Biological Effects Of Electric And Magnetic Fields

As wireless technology becomes more sophisticated and accessible to more users, the interactions of electromagnetic fields with biological systems have captured the interest not only of the scientific community but also the general public. Unintended or deleterious biological effects of electromagnetic fields and radiation may indicate grounds for health and safety precautions in their use. Spanning static fields to terahertz waves, Electromagnetic Fields in Biological Systems explores the range of consequences these fields have on the human body. With contributions by an array of experts, topics discussed include: Essential interactions and field coupling phenomena, highlighting their importance in research on biological effects and in scientific, industrial, and medical applications Electric field interactions in cells, focusing on ultrashort, pulsed high-intensity fields The effect of exposure to naturally occurring and human-made static, low-frequency, and pulsed magnetic fields in biological systems Dosimetry or coupling of extremely low frequency (ELF) fields into biological systems and the historical developments and recent trends in numerical dosimetry Mobile communication devices and the dosimetry or coupling of radiofrequency (RF) radiation into the human body Exposure and dosimetry associated with magnetic resonance imaging (MRI) and spectroscopy Available data on the interaction of terahertz radiation with biological tissues, cells, organelles, and molecules There is great potential for communication, industrial, scientific, and medical use of electromagnetic fields and radiation. To help advance knowledge of the biological effects of such fields and to exploit their potential medical applications, this book highlights critical issues relating to their effects on living systems.

A broad region of the electromagnetic spectrum long assumed to have no influence on living systems under natural conditions has been critically re-examined over the past decade. This spectral region extends from the superhigh radio frequencies, through decreasing frequencies, to and including essentially static electric and magnetic fields. The author of this monograph, A. S. Presman, has reviewed not only the extensive Russian literature,1, but also at most equally comprehensively the non-Russian literature, dealing with biological influences of these fields. Treated also is literature shedding some light on possible theoretical foundations for these phenomena. A substantial, rapidly increasing number of studies in many laboratories and countries has now clearly established biological influences which are independent of the theoretically pre-dictable, simple thermal effects. Indeed many of the effects are produced by field strengths very close to those within the natural environment. The author has, even more importantly, set forth a novel, imaginative general hypothesis in which it is postulated that such electromagnetic fields normally serve as conveyors of information from the environment to the organism, within the organism, and among organisms. He postulates that in the course of evolution or ganisms have come to employ these fields in conjunction with the well-known sensory, nervous, and endocrine systems in effecting coordination and integration.

The objective of this book is to present in a concise manner what is actually known at the present time about biological effects of time invariant, low frequency and radio frequency (including microwave) electric and magnetic fields. In reviewing the vast amount of experimental data which have been obtained in recent years, the authors tried to select those results that are, in their opinion, of major importance and of lasting value. In discussing mechanisms of interaction of electromagnetic fields with living matter they have tried to differentiate between what is clearly established, what is suggested by available evidence without being convincingly proven, and what is conjecture at the present time.

Recent concerns over the possible hazards of electrical and magnetic fields in the home and workplace are comprehensively addressed within this book. The chapters contain detailed research on the biological effects of electric and magnetic fields, and evidence for and against any interaction of electromagnetic fields (EMFs) and biological systems. The relative risk of exposure to EMFs Putative behavioral and neural effects of EMFs EMF effects on cells

Identifies research needed to reduce uncertainties in the risk assessment of EMF and to prioritize categories of these research needs. Evaluates research needs in: animal and human studies; investigation of biophysical mechanisms; improved assessment of human exposure to EMF; and identification and evaluation of mitigation options to prevent and reduce human exposure to EMF. Bibliography.

DOE's EMF Program is presented. The possibility of biological effects from electromagnetic fields created by electricity is examined. Current research at many National Laboratories is reviewed.

Biological and Medical Aspects of Electromagnetic Fields examines potential health hazards, exposure standards, and medical applications of electromagnetic (EM) fields. The second volume in the bestselling and newly revised Handbook of Biological Effects of Electromagnetic Fields, Third Edition, this book draws from the latest studies on the effects of exposure to electric and magnetic fields. In addition to extensive reviews of physiological effects, the book contains now separate reviews of behavioral and cognitive responses to various exposures. The book also describes an approach to setting standards for exposure limits and explores a few of the beneficial uses of EM fields in medical applications, both diagnostics and in treatment. Biological and Medical Aspects of Electromagnetic Fields provides a practical overview of the experiments and methods used to observe ELF and RF fields and the possible useful and hazardous implications of these observations.

The editors are pleased to present these Proceedings of the V Course of the "International School of Radiation Damage and Protection" of the "E. Majorana Centre", held in Erice (Italy) in November 1983. The lectures and discussions among leading scientists in various disciplines of physics, engineering, biophysics, cellular biology, physiology and medicine from 11 countries are included in this compilation. In this volume we have attempted to explore all aspects of the interaction of static and Extremely Low Frequency (ELF: 0-300 Hz) electric and magnetic fields with biological tissue, systems and whole organisms; we considered dosimetry and what is known or presumed concerning basic interactions, responses from the cellular and molecular level to the whole organism. Discussions of medical appli-cations as well as epidemiologic investigations related to high volt age transmission were held with critiques of methodologies used and recommendations for future approaches. Consideration was also given to the necessity and principles of setting protection standards for man and the environment. We believe this is the first attempt to put all this information together in one volume to provide perspective for understanding the influence of static and ELF electric and magnetic fields on biological systems. We hope our attempts were successful. Martino Grandolfo Sol M. Michaelson Alessandro Rindi v ACKNOWLEDGEMENTS This is the Fifth Course of the International School of Radia tion Damage and Protection of the "Ettore Majorana" Centre for Sci entific Culture directed by Professor A. Zichichi.

the Genetic Code.- II. Effect.

During the last 35 years, there has been considerable develop ment and increase in the number of devices that emit nonionizing radiant energies. These energies such as radiofrequency including microwaves are used in all sectors of our society for military, industrial, telecommunications, medical, and consumer applications. This increase in sources of nonionizing radiant energies has resulted in growing interest on the part of government regulatory agencies, industrial and military physicians, research workers, clinicians, and environmentalists. Although there is information on biologic effects and potential hazards to man from exposure to microwave/radiofrequency energies, considerable confusion and misinformation has permeated not only the public press but also some scientific and technical publications. Because of the complexity of the interactions of nonionizing radiation in biological systems, an inter-disciplinary approach is necessary to assess and elucidate the problems that evolve as this field advances and as the use of these energies expands. It is important to maintain a proper perspective and assess realistically the biomedical effects of these radiant energies so that the worker or general public will not be unduly exposed nor will research, development and beneficial utilization of these energies be hampered or restricted by an undue concern for effects which may be nonexis tent or minimal in comparison to other environmental hazards.

People are immersed in electromagnetic fields from such sources as power lines, domestic appliances, mobile phones, and even electrical storms. All living beings share electric fields, but the physical origins of the phenomenon are still unclear. Magnetobiology considers the effects of electromagnetic fields on living organisms. It provides a comprehensive review of relevant experimental data and theoretical concepts, and discusses all major modern hypotheses on the physical nature of magnetobiological effects. It also highlights some problems that have yet to be solved and points out new avenues for research. Why do some people feel unwell during a lightning storm? Why is there a correlation between the level of electromagnetic background and the incidence of cancer? Why so do many medical centers use electromagnetic exposures to treat a wide variety of disorders in humans? The international scientific community is extremely interested in a theory of magnetobiology and the answers to these and other questions, as evidenced by the growing number of research associations in the United States, Europe, and other parts of the world. The World Health Organization (WHO) has named electromagnetic contamination in occupational and residential areas as a stress factor for human beings. This book stands out among recent texts on magnetobiology because it draws on a strong foundation of empirical and theoretical evidence to explain the various effects of magnetic fields on the human body. It contains the first comprehensive collection of experimental data bearing physical information, frequency and amplitude/power spectra, and original research data on how electromagnetic fields interfere with ions and molecules inside the proteins of living organisms. Introduction is written so that it will be understandable to a wide scientific community regardless of their specialisation. First comprehensive collection of experimental data bearing physical information, frequency and amplitude/power spectra Original theoretical research data on the interference of ions and molecules inside proteins Appendix covers physical questions most relevant for magnetobiology. In particular there is an original exposition of the magnetic resonance basic principles.

Reporting new results, this book covers the subject of biological effects of EMF in its entirety. Experimental verification of the theoretical results is given when at all possible, and the book is expected to open new areas of research, providing material for university course creation.

This book will serve as an ideal guide to the relatively new and rapidly developing field of bioelectromagnetics for students and researchers interested in the interaction of biological systems and electromagnetic fields. Coverage includes: (1) biological responses of human and animals, both in vivo and in vitro methodologies, to magnetic and/or electromagnetic field exposure, (2) characteristics of effective fields, (3) hypotheses to explain possible mechanisms of interaction between the fields and cells, and (4) induced current in ELF and induced heat in RF fields as key interaction mechanisms. The first edition of this book has been recognized as the standard reference on biological effects of electric and magnetic fields from DC to microwaves. But much has changed in this science since the book's original publication in 1986. With contributions from eighteen leading researchers, this latest edition includes authoritative discussions of many new developments and will quickly become the new, must-have resource handbook. Dielectric properties of biological tissue are thoroughly examined, followed by chapters on physical mechanisms and biological effects of static and extremely low frequency magnetic fields. New chapters on topics that were treated very briefly in the first edition now receive extensive treatment. These topics include electric and magnetic fields for bone and soft tissue repair, electroporation, and epidemiology of ELF health effects. The chapter on computer methods for predicting field intensity has been substantially revised to describe new numerical techniques developed within the last few years and includes calculations of power absorbed in the human head from cellular telephones. The chapter discussing experimental results on RF interaction with living matter now contains information on effects of very high power, very short duration pulses. A new appendix on safety standards is based on the latest publications of governmental, as well as quasi-governmental organizations (such as the U.S. Council on Radiation Protection) in the United States, Europe, and Australia. With all its revisions, this updated version of the CRC Handbook of Biological Effects of Electromagnetic Fields provides the most comprehensive overview available of this rapidly changing science.

Describes the analysis and conclusions of the National Institute of Environmental Health Sciences (NIEHS) regarding possible health effects from ELF-EMF (magnetic field) exposures. The NIEHS carried out a hazard evaluation of ELF-EMF exposure that examined both historical and novel scientific evidence on possible health and biological effects at a series of open, scientific meetings. The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak, and there is a lack of connection between the human data and the experimental data (animal and mechanistic).

Recent concerns over the possible hazards of electrical and magnetic fields in the home and workplace are comprehensively addressed within this book. The chapters contain detailed research on the biological effects of electric and magnetic fields, and evidence for and against any interaction of electromagnetic fields (EMFs) and the biological systems. The relative risk of exposure to EMFs Putative behavioral and neural effects of EMFs EMF effects on cells

The two volumes of this new edition of the Handbook cover the basic biological, medical, physical, and electrical engineering principles. They also include experimental results concerning how electric and magnetic fields affect biological systems—both as potential hazards to health and potential tools for medical treatment and scientific research. They also include material on the relationship between the science and the regulatory processes concerning human exposure to the fields. Like its predecessors, this edition is intended to be useful as a reference book but also for introducing the reader to bioelectromagnetics or some of its aspects. FEATURES • New topics include coverage of electromagnetic effects in the terahertz region, effects on plants, and explicitly applying feedback concepts to the analysis of biological electromagnetic effects • Expanded coverage of electromagnetic brain stimulation, characterization and modeling of epithelial wounds, and recent lab experiments on all at frequencies • Section on background for setting standards and precautionary principle • Discussion of recent epidemiological, laboratory, and theoretical results; including: WHO IARC syntheses of epidemiological results on both high and low frequency fields, ITRI lab study of cancer in mice exposed to cell phone-like radiation, and other RF studies • All chapters updated by internationally acknowledged experts in the field Biological Effects of Electric and Magnetic FieldsBeneficial and Harmful EffectsAcademic Press
Leading scientists discuss the relevant aspects of a research agenda and prevention strategies on the health effects of EMF. Clarifies what is known and identifies what is not known so as to plan a research agenda that will fill gaps in current knowledge. Charts and graphs. Glossary.

This book, a selection of the papers presented at the 2nd World Congress for Electricity and Magnetism, provides state-of-the-art information on applications of electricity and electromagnetic fields on living organisms, especially man.

This book presents physical models, backed by experimental results, explaining the behavior of living matter in relation to electromagnetic (EM) fields ranging from quasi-stationary state to optical range. The ability of very low frequency EM fields to cure diseases (e.g. respiratory infection) is addressed. The bacteria destruction by non-thermal effects of low frequency electric fields is explained with the proton nuclear resonance and the DNA half-wave resonance. The microtubule instabilities are studied. Explosion of bacteria with acoustic resonance is also modeled. Centimeter and millimeter-waves effects are discussed. Clues about interaction with the human brain are given. Effects of a 60 GHz field on cellular physiology are presented as well as on mice nerve system. A cell membrane is modeled in near IR to UV ranges. The capacity of cells to move towards an IR source is explained. Finally, explanation of cancer mechanisms of the human skin is proposed with ultra-weak photon energy.

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