Available online at www.sciencedirect.com
SCIENCE DIRECT®
Bioelectrochemistry 59 (2003) 131
Bioelectrochemistry
www.elsevier.com/locate/bioelechem

Book review

Magnetobiology—underlying physical problems
Vladimir Binhi, Academic Press, San Diego, 2002, ISBN: 0-12-100071-0, XIII+473 pages, $ 149.00

Whereas there are several books on electroporation and electrofusion for cell biology and genetics, this monograph is the first comprehensive description of possibilities how electromagnetic fields can affect cell metabolism from a physical point of view.

In the introduction (chapter 1), general topics such as congresses, reviews, terms and criteria of magnetic fields, limitations, thermal actions, etc., are compiled. Chapter 2 presents an overview of experimental findings and contains many useful tables with objects studied, observable parameters, as well as ranges and configurations of electromagnetic fields. Topics dealt with are biological effects of DC and AC magnetic fields, the influence of the geomagnetic fields (circadian rhythm), the influence of atomic nuclear spins, and fields in the microtesla range.

The main part (chapter 3) presents current theories which are grouped as follows: (i) phenomenological models (chemical kinetics, phase transitions, radiotechnical comparisons), (ii) macroscopic models (eddy currents, superconductivity, magnetohydrodynamics), and (iii) microscopic models (resonance, interference, and oscillatory effects, free radical reactions, many-particle systems). In this context, several experiments and fitting to some models are mentioned. The ''kT problem'' is also considered, and its solution may be found in interference effects. These and the quantum states of an ion in an idealized protein cavity, which was first proposed by the author [*Electro-Magnetobiology* 16 (1997) 203–214], are discussed in the large chapter 4. His ''interference of bound ion'' theory explains most of the experiments up to now. Practical consequences and future developments are dealt with in Chapter 5, as well as prospects of electro- and magneto-biology including microwaves and the description of a molecular gyroscope.

Chapter 6 contains addenda dealing with angular momentum operators, the Lande factor, the Davidov soliton, the Fröhlich model, and the Josephson effect. For some readers, the discussion of the possible role of liquid water (memory effect, metastable behavior) may appear somewhat ambiguous. The bibliography comprises more than 650 references.

From the author's evaluation of the models, particularly those pertaining to interferences, one can conclude that bioelectrochemists must still wait for a generally valid theory. Unfortunately, an occasional lack of reproducibility of experimental data on the cellular level obtained with fields in the range below 10 μT cannot be denied [see also *Bioelectrochem. Bioenerg.* 48 (1999) 355–360]. Nevertheless, the potentialities of capacitively and inductively coupled electromagnetic fields in nature are universal and of great importance to life sciences. Binhi's book will turn out to be a milestone on the way of further research in order to answer still open questions, some of which are listed on page 394 of this excellent book.

Hermann Berg
Greifbergstrasse 15
Jena D-07749, Germany
E-mail address: hbergjena@hotmail.com
Tel.: +49-3641-448-250; fax: +49-3641-448-250

doi:10.1016/S1567-5394(03)00011-2