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## BOOK REVIEWS

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**Public Health Risks of the Dioxins** – Proceedings of the symposium held in New York City on 19–20 October 1983 by the Life Sciences and Public Policy Programme of the Rockefeller University. Edited by William W. Lowrance, (Published by William Kaufmann Inc., Los Altos, California 94022, USA) 1985, pp. 389., Price not given.

The Dioxins are a family of seventy-five closely related compounds that occur as trace environmental contaminants. They constitute a major public concern and toxicological puzzle.

This symposium was organised as a meeting of scientists and physicians to discuss the difficult technical issues involved in assessing the public health risks of the dioxins, to critically review scientific issues surrounding the human health risks from low level exposure to dioxins and to examine the dioxins as prototypes of other issues of this kind that will be arising.

It is to be noted that in some situations these compounds have been generated as inadvertant and unwanted by-products in the manufacture of chemicals based on chlorinated phenols. In some cases such as phenolic wood preservative uses, and in areas sprayed with the herbicide 2,4,5-T (2,4,5 trichlorophenoxy) acetic acid containing residual dioxin contaminants for civilian forestry or weed control or military defoliant programs the dioxins are dispersed and are slowly decaying; in industrial sites small concentrated pockets of the toxins exist and there have been occupational exposures. Fires involving heavy electrical equipment can release dioxins from polychlorinated triphenyl (PCB) electrical insulating fluid.

Extensive tests are on, in a number of countries to analyze for dioxins in air, soil, waters, fish, foods and animal and human tissues. Because of health concern, extreme precautions are now being taken to prevent formation and release of dioxins. For several decades research has focussed primarily on 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD), which appears to be the most toxic dioxin.

The dioxins are extraordinarily toxic to rodents and other lower animal species and are not so toxic to humans. Epedimiologic follow-ups have not yet convincingly revealed any increased or unusual pattern of mortality from human exposure. Thus the dioxins pose a classic public health dilemma. They are ex-

tremely toxic to test animals but are not clearly so toxic to humans.

The symposium discussion proceeded from analytic chemical issues to human tissue analyses, to small mammal toxicity, to carcinogenicity in rodents and then to the issue of the principal conjectured human cancer (soft tissue sarcoma) and on through immunotoxicity, reproductive toxicity and broad metabolic alterations. Then come overviews of actions currently being undertaken by Federal Agencies. This was followed by panel discussions of research strategy.

Biological effects of TCDD in experimental animals, analytical chemistry and human fat analyses, experimental assessment of TCDD carcinogenicity, the soft tissue sarcoma problem, impairment of endocrine and some reproductive functions by TCDD in experimental animals are the areas critically reviewed at the symposium. Current Federal agency activities presented refer to the US environmental protection Agency's 'Dioxin Strategy'; US National Institute for occupational safety and health's 'occupational Dioxin Registry' and US Food and Drug Administrations' 'Approach to Tolerance Setting for Dioxins in food'.

The rapidly developing chemical industry will find the volume, a useful guide for investigations on the toxicology of trace chemicals including the intermediary products likely to occur as environmental contaminants.

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**Dynamics of Green Revolution in India** by B. Venkateswarlu, (Published by Agricole Publishing Academy, 208, Defence Colony, New Delhi 110 024), 1984, p. 310, Price Rs. 200.00 and \$40.00.

The book carries information on various aspects of Green Revolution in India. It analyses the various factors contributing to increased production of food-grains. While bringing out the problems and perspectives of adapting modern production technology, voluminous data and large number of case studies have been brought in.

The Chapter 'How Green is our Revolution' gives an exhaustive coverage of foodgrain production, in India and in different states, a comparison of the growth rate in production over three decades, land-production ratios, production figures for wheat, rice, jowar, etc. The data are well-illustrated in the text figures.

The Chapter on relative contribution of different factors to rice production is precise and brief, though the inferences are not fully supported by field data. The coverage on Agricultural Research and Education is inadequate, whereas the same in respect of farm prices in Chapter 7 is too loosely presented to bring out the major issues. Chapters 8 to 14 reflects the random thoughts of the author on varying topics under the broad heading of Agriculture, and not necessarily 'Green Revolution'.

The book brings together several ideas and large data on Indian Agriculture. It lacks preciseness in presentation of the ideas, especially those concerning the 'Dynamics of Green Revolution in India'. The presentation is biased towards rice crop, perhaps because of the background experience of the author. The language needs drastic editing. There are innumerable grammatical, spelling and printing errors, which reduces the value of the book. The author would be well-advised to take up early revision of the book to rectify the deficiencies and to update production figures of Agricultural Commodities which have gone into the text and the figures.

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**Annual Review of Biophysics and Bioengineering** by Donald M. Engleman (Published by Annual Reviews Inc, 4139, El Camino Way, Palo Alto, California 94306, USA) Vol. 13, 1984, pp. 538, Price USA \$47-00, Elsewhere \$50-00.

The annual reviews of Biophysics and Bioengineering brought out by Annual Review Inc. for 1984 contains a total of 19 reviews. Six of them deal with application of different spectroscopic techniques to a variety of problems in biology. Two articles cover ion channels and Na/K pump. Three-dimensional image reconstruction using electron microscopy and light microscopy are dealt with in 2 articles. Other articles cover bacterial motility, magnetic guidance of

organisms, estimation of volumes of peptides and proteins, implications of the sequence of myosin rod for muscle function, deducing protein dynamics by x-ray crystallographic data and evolutionary implications of the three-dimensional structure of protein.

A variety of spectroscopic techniques are used in biophysics. The increasing use of these techniques and their developing sophistication is reflected in the six chapters devoted to various aspects of the field. The chapter on NMR of proteins in solution (p. 493) describes the current NMR methodology including one-dimensional and two-dimensional methods, strategies for assignment of resonances and presents a comprehensive list of proteins studied by NMR spectroscopy. Application of NMR spectroscopy for studies of inorganic ions and organic metabolites in intact organisms and isolated living cells is dealt with in another review (p. 221). This article essentially focuses attention on the quantitative estimation of inter-cellular cationic concentration in different cell types. Although, NMR methods have been utilized to study the dynamics of small molecules and polymers in solution state for a couple of decades, studies on proteins in solid state is a more recent development. This has been achieved by the advent of modern Pulse Fourier transform technology. The limitation of solution state NMR studies results from its inability to probe internal motions.

The discussion of solid state NMR studies as referred to collagen and bacteriophage are detailed in chapter 6 (p. 125). The application of Raman Spectroscopy to the studies on biological membranes and their phase transitions are detailed in the first chapter. A full understanding of the enzyme catalysis is possible only if the structure of the transient enzyme-substrate complexes during catalysis is known. X-ray crystallographic techniques can only reveal snapshots of certain points along the catalytic reaction pathway. The structural fluctuations in the active site and the role of bombarding solvent molecules during catalysis can be studied by Resonance Raman Spectroscopy. This forms the subject matter of the review on Resonance Raman Spectroscopy to the studies on enzyme-substrate bonds (p. 25). Two chapters are devoted to the application of fluorescence techniques to the study of excited states of atoms, molecules and crystals (p. 105) and to the study of cellular phenomena at liquid/solid interfaces (p. 247).

The description of the bacterial motility in molecular terms has been a field of active research in recent years. The structure of bacterial flagella and its relation to motor function mechanism form the sub-

ject matter of the chapter on bacterial motility (p. 51).

It is now well established that earth's magnetic field plays an important role in homing of a wide variety of organisms. The present state of knowledge in this field has been summarized in chapter 4 (p. 85) with particular emphasis on magnetotactic bacteria which seems to use enveloped 500 Å particles of  $\text{Fe}_3\text{O}_4$  for orientations and navigation.

The definition of volumes of biological macromolecules and their determination has always been a difficult task. Different numbers are obtained based on different methodologies. These form the subject matter of the review on page 145.

The structure and function of muscle action is an active field of modern biophysics. The amino acid sequence of myosin molecules from different species show a repeated 28-residue zone. The implication of this feature of the sequence for the structure, packing and mechanical properties of the muscle thick filament are detailed in another chapter (p. 167).

The topography of ribosomal proteins on the intact ribosomes as explored by immuno electron microscopy form the subject matter of the review on p. 303, while the article on p. 191 describes optical sectioning microscopy as a tool to reconstruct the three-dimensional shape of large objects (1000 Å at a relatively low resolution of 50–100 Å).

Transport of ions across cell membranes is controlled by a variety of molecules including single ionic channels. Channels are allosteric enzymes capable of increasing conductivity across membranes by many orders of magnitude. The properties of a variety of channels as studied by patch clamp technique are described in the review on page 269. The role of the Na/K pump in the cardiac cells which in turn seems to regulate the rhythmical activity of the heart is the subject matter of the article on p. 373.

Making use of the dependence of the electrophoretic mobility of DNA on the state of helicity and dissociation of DNA, a methodology utilizing electrophoresis in a gradient of denaturing solvents has been developed for high resolution separation of different species of DNA molecules. The application of this methodology for studies on helix-coil transitions of nucleic acids is detailed in the article on p. 399.

Biophysical applications of neutron scattering are found on p. 425. X-ray crystallography has resulted in a wealth of information on the structure and function of biological macromolecules. The information regarding the dynamics of proteins through x-ray studies form the subject matter of review on p. 331 while the contribution of this field to our understand-

ing of the evolution of proteins are covered in the article on p. 453.

Thus, the Vol. 13 covers a wide range of research topics in the field of biophysics and bioengineering and hence a valuable guide for researchers in these areas.

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**Annual Review of Biophysics and Biophysical Chemistry** (Published by Annual Reviews Inc, 4139, El Camino Way, Palo Alto, California 94306, USA) Vol. 14, 1985, pp. 478. Price \$ 47-00 in USA, Elsewhere \$ 50-00.

The 1985 issue of Annual Review of Biophysics and Biophysical Chemistry marks the change in the title of this informative series from bioengineering to Biophysical Chemistry. This issue contains several reviews on lipids, proteins and techniques used in Biophysics. Individual articles describe other chosen topics.

Four articles are devoted to the structure, dynamics and function of biological membranes. Experimental techniques such as low-angle x-ray diffraction, NMR spectroscopy and electron microscopy have been used to elucidate lipid bilayer structure and structural polymorphism with respect to variables such as hydration and lipid chemical composition (pp 211–238). Glycosphingolipids are relatively minor lipid components that appear to be localized in the external surface of mammalian plasma cell membrane in contrast to other lipid components which are present in all membranes of the cell. The present state of knowledge on the structure and function of glycosphingolipids are presented in pp 361–386.

Initial studies on transport of ions through membranes employed simple peptides such as gramicidin A and alamethicin as model compounds. However, due to developments in biochemical techniques and assay procedures, recently, a variety of ion channels such as  $\text{Ca}^{2+}$  activated  $\text{K}^+$  channels,  $\text{Cl}^-$  channel of torpedo electroplex, cardiac channels, etc., have been successfully reconstituted and incorporated into planar bilayers and their conductivity studied in detail (pp 79–111). The molecular dynamics simulations used to model ion transport through gramicidin A and comparison with other channel models are presented in pp 315–330.

Two articles deal with protein structure and function. Electrostatic effects play an important role in the folding and function of proteins (pp 387–417). Electrostatic effects might exert a significant role in long range interactions governing protein folding and protein-ligand interactions. The difficulties and methods of estimating dielectric constant and the computational state of art are described. Nitrogenase is the central enzyme in the biological nitrogen fixation by certain free living and symbiotic microorganisms. The structure and function of the iron protein and molybdenum-iron protein form the subject matter of article on pp 419–459. However, the article does not cover the recent X-ray crystallographic work on these proteins.

A variety of recent techniques are described in different articles. The power of a light microscope might be significantly increased by attachment of a video and image processing system (pp 265–290). Photo electron imaging (pp 113–130) allows reconstruction of cell surface by imaging the photoelectrons that are ejected when a cell surface is irradiated with UV light. A comparison of this technique and other methods such as immunofluorescence microscopy and electron microscopy is presented in pp 113–130. Image reconstruction by transmission electron microscopy as applied to the structure of muscle filaments are detailed on pp 291–313.

Although the mechanism of muscle contraction has been studied in great detail, there are two other systems where biological chemical energy is transferred to produce movement. A previous issue of this series covered the bacterial flagellum system. This volume describes the microtubule-dynein system of eucaryotic cilia and flagella (pp 161–188).

Individual articles cover a variety of other topics. Circularly closed, double standard DNA exhibits a very large number of conformational states. However, changes in local twists influence the global or superhelical structure through the requirement of the constancy of linking number. A theoretical treatment of the superhelical conformational equilibria of circularly closed DNA is presented on pp 23–45. Aspects of light harvesting by phycobilisomes in the antenna assembly of cyanobacteria and red algae form subject matter for another review (pp 47–77). The minimum requirement for considering a macromolecular interaction as diffusion controlled and a theoretical treatment of the diffusion process of biological macromolecules are found in the article on pp 131–160. The mechanism of action and tubulin polymerization, polymerization of abnormal sickle hemoglobin where

a valine residue replaces a glutamic acid residue in the globin  $\beta$ -chain, rhodopsin and other proteins involved in signal amplification and resulting phototransduction form topics of discussion in other review articles.

Apart from 16 useful reviews, the volume contains a highly readable and entertaining article by F. O. Schmitt describing his exciting personal experiences as a molecular biologist.

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**Annual Review of Pharmacology and Toxicology** by George Okuw Cho, (Published by Annual Reviews Inc, 4139, Palo Alto, El Camino Way, California 94306, USA) Vol. 24, 1984, pp: 533, price: USA \$27.00, elsewhere \$30.00

The twelve chapters of this volume have generally kept the high standards associated with Annual Reviews. In the autobiographical account, Prof Borje Uvanas traces the evolution of Pharmacology as an independent discipline from the early foundation laid by physiologists. The role played by the Karolinska Institute, Stockholm, Sweden in developing frontier areas such as biochemical pharmacology, neuro-psychopharmacology, clinical pharmacology and toxicology, the formation of IUPHAR etc are of interest to students of history of this discipline. The critical overviews on the biotransformation of insecticides and biphenyls are of topical interest. The mechanisms of cyanide intoxication highlight the newer trends of research in the area of toxicology of this classical chemical poison. For those engaged in the pharmacology and toxicology of chemotherapeutic agents given to pregnant mothers and neonates, the chapter on the mechanism of teratogenesis should prove to be of special interest. Under the heading Review of Reviews there is a very useful account of the relevance of the plethora of journals appearing on the scene, the state of art of allelopathic agents, a plea for a rational basis for development of new anti hypertensive, opiopeptides, analgesics and drug dependence. The volume is a must for libraries engaged in teaching and research in Pharmacology and Toxicology.

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