

Topics in Environmental Physiology and Medicine

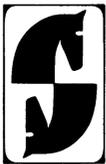
Edited by Karl E. Schaefer

Herbert L. König
Albert P. Krueger
Siegnot Lang
Walter Sönning

*Biologic Effects
of Environmental Electromagnetism*

Translation by Terry C. Telger

With 142 Illustrations



Springer-Verlag
New York Heidelberg Berlin

Herbert L. König
Institute for the Foundation of Electrotechnics
Munich Technical University
Munich, West Germany

Albert P. Krueger
School of Public Health
University of California
Berkeley, California 94720 U.S.A.

Siegnot Lang (deceased)

Walter Sönning
Emil Dittlerstrasse 4
D-8000 Munich, West Germany

Library of Congress Cataloging in Publication Data

Main entry under title:

Biologic effects of environmental electromagnetism.
(Topics in environmental physiology and medicine)

Bibliography: p.

1. Electromagnetism—Physiological effect. I. König,
Herbert L., 1925— II. Series. [DNLM: 1. Electro-
magnetics. 2. Electrophysiology. 3. Ions. QT 34
K77u]

QP82.2.E43B54 574.19'17 81-8898
AACR2

© 1981 Springer-Verlag New York Inc.
Softcover reprint of the hardcover 1st edition 1981

All rights reserved. No part of this book may be translated or reproduced in any form without written permission from Springer-Verlag, 175 Fifth Avenue, New York, New York 10010, U.S.A.

The use of general descriptive names, trade names, trademarks, etc. in this publication, even if the former are not especially identified, is not to be taken as a sign that such names, as understood by the Trade Marks and Merchandise Marks Act, may accordingly be used freely by anyone.

9 8 7 6 5 4 3 2 1

ISBN-13: 978-1-4612-5861-2 e-ISBN-13: 978-1-4612-5859-9
DOI: 10.1007/978-1-4612-5859-9

Contents

Foreword vii

Preface ix

- 1 The Electromagnetic Environment 1
 - 2 Electrophysical Forces of Natural Origin 16
 - 3 Man-made Electromagnetic Fields and Ionizing Processes 43
 - 4 Biologic Activity of Static and Low-frequency Fields 56
 - 5 Project Seafarer 103
 - 6 Biologic Activity of Higher-frequency Fields and
Chemophysical Reactions 113
 - 7 Biologic Activity of Electromagnetic Energies: General
Considerations 135
 - 8 Small Air Ions As Biologically Active Agents 144
 - 9 Biometeorology 176
 - 10 The Divining Rod Phenomenon 194
 - 11 Electromagnetic Fields: Biologic Stress or Therapy? 218
 - 12 Electromagnetic Energies in Man's Immediate Environment 247
- Appendixes 272
- A Technical and Electrophysical Terms 272

vi Contents

B	Parapsychological Observations	283
C	Acceleration	286
D	Heredity	289
E	Heliobiology	291
F	Conclusion of the Public Service Commission of the State of New York's Opinion #78-13 on 760-kV Transmission Lines	294

	List of References	296
--	--------------------	-----

	Index	325
--	-------	-----

Foreword

ARCHIVE COPY
DO NOT REMOVE

The public in industrialized countries shows a mounting concern about biological effects of electrical and magnetic fields. As a result, experimental studies on this subject are being published in increasing numbers throughout the world.

Prof. H. L. König, of the Technical University of Munich, West Germany, a leading expert and pioneer in this field, has written an authoritative text in a lucid style which makes the material also accessible to lay readers. The book describes the effects of natural as well as artificial electromagnetic energies covering the entire measurable frequency range from the highest frequencies, x-rays, through microwaves, radio waves, and finally extremely low frequency (ELF) waves. Citing the evidence from scientific studies in various countries, König also appraises the biologic effects of microwaves and high tension power lines, which have become controversial issues in recent years.

Other contributions to the book have been made by Prof. Albert P. Krueger, University of California, Berkeley, on air ionization effects and by the meteorologist Walter Sönning on biometeorology, documenting the influence of atmospheric electrical currents on health and disease. Moreover, the late Dr. Siegnot Lang, a former coworker of Dr. König, has contributed to this book.

Research on the biological effects of electrical and magnetic fields has not up to now attracted the attention of the large number of investigators it deserves. As a result, there are still considerable gaps in our knowledge, and in some areas only a fragmentary mosaic of studies exists. Moreover, individual variability in the reactions to electromagnetic influences appears to be rather large, and it is therefore often not possible to get clear-cut, statistically significant results, to which I can attest on the basis of my own experience in the study of air ion effects.

In spite of these obstacles, the authors have succeeded admirably in providing an excellent account and integrative evaluation of the known biological effects of the electromagnetic environment.

Karl E. Schaefer

Preface

In recent years we have seen increasing evidence that electromagnetic fields, as well as electric and magnetic fields separately, air ions, and other phenomena of atmospheric electricity affect living organisms. A great deal of important research has been reported, but remains largely unnoticed because the problems involved transcend the boundaries of the individual scientific disciplines as they are traditionally defined. This volume is the first comprehensive treatment of the subject. For those with an interest in certain specialized areas, this book brings together information previously available only in scattered reports in the international literature. For readers interested in a general overview of this timely topic, these specialized studies are reviewed in the context of basic bioelectric and biomagnetic principles.

We have devoted attention to the biologic activity of both natural and artificial electromagnetic energies covering the entire measurable frequency range, and to such related phenomena as air ionization and atmospheric electric currents. We intentionally speak in terms of biologic *activity* because it is often impossible to classify such effects as either adverse or beneficial. As in all biological problems, investigations must have a statistical basis, although the reactions of individual organisms are characterized by subjective, personality-specific traits. It is beyond the scope of this book to include exhaustive detail in discussing the studies cited, such as, for example, statistical problems and proofs. This would compromise the clarity of format we hope to achieve. An extensive bibliography is provided for the reader who wishes more detailed information.

Practical applications of these experimental results have developed in such fields as biometeorology, architectural biology, and biomedicine (both diagnostic and therapeutic). Discussions of the most important of these applications are included. They are completed with a discussion of the problems of high-voltage transmission lines and the dowsing effect in view of the activity of electromagnetic fields. However, sizable gaps still exist in our knowledge, both because of inconclusive findings and because certain questions have yet to be addressed scientifically. Still, even inconclusive data point out new directions in which comprehensive study will yield statistically significant results. The most difficult task

today is to establish an adequate interdisciplinary framework within which these problems can be resolved.

We hope to have presented the subject in a manner that both includes the wealth of the scientific findings in these areas and remains accessible to the large audience interested in this field as a whole: physicians, veterinarians, public health officials and researchers, city planners and architects, environmentalists, meteorologists, biologists, and the many engineers and technicians involved in the production and utilization of electric and electromagnetic energies. As our small world becomes increasingly crowded, the need for an understanding of the principles and questions addressed herein becomes ever more urgent. Our strongest wish is to bridge the gaps between workers in these various fields and stimulate the truly interdisciplinary interest that is required to focus upon questions that remain not only unsolved, but often unthought-of, and to assess the implications of findings that are often neglected.

Herbert L. König