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BOOK REVIEWS

COMPUTER SIMULATION IN BIOLOGY. A BASIC INTRODUCTION by Robert E. Keen and James D. Spain. Wiley-Liss, 1992, 498 pp.

Many areas of biology can benefit from computer modelling. This book is an excellent introductory text for the uninitiated. It starts with an explanation of simple concepts after which it develops a few deterministic and probabilitic models and finally some special topics. It is a fine attempt to inculcate the approach "here is an interesting biological phenomenon; let's explore it with a model" in students of biology. Mathematical explanations are well done and models are well-introduced before proceeding to a series of problems carefully formulated to provide insight into modelling approaches in many fields of biology. The book is aimed at users of personal computers. The working language is BASIC. The book is very practical and quickly builds confidence and competence in computer modelling as an indispensable tool in biology.

J. V. BANNISTER

TECHNIQUES IN FREE RADICAL RESEARCH (LABORATORY TECHNIQUES IN BIOCHEMISTRY AND MOLECULAR BIOLOGY, VOL 22) by C. A. Rice-Evans, A. T. Diplock and M. C. R. Symons, Elsevier, Amsterdam, 1991, 291 pp. (ISBN 0444813144).

Free radicals are now an established part of basic biology, and as such command the interest of a multi-disciplinary scientific audience. Because of their transient nature and extremely low biological concentrations, there are no techniques yet available which allow direct quantitation in tissues or biological fluids. Consequently, indirect evidence is sought of where free radicals have visited and left their characteristic calling card. Patterns of damage modification, not characteristic of normal metabolic processes, are most often studied in lipids, proteins and DNA using spectrophotometric, spectrofluorometric, HPLC and GC-MS techniques. Many scientists working in medical and biochemical research, who are not familiar with free radical techniques desperately require access to clear and well presented methodologies often difficult to distil from the literature. Three distinguished UK scientists from the field of radical research have addressed this difficult problem by contributing to the concise and well established series "Laboratory Techniques".

Electron spin resonance is, at present, the only direct instrumental technique we have for detecting free radicals and their spin adducts, and this topic is comprehensively covered in depth. In the same Chapter (Chapter 3) indirect methods for detecting free rdicals, and reactive oxygen intermediates such as hydrogen peroxide, are also described. The deoxyribose method has been widely used since its introduction for detecting hydroxyl radicals in cell free systems, and is particularly useful for determining second order rate constants. The deoxyribose method described in the book, however, is one of the few examples of its use within a cellular system, and

potential users should be aware of the limitations this imposes. Hydroxylation of benzoate was one of the earliest, and most useful, techniques for measuring the participation of hydroxyl radicals in chemical reactions using spectrophotometric and HPLC techniques. The inclusion of speedy and simple spectrofluorometric hydroxylation assays would also have been useful to many readers.

The importance of transition metal ions to free radical biology is recognised by the inclusion of a separate Chapter to deal with them. Background to the subject is covered in detail with a method presented for, total, iron, haem-iron, non-haem-iron, loosely bound iron, and ferryl haem proteins. The bleomycin assay for loosely-bound iron, as shown, is the original method published in 1981 which can be rather troublesome unless some of the later modifications are introduced. The inclusion of different copper methods would have been useful in this chapter. Methods for foot-printing damage to lipids, proteins and DNA are covered in Chapters 5, 7, and 8 and a wide range of techniques concisely and uniformly presented. Chapter 6 specifically describes assays for antioxidant nutrients and antioxidant enzymes, but by definition excludes the assays for peroxyl radical scavening, especially the widely-used TRAP assay.

The task of producing a small uniform methodoloy book with tested fail-safe recipes is daunting, and the authors' have made an excellent start. The next edition would, perhaps, benefit from a greatly reduced background discussion of general free radical theory and an expanded content of the valuable methods presented.

JOHN M. C. GUTTERIDGE

MOLECULAR BIOLOGY OF FREE RADICAL SCAVENGING SYSTEMS by John G. Scandalois, Cold Spring Harbor Laboratory Press, 1992, 284 pages

This book is based upon a Banbury Center Conference held in November of 1990 at Cold Spring Harbor. The overall theme of this book related to those molecular mechanisms by which cells cope with oxidative stress. This is an important contribution to the free radical literature because, as Dr Scandalios states in the preface, "aside from numerous correlative responses (i.e., increase in oxidative stress that lead to increased levels of some antioxidant defenses) little is known of the underlying molecular mechanisms by which the genome perceives oxidative insult and mobilizes a response to it". The book is composed of 12 chapters covering subjects ranging from basic concepts in reactive oxygen metabolism and oxidant defences to the molecular mechanisms by which prokaryotes and eukaryotes respond to oxidative stress.

In the first chapters Drs Ames and Shigenaga discuss the mechanisms by which DNA may be damaged by endogenous oxidants. In addition, they present data to suggest that mitogenesis is a major multiplier of endogenous (or exogenous) DNA damage which may lead to mutations. Dr Frei *et al.* summarize their work regarding the protective effects of certain low molecular weight antioxidants present in extracellular fluid (plasma). Drs Halliwell and Aruoma discuss the potential mechanisms of DNA damage by free radicals, the physiological importance of this damage and the methods available to quantify free radical attack on DNA. Dr Wong

et al. provide an overview regarding the molecular mechanisms by which tumor necrosis factor promotes protection of cells to oxidant challenge. Dr Loewen then discusses the regulation of bacterial catalase synthesis. Drs Scandalios as well as Ruis and Hamilton provide overviews of the regulation of the antioxidant defense genes in maize and yeast, respectively. Dr Asada complements the work presented on plants by discussing the production and scavening of active oxygen in chloroplasts. Stallings *et al.* present data demonstrating the structure-function relationship of iron and manganase SODs. Liochev and Fridovich discuss in their chapter the biochemical and molecular biological events associated with the overproduction of superoxide in E. coli. Dr Touati describes the molecular characterization of the MnSOD gene from E. coli. and the regulation of its expression. In the final chapter Groner *et al.* discuss the interesting possibility that some of the neurobiological abnormalities observed in Downs syndrome may be associated with the overproduction of Cu-Zn SOD.

Overall, I found this book to be very interesting and I strongly recommend it.

M. B. GRISHAM

IRON AND HUMAN DISEASE

Edited by R B LAUFFER, 534 pp, ISBN 0-8493-6779-4
CRC Press, Boca Raton, Florida, USA, 1992

Iron is an essential element for life in oxygen and the fourth most abundant element in the Earth's crust. These facts obscure how aerobic life balances on the edge of a precipice when using iron to facilitate oxygen utilisation. It is now becoming clear that iron is a major player in several life-threatening human diseases.

Thirty-one international scientists have contributed to twenty chapters, prefaced by a succinct and stimulating contribution, from the Editor, "Iron, aging and human disease". In this section three challenging points, arising from the current medical literature, are raised: (1) The higher body iron stores characteristic of Western life styles. (2) The essentiallity of iron for cell growth, with the implication that high levels may predispose to infection and cancer. (3) The catalytic role of iron in aerobic metabolism which can malfunction to produce aggresive oxidants. The book is divided into six sections covering the topics: chemistry and molecular biology of iron and binding proteins; iron accumulation and metabolism; iron and oxidative stress; iron in cardiovascular disease and other common diseases, and lastly implications for prevention and therapy.

Unlike the complexities of many disease-causing toxins, the control of iron-intake should be relatively simple. Two important first steps would be to stop the food industry fortifying adult foods with iron, and make iron tablets unavailable without medical prescription. These and other issues concerning iron-addition to food-stuffs are discussed in the Foreword and in Chapter 3, and become particularly important when it is pointed out that at least 1 in 300 of Caucasians living in Western countries will carry the haemochromatosis gene. Many scientists, including the reviewer, have vigorously drawn attention to this point for some 20 years now.

Most of the chapters are substantial and informative contributions of value to researchers for their depth, clarity and the seminal references they contain. There is some overlap in oxygen radical chemistry between chapters although, this is to be expected when considering the importance of iron–oxygen interactions as an explanation for iron toxicity. The book is a quality presentation, and its appearance a timely one for library purchase to satisfy an ever increasing number of dedicated research ferrophiles.

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