Proceedings of the Fifth International Congress of Radiation Research

RADIATION RESEARCH

Biomedical, Chemical, and Physical Perspectives

EDITED BY

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Radiation Research

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Proceedings of the
Fifth International Congress of Radiation Research
Held at Seattle, Washington, U.S.A.
July 14-20, 1974

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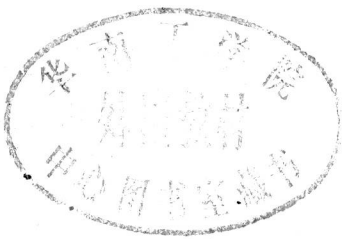

The Fifth International Congress of Radiation Research

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PREFACE

The basic aspects of radiation effects on living systems include not only examination of these effects at all levels in such systems—molecular, cellular, organ, and whole animal—but also consideration of the processes by which radiation interacts with matter and generates chemical species capable of subsequent interaction with biologically important molecules. Recognition of the need to consider these fundamental aspects lies at the root of radiation research as a field. Consequently, meetings and discussions among physicists, chemists, and biomedical scientists have played a special role in the development of this area of research. Initially such meetings were small, and took place at Oberlin, Ohio (1948), and subsequently in London, Aarhus, Liege, Stockholm, Cambridge, and Venice. The interdisciplinary character of the subject was emphasized, as well as the necessity for physicists, chemists, and biologists to meet and to discuss their different approaches to the common problems confronting them. At the same time concern was felt about the uncertainties associated with long-term exposure to radiation delivered even at very low dose rates, and the need to understand fundamental processes in order to evaluate the potential hazards.

During this same period a number of societies devoted to radiation research were founded in different countries, including the United States, Great Britain and other European countries, and Japan. Additional societies are still being formed as interest in this challenging field continues to grow.

This national and international activity resulted in the First International Congress of Radiation Research, which was held at Burlington, Vermont, in 1958. This congress was an important development, as not only did it open the eyes of many to the broad implications of research in radiation chemistry, physics, and biology, as well as in medicine, but also it provided a base for the development of international cooperation. This base was firmly established at the Second International Congress of Radiation Research, held at Harrogate, England, in 1962, where it was decided to form the International Association of Radiation Research (IARR). A principal responsibility of the IARR is to act as sponsor for these international congresses. In addition, the Association provides for their continuity, decides upon appropriate hosts and locations, fosters the development of international cooperation in the field, and encourages smaller meetings. Under IARR sponsorship, the Third Congress was held in Cortina, Italy, in 1966; the Fourth in Evian, France, in 1970; and the present Fifth Congress in Seattle, Washington, USA, July 14-20, 1974.

The development of modern biology and the explosive increase of information on basic structures in the nucleus and cytoplasm, the discovery of the structure of nucleic acids and of the mechanisms of transcription and translation of information within cells have opened many new avenues to the biologists. This accumulation of basic information has been paralleled by many significant new developments in mammalian radiobiology, basic biochemistry, radiation chemistry, and physics.

Radiation genetics and radiation cytology have provided some of the keys for the development of modern molecular biology. At the same time theories of radiation action, models of possible low-level effects in populations, and comparisons of radiation with other hazards have been generated.

A number of Symposia and many contributed papers at the Seattle Congress emphasized the significance of the above mentioned areas of radiation research. Public awareness of the importance of the uses and effects of radiation had increased appreciably. While the focus of the present Congress was on fundamental research, there were several well-attended sessions on the practical aspects of radiation research as it relates to radiotherapy, central station power generation by both nuclear fission and fusion, and the environment.

The scientific sessions and other activities of the congress were held at the Seattle Center, a large parklike area in the heart of Seattle. Leading scientists, many of whom were from fields not directly involved with radiation research, accepted invitations as speakers in the Plenary Sessions and Symposia. The fresh points of view and the range of experiences which these speakers provided were important factors in the overall success of the Congress.

The recent transformation in the United States of the former Atomic Energy Commission into the broader framework of a new agency, the Energy Research and Development Administration, provides the investigator with new challenges. Those disciplines which have contributed so much to radiation research are now facing the additional challenge of considering other environmental insults and especially those resulting from the various aspects of energy generation. These new hazards must be evaluated, modified, and reduced, or perhaps even eliminated. Some of the Plenary Sessions, Symposia and sessions for contributed papers which were convened at this Congress addressed themselves to such questions, and we can confidently expect more attention to be devoted to these subjects in the future.

This was a full and busy congress, attendance was excellent, and no less than 36 countries were represented. Especially important to this congress was the presence of so many young investigators, both from within the USA and abroad, many of whom were assisted by travel grants from the Congress and its sponsors.

The enormous number of developments that have taken place in radiation research in recent years were reflected best at Seattle, not so much in the fundamental discoveries that have accumulated in recent times, but rather by the greatly broadened scope of the subject, and the evidence of the role it must play in the general area of science as well as in the public arena. An air of excitement and expectancy prevailed throughout and a common remark was "There is so much going on that is interesting, I cannot possibly take it all in." But this was said with a feeling of challenge rather than chagrin, as if the truly broad dimensions of the field were just being fully realized. To the Congress organizers and their sponsors, the IARR and the Radiation Research Society, this feeling was especially encouraging as it demonstrated the healthy state of radiation research and the central role it has played, and is playing, in advancing knowledge in certain areas of basic biology, chemistry, physics, and medicine.

We hope that these proceedings will capture the optimistic feeling of challenge for the future which we think pervaded the Seattle Congress.

V.P. Bond, *President*
W.K. Sinclair, *Secretary-General*

5th International Congress of
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EDITORS' NOTE AND ACKNOWLEDMENTS

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The editorial tasks involved in the preparation of this volume were greatly facilitated by the dedicated assistance of Mary Jane Loop who handled much of the logistics and did the major share of proofreading; the Editors are deeply grateful to her for her invaluable contribution to the publication of these Proceedings.

We further wish to express our appreciation to Mrs. Paulette Snowden for editorial assistance, and to the staff of the Health Center Library, Case Western Reserve University, for its tireless help in verifying and completing a great many of the references.

This volume will serve as a record of the Plenary Sessions and Symposia of the Seattle Congress. The Editors regret that it was not possible to publish the Contributed Papers as well. However, abstracts of all papers, including those reproduced in this volume, are available as a permenant record in the July, 1974 issue of the periodical *Radiation Research* (Vol. *59*, pp. 1–315).

A separate list of contributors to the volume has not been provided since full addresses of the authors appears with their contributions.

O. F. Nygaard
H. I. Adler
W. K. Sinclair

The Officers and Organizing Committee of the Fifth International Congress of Radiation Research

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The International Atomic Energy Agency, Vienna, Austria (IAEA)
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