

## BOOK REVIEWS

effect on different phases of cell cycle, inhibition of DNA synthesis and division delay is given, without doing a deep study on any of the subjects. Unlike in many of the earlier books on radiation biology, chromosome aberrations and gene mutations are dealt with in separate chapters. This is quite appropriate in view of the great progress in mutation research in recent years. The molecular aspects of radiation mutagenesis described in chapter 12 can give the preparatory information for a researcher entering the field of molecular radiobiology. The chapter also gives a brief outline of *in vitro* neoplastic transformation studies.

The topic of repair and recovery is dealt with in better detail, with attention to the different types of repair processes. Examples of human hereditary diseases related to mutations and gene repair anomalies are cited. Modification of radiation effects by physical factors like dose modulations and temperature are touched upon in chapter 14. A short section on repair inhibitors is included.

Chapter 15 tries to give some insight into the hazardous effects of other types of radiations not usually incorporated in a book on radiation biology. Though not elaborate, this chapter is important because of the advent of ultrasound, microwaves and radiofrequency waves in human application as also the possibility of incorporation of radionuclides and radiomimetic chemicals into cells.

Chapter 16 deals in fair detail the different theoretical approaches to quantitate radiation action on cells. Starting from the original target theory it goes on to the two-hit model and theories based on microdosimetric considerations and repair models. The references at the end of the chapter should give enough reading material to those who have more than a casual interest in the subject.

Chapter 17 is a brief introduction to relating cellular effects to whole-body effects. *In vivo* cell survival parameters and cell renewal systems are introduced. This is followed by a description of whole-body effects, where acute radiation syndromes, lethality and therapy of radiation sickness are discussed.

The next three chapters, 19, 20 and 21, are important in the context of the present-day awareness of the harm to progeny and radiation carcinogenesis.

With recent reports on radiation-induced mental retardation in Japanese children and leukaemia incidence in the children of nuclear power plant workers, interest in the effect of *in utero* exposure is increasing. But this topic has received only a cursory examination in chapter 19, which could serve at the best as an introduction to the subject, while late somatic effects, especially radiation carcinogenesis, are dealt with in more detail in the next chapter.

Chapter 21 deals with environmental risks from radionuclides deposited in the body, which is very relevant in terms of environmental pollution. The dosimetric factors for emitters of different types of radiation given in the chapter will be useful in risk estimation from released radioactivity.

Radiation in the environment, though universally accepted as important, is not generally included in a book of radiation biology. Therefore it has been thoughtful of the author to devote some space for this area in chapter 22, on radioecology. It is also logical that this topic is followed immediately by a chapter on radiation protection regulations.

No book on modern radiation biology is complete without a discussion on the relevance of radiobiological studies in improving radiotherapy of cancer. This is made clear in the last chapter of the book, where the author discusses radiobiological experiences with experimental tumours and their role in understanding tumour response to radiotherapy. A brief review of the new modalities in radiation therapy is also included.

There are two appendices at the end. The first is on mathematical and physical relations. The mathematical equations may generally be ignored by a radiobiologist as too complicated. But a radiation physicist could find them useful. The second appendix, titled 'Biological background', deals with DNA, the genetic code and information processing. The notes on cell cycle and gene cloning at the end are too brief to be of much help to a beginner. The information given in appendix II could have been easily incorporated into the chapters 10 and 11.

In dealing with such a vast array of topics, it should be expected that all the subjects cannot be dealt with in equal depth and detail. Therefore a number of topics, some of them falling mainly in a biologist's realm, are only briefly dis-

cussed, while some others, e.g. cellular radiobiology, are discussed in more detail. The chapters on radiation physics and chemistry will attract both physical and biological scientists, though the elaborate mathematical treatment of some of the aspects can sometimes scare a pure biologist. In general the book will be useful to both physicists and biologists working with radiation.

In addition to UV and ionizing radiations, light photon interactions are given a not-so-insignificant place in this book. This probably reflects the author's interest in the currently up-coming field of cancer phototherapy. Biophysics has a dominating presence all through the different chapters of the book. This is not surprising considering that the author has a physics background and the book is built on his classroom lectures, as stated in the preface. This book is an updated English version of his original book in German *Biologische Strahlenwirkung*, published in 1981. The references at the end of each chapter are thoughtfully selected to give ample guidance for literature search to those who want to study the subject in more detail.

This seems to be the first time that somebody has attempted to combine so many diverse aspects of radiation biology in one book, though the main emphasis is on cellular radiobiology. The author is to be congratulated on his success in bringing out such a book. The effort put is clearly evident in the extensive literature cited and the illustrations included. This could be a good reference book for students of radiation biology and will be an asset to any library catering to research needs in the subject.

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### Brief reviews

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**Biotechnology in Agriculture — Reaching The Unreached, A Dialogue.** M. S. Swaminathan, ed. Macmillan. 371 pp. Rs. 320.

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The book is a record of the 'interdisciplinary dialogue' held in Madras in



January 1991, with a grant from the International Development Research Centre, Canada. The objective was to find out which biotechnologies are ready to be taken to the 'unreached' and how.

The book has eight sections, of which the first one deals with integration of the traditional and the new technologies. The next four deal with the technologies themselves, and the remaining three concern the paradigm to be used, the social concern regarding some of the technologies in animal husbandry, and the management of the delivery system for the technology.

There were 41 participants, including M. S. Swaminathan, who chaired all the sessions, and who clearly was the guiding force behind the discussion. The search for the 'ready' technologies was in fact initiated to produce a work programme for the Swaminathan Foundation. The others were scientists, government and institutional officials, industry and university representatives, and international groups, a wide enough coverage, with the perhaps unfortunate (or inevitable?) omission of grassroots-level representatives of the 'unreached'.

The sections give the introduction by the chairman, followed by the text of the papers and then an apparently verbatim report of the discussions.

Among the technical reports, there are two types of papers 'Micropropagation technology' by Jitendra Prakash of Indo-American Hybrid Seeds gives an apt presentation with details of costs and equipment and how at least some plant tissue culture could be done at village level economically. The author backs it up with his experience in producing millions of plants and selling them. This is further elaborated in the section on biovillages.

Eapen George talks more generally but makes the points leading to the concept of bio-district, with different technologies for different villages. He elaborates on this in a later section.

Chamber's reaction to most of the papers is 'These are scientist's choices; have you consulted the unreached?' Though a valid question elsewhere, I do not consider this very relevant in this conference; because the objective was not to decide priorities for new tissue culture work, but to put to use existing knowledge. Certainly the landless would have understood nothing if the scientists

were to talk to them.

The other technical papers, on 'Biomass refineries' and 'Recombinant DNA' go off in different directions. The biomass refineries paper by Rexen does not seem relevant to India. The Indian farmer uses almost every part of jowar for his own food and for fodder etc. He says, 'Today sorghum [= jowar] stems are left in the field and considered of no value to the farmer.' He is therefore suggesting industrial use for this biomass. This makes no sense either in economic terms or social needs of the 'unreached'. His other ideas also would have carried more conviction if he had calculated even order-of-magnitude figures in suggesting fuel substitutes for diesel. The other technical papers discuss technologies and what they have the potential to do—not about how any of them can be harnessed now for the unreached.

In conclusion it is difficult to say whether the Swaminathan Foundation has a clear mandate on what to do for the unreached. At least they should know where to go for more help if they start such a programme for the unreached.

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**The Human Brain.** IBH Prakashana, V Main Road, Gandhinagar, Bangalore 560 009. 1988. 227 pp. Rs. 30.

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The most marvellous creation known to mankind is the human brain with its enormous potentialities and structural complexity. From the basic vital functions like breathing to the highest philosophical and scientific thought, all reside in the brain. The human brain is the culmination of millions of years of evolutionary process. It is strange that human beings are themselves so unaware of this marvellous organ that they possess. It is necessary to eliminate such ignorance and this book serves the purpose well.

Beginning with an introduction of the basics, the authors deal with the cells of the nervous system and their methods of communication. This is followed by a

discussion on the growth, structure and function of the brain. The functions of the senses, thought and consciousness are discussed. The language is simple and could be followed by persons who have no biological background. The index at the end is useful. The book is recommended to all educated persons who like to know about the functioning of their own brain.

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## Neuroscience *in vitro*

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**Culturing Nerve Cells.** Gary Banker and Kimberly Goslin, eds. Cellular and Molecular Neuroscience Series, The MIT Press, Massachusetts Institute of Technology, Cambridge, Massachusetts 02142, USA. 1991. 453 pp. US\$ 45.00.

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Nerve tissue culture today offers almost unlimited flexibility to the seasoned neuroscientist who exploits its potential for the study of fundamental processes—biochemical or physiological—and its relation/behaviour with other cells or cell types. In order to begin nerve tissue culture experiments one needs a do-it-yourself manual that gives detailed recipes/protocols and the principles behind them.

Nerve tissue culture has had a long incubation period between first report and application. P. Weiss (forties), C. E. Lumsden (fifties), E. R. Peterson (fifties and sixties) and many more laid the foundation. Although the techniques are over half-a-century old, the method itself has come of age in the last few decades. This was probably due to the absence of methods of defeating the 'bugs'. Antibiotics and Millipore filters have changed the face of nerve tissue culture since the mid-sixties, when more and more sterilized products (such as culture media, plasticware, incubators, etc.) began flooding the market. However, large doses of certain antibiotics were found undesirable for all neurobiological cultures, e.g. penicillin appli-