOLOGY

VOLUME I: HIGH ENERGY RADIATION

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Prepared under the Auspices of the Committee
on Radiation Biology, Division of Biology and Agriculture
National Research Council
National Academy of Sciences
Washington, D.C.

PART I

CHAPTERS 1 TO 8

NEW YORK TORONTO LONDON
MCGRAW-HILL BOOK COMPANY, INC.

1954

12.7.1954 Rs. 2.20 (R.12) 574.101
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RADIATION BIOLOGY
VOLUME I—PART I

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Library of Congress Catalog Card Number: 53-6042

612.01448
R1161

PREFACE

These three volumes deal with the biological effects of radiations, corpuscular and electromagnetic, throughout the energy spectrum from the highest available energies to the near-infrared region. Radiation biology has progressed through important stages during the last fifty years. An upsurge of interest in the early years of the century was stimulated by developments which followed the discovery of X rays and radioactivity. In this era many of the fundamental phenomena in radiation biology were recognized, during the early growth of concepts in atomic and nuclear physics. Because much of the modern research had its roots in investigations of this period, a study of these early reports is still very rewarding. After World War I an important phase of research was reached with the discovery of (1) the genetic effects of radiation in *Drosophila* by Muller and, some time later, in maize by Stadler; (2) the effect of density of ionization; and (3) the exact action spectrum of the biological effects of ultraviolet. The unfolding of most of these early investigations is discussed in B. M. Duggar's most comprehensive review, "Biological Effects of Radiation." Significant aspects of radiation biology have been discussed in Lea's book, "Actions of Radiations on Living Cells"; the *British Journal of Radiology* supplement, "Certain Aspects of the Action of Radiation on Living Cells"; the Oberlin symposium on radiobiology, "The Basic Aspects of Radiation Effects on Living Systems"; and many monographs. Modern developments in biochemistry, biophysics, pathology, and related fields have established a profound and growing influence on research in the radiation field.

The discovery of the chain reaction in uranium initiated a new phase of scientific endeavor. The phenomenon of nuclear fission has become a practical instrument in the development of nuclear weapons; it gives great promise of becoming an economic factor as a power source; and it is outstanding as a contributor of important research tools. Many of the applications of nuclear energy are limited by their biological implications.

These volumes grew out of a tentative plan to revise the Duggar publication. However, the extraordinary expansion in radiation biology made it desirable to go beyond a straight-line biological discussion and to include in these volumes some discussions on the borderline subjects. Important developments in the field of ultraviolet radiation, especially in regard to its practical applications, justified extensive treatment. Widespread advances in photosynthesis, photoperiodism, vision, and related subjects demanded a complete volume on the effects of visible light.

The effects of the three types of radiation are presented in three volumes: Volume I, ionizing (high-energy) radiations; Volume II, ultraviolet; and Volume III, visible light. Since many biological effects are common to both ionizing and ultraviolet radiation, a sharp separation of these fields is no longer possible. The first two volumes might, therefore, be regarded as a whole. Both the ultraviolet and high-energy regions of the spectrum are discussed in individual chapters in both volumes. The radiation biology field, in general, is so active that, although only two years have elapsed since initiation of these publications, some of the discussions are not up to date. Space does not permit inclusion of all subjects of interest to the radiation biologists; some worthy topics are omitted for lack of an appreciable amount of new material. Studies on the use of radioisotopes as a research tool are not included because adequate texts are already available.

Gratitude is expressed to Dr. R. E. Cleland, who, during his tenure as chairman of the Division of Biology and Agriculture of the National Research Council, gave encouragement in the planning of these volumes; to Dr. Paul Weiss, the present chairman, who added his ready support to the project; and to the other members of the National Research Council. Acknowledgment is also made of the contribution of the members of the editorial boards of the separate volumes of "Radiation Biology." Without the generous support of the Division of Biology and Medicine of the Atomic Energy Commission and the Oak Ridge National Laboratory, the preparation of this work would not have been possible.

Alexander Hollaender, Editor

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