BOOK REVIEWS

Annual Review of Earth and Planetary Sciences, Vol. 16, 1988, pp. 676, (eds.) G. W. Wetherill, A. L. Albee and F. G. Stehli, (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303, USA), Price: USA $ 49, Elsewhere $ 53.

This volume, true to the high reputation of the series, consists of magnificent state-of-the-art reviews in geophysics (5 articles), planetary science (3), tectonics and stratigraphy (2 each), climatology, engineering geology, sedimentology, petrology, geochemistry and economic geology (1 each). Cumulative indexes of contributing authors and chapter titles (organized subject-wise) for the volumes 1 to 16, along with the subject index for the current volume, thoughtfully included here, offer a valuable service to the interested reader. If the contents are also organised subject-wise, it will facilitate easier reading.

The prefatory autobiographical article by the eminent geologist R. P. Sharp deals with the much-neglected area of earth science field-work and holds forth a refreshingly optimistic view that the field investigations are as sorely needed now as in the past, in spite of the new glamour for laboratory and theoretical studies. This is very relevant in the context of steadily declining field outputs of the earth science research organizations in the country. P. F. Hoffman comprehensively reviews the Early Proterozoic geological history of the Canadian shield in terms of modern plate tectonics. His modified division of the shield into cratons surrounded by mobile belts marking convergent boundaries appears too good to be true, but there is no mistaking the fact that plate tectonics is rapidly becoming acceptable to Precambrian geologists. K. Burke demonstrates in his inimitable style that the Caribbean island arc systems provide an actualistic analogue of continent building in the distant past. E-an Zen gives an overview of the origins of peraluminous granitic rocks which are the host and source for valuable deposits of tin and tungsten. C. Meyer presents a brief review of the temporal controls of the various genetic types of ore deposits. T. A. Cross and M. A. Lessenger emphasize the recent advancements in seismic stratigraphy of sedimentary basins, consequent on the oil industry's vast exploration efforts. Another recent advancement in stratigraphy is HIRES (High Resolution Event Stratigraphy) which originated when conventional methods reached a 'plateau' as the review by E. G. Kauffman indicates. While natural disasters like subaerial mass wasting claimed wide attention due to their societal impact, the even larger subaqueous mass wasting at the continental margins has received less attention, as noted in the paper by T. M. Coleman and D. B. Prior. The impact of volcanic eruptions on atmosphere, climate and life is enumerated by M. R. Rampino, S. Self and R. B. Stothers. Another important concern of our modern society is the safe disposal of the dangerous nuclear waste, the geotechnical aspects of which are interestingly debated in the chapter by K. P. Krauskopf.

T. H. Heaton and S. H. Hartzell critically review the diversity of ground motions in the near-source regions. J. M. Wahr discusses the causes of fluctuation in the earth's rotation, citing examples from ongoing research. V. Courtillot and J. L. Le Mouel give an exhaustive review of current progress in geomagnetic secular variations and plead for more intensive co-operative research. Another comprehensive review by P. G. Silver, R. W. Carlson and P. Olson deals with the problem of convection of whole-mantle vs two-layer mantle. J. B. Rundle and D. P. Hill describe the seismicity of the Long Valley caldera dominated by earthquake swarms. D. Lal gives a detailed account of *in situ* cosmogenic isotopes in terrestrial rocks and their potential applications for geological processes.

The remaining three articles deal with planetary science. A. T. Basilevsky and J. W. Head III review the present state of knowledge on the geology of Venus and its importance for the evolution of terrestrial planets. M. F. A'Hearn updates our knowledge on the cometary nuclei and its bearing on the origin and evolution of the solar system. J. A. Wood portrays the chrondritic meteorites, which represent the oldest rocks of the solar system, as having formed in the dynamic, dust-rich zones of the nebula.

The wide spectrum of coverage and the high quality of the review articles make this a valuable

reference book which is a 'must' for every earth science library, particularly for those in the developing world.

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Annual Review of Pharmacology and Toxicology, Vol. 28, 1988, pp. 504, (eds) Robert George and R. O. Kun, (Published by Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94306, USA), Price: USA $ 34, Elsewhere $ 38.

There are sixteen articles in this volume which attempt to chart the milestones of researches and achievements in the important problem areas of blood-brain barrier transport, vascular responses elicited by serotonin, dynorphin, the modulatory action of peptides on the nervous system, methods for assessing the biochemical functioning of neurotransmitters in man, regulation of the release of coexisting neurotransmitters, neuroendocrine function, immunologic basis of drug hypersensitivities, endogenous ligands for high affinity recognition sites of psychotropic drugs, opiods in temperature regulation and chemotherapeutic approaches to leprosy and AIDS.

Four articles deal respectively with the mechanism of toxicity of chloramphenicol, novel marine neurotoxins, host defence against prooxidant induced cellular injury and drug nephrotoxicity. The Review of Reviews has dealt with the Chinese Materia Medica, heroin, AIDS and public policy and trend of new books on pharmacology.

Better understanding of the blood brain barrier (BBB) is needed from the angles of the trophic factors of regulation of transport. The glucose carrier has been characterized. A 2.8 kilobase (kb) transcript that encodes for the glucose transport is most abundant in the brain capillary. Many barrier peptide receptors such as the ones for insulin, transferrin and insulin-like growth factor have been characterized. Three strategies for drug delivery through BBB are under investigation: (i) invasive, (ii) pharmacologic (liposomes), and (iii) physiologic (chimeric peptides). The focus on BBB thus seems to be changing from that of a "relatively immutable structure to a dynamic interface between blood and brain".

The p-NO_2 group of chloramphenicol (CAP) has long been known to have the dual function of antibacterial action as well as the potential to induce aplastic anaemia. Recently acquired information suggests the role of metabolites of CAP such as dehydro-CAP produced by gut flora which are active substrates for amination by bone marrow. The induction of aplastic anaemia in the susceptible host seems to be related to either greater production of bacterial metabolites for the reduction by bone marrow, or greater bone marrow activity or greater sensitivity of host DNA to the toxic metabolite. Although chloramphenicol is seldom used now, its chemistry has been exploited as a probe for exploring the metabolic activity of bone marrow.

The integrated "network" of biochemical defence mechanisms against prooxidant factors include: (a) primary defence by enzymes such as superoxide dismutase, catalase, selenium-dependent glutathione peroxidase; (b) primary defence by small molecules such as glutathione, ascorbic acid, uric acid and taurine, metal ion chelators, mucopolypeptides; and (c) secondary defence by anti-lipid peroxidation, GSH peroxidase, tocopherols, β-carotene and bilirubin. There is increasing evidence to indicate the role of the tight control of redox balance to normal cell function.

The possibility of using Positron Emission Tomography (PET) as a non-invasive technique for assessing neurotransmitter function has been demonstrated in studying cholinergic, opiate, benzodiazapine and dopamine receptor biochemistry.

Increasing idiosyncratic toxicities associated with drugs have begun to cause concern to physicians. Of this group between 3 and 25% of drug reactions belong to the hypersensitivity class. The first step in such reactions needs formation of a conjugate with a carrier molecule, usually a protein. The hypersensitivity associated with some drugs and industrial chemicals also requires biotransformation. Major histocompatibility complex (HMC) genes encode cell surface glycoproteins and by inducing formation of "drug immunogens" cause hypersensitivities.

Hypertension can be produced experimentally by diverse initiating factors to increase total peripheral resistance. These factors could be genetic, endocrinal, renal or neural. Membrane receptivity and permeability are altered with increased availability of calcium to contractile proteins. The subtle membrane changes remain to be elucidated.

AID related complex associated with acquired immune deficiency syndrome is aetiologically related to a human immuno deficiency virus. Design of drugs against AIDS depends on (i) blocking virus attachment or assembly, e.g. D-penicillamine, suramin, avarol, amphotoricin B; (ii) interference with reverse transcription, e.g. Foscarnet, AZT, 2′-3′-dideoxycytidine, ribuvarin, cyclosporin, and (iii) inhibition of DNA and RNA transcription, e.g. oligo-deoxy nucleotides. Possible target sites for antisense RNA therapy such as RNA→DNA polymerization block, DNA integration block, DNA transcription block and translation-initiation block—have been discussed in a highly stimulating review. It may be remembered that several thousand victims of AIDS are waiting for the release of such drugs.

All the above scholarly reviews maintain the usual standard of clarity and purposefulness in updating the reader in the explosively growing areas of pharmacological research. However, as far as the present reviewer is concerned, the autobiographical piece by Julius Axelrod, a father figure for Biochemical Pharmacologists, is a topper. It is interesting to learn that Axelrod applied to several medical schools after graduation from the City College, New York but was rejected by all. He worked as an assistant to a biochemist purifying salts for buffers and later in an Industrial Hygiene Laboratory, earning around $ 25 a month. While working in that laboratory he took courses at night in the New York University, and earned his Masters in Chemistry in 1942. Talking to Bernard "Steve" Brodie was a turning point leading to a method to measure aniline in nanogram amounts in human urine and plasma. This led to metabolic studies on acetanil and phenacetin, and aminopyrine. At the National Heart Institute, even before earning a Ph.D., his work led to the central role of *sympathomimatic* amines and the elegant demonstration of the biotransformation of ephedrine by two pathways: demethylation and hydroxylation, and to the exciting area of microsomal drug metabolizing enzymes. One not only gets a fascinating historical overview of frontiers of multi-disciplinary pharmacological research of 3 decades by reading this 24 page testament of what Julius calls "an unexpected life in research" but also an inspiring account of how high motivation and dedication can bring out the scintillating creative brilliance of a biomedical scientist who started with a firm foundation in chemistry and biochemistry and very little of medical training and yet has contributed so much to the emergence and development of Biochemical Pharmacology.

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Annual Review of Medicine, 1988, Vol. 39, pp. 569, (ed.) William P. Creger, (Published by Annual Reviews Inc., 4139, El Camino Way, Palo Alto, California 94306, USA), Price: USA $34, Elsewhere $38.

The volume is in conformity with its earlier editions. There are 42 chapters of topical interest. The book commences with the topic on 'Intestinal pseudo-obstruction syndromes' by Sinna Anurus followed by the subject of 'Swallowing disorders' by A. Meslow and S. Cohen. Both these topics are discussed extensively. The topic on 'Localisation of parathyroid glands' is interesting and throws a new light on the diagnosis and localisation of the disease. The topic of 'Atrial fibrillation' is highly relevant as it is a clinically important arrhythmia carrying prognostic and therapeutic implications. J. H. Foster has given a lucid account on 'Evaluation of asymptomatic solitary hepatic lesions'. The topic of 'Silent myocardial ischaemia' would have been discussed at greater length, in view of its epidemiological significance. Topics relating to immunology have rightly found adequate coverage. The topic on 'Evaluation of brain imaging techniques in mental illness' by N. C. Andreasen throws some new light in little understood areas. Topics such as thrombolytic therapy and polyuria make interesting reading. The book on the whole is useful for physicians as well as research workers. While going through the book one gets the impression of changed outlook to several established phenomenas as well as changing concepts and interpretations.

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Dynamics of Insect-Plant Interaction, (eds) T. N. Ananthakrishnan and A. Raman, (Published by Oxford & IBH Publishers, 66, Janpath, New Delhi 110 001), 1988, pp. 223, Price: not given.

In recent years a great deal of attention has been paid to the extremely complex insect-plant interaction. However, our knowledge of the intricate interaction mechanism is still far from satisfactory. There is enormous scope for coordination on a multidisciplinary level. Further a critical review of all the available information, precise identification of problems and future programmes are most urgently needed. The book provides all this.

The book marks the celebration of 25 years of the establishment of the Entomology Research Institute, Loyola College, Madras. It also serves as a report of a symposium held to commemorate this event. In the opening chapter, the editors define the central concept of the book. This is followed by 15 contributions by eminent researchers, which review virtually all the salient aspects of the problem.

Dr Krishna reports on the effects of odoriferous substances from non-host-plants on the breeding potential of insects, with special reference to *Earias* and *Dysdercus*. Though it is shown that the viability of the eggs is affected, the discussion lacks precise data on the concentrations used, latent periods, influence of previous treatment, temperature, etc. The biochemical parameters which influence the resistance to insect are reviewed in the third chapter by Jayaraj *et al.* Referring to the role of stimulants, deterrents, attractants and repellents to feeding, it is shown that the changes in the nutritional state of the plant are induced by the application of insecticides. In the next chapter, David and Easwaramoorthy discuss the physical resistance mechanisms like trichomes, surface wax, silica, cell-wall thickness, etc. in relation to plant feeding insects and their predators. The role of semiochemicals, produced by plants and which influence insect behaviour, is illustrated by reference to the studies on *Heliothis* by Rembold (chapter 5). In the next chapter Kumuda Sukumar refers to plant substances, which inhibit feeding by phytophagous insects. Closely interlinked with this account follows in the next chapter, an analysis by Suresh on the natural plant products, which prove toxic to diverse insects. Reference is made to allelochemicals like conessine as growth retardants on *Aedes*, sterilant on *Dysdercus*, etc. by Saxena and Tikku. They conclude that Nature herself is a step ahead of man in that nearly all the insecticides, which man thinks of, are already synthesized by the plants themselves, as self-defensive mechanisms. There is a brief reference in chapter 9 by Prabhu to the occurrence in plants of mimics of insect hormones and antihormones. Then follows a description of thrips as one of the important pollinators by Kirk. A predictor model of the energetics of Lepidoptera, based on the data of the food consumed and faeces, is proposed by Pandian in chapter 11. The selective factors and adaptive changes in ant-plant mutualism are examined by Ganeshaiah and Veena (chapter 12), who conclude that ant behaviour is not random, but ants learn the pattern of nectar display and modify their foraging activity accordingly. Insect galls represent a unique product of a most intricate insect plant interaction, some aspects of which are analysed by Grover in chapter 14 and by Raman in chapter 15. The possibility of man creating an insect-tolerant plant, by the application of the knowledge gained from researches in genetic engineering, is foreshadowed by Kuntala Jayaraman as a climax to the previous discussions. In the final chapter the senior editor provides the essential guidelines for future work—this is perhaps the cream of the book. It is evident that the editors have taken pains to maintain the same level of high standard in all chapters. However, it is unfortunate that the book lacks the most essential part—a general index. The printing, illustrations and general get up are fine and the publishers must be congratulated for this.

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Rothamsted Experimental Station, Report for 1987, (Printed in England by Staples Printers, Rochester Ltd., Love Lane, Rochester Kent), 1988, pp. 249, price: £12.

This report is divided into two parts. Part 1 gives the divisional reports, namely, multi-disciplinary agronomy, biomathematics, crop and environment protection, crop sciences, list of publications and Brooms Barn Experimental Station.

Part 2 gives the use of fertilisers in England and

Wales, Rothamsted insect survey, weather tables and maps in the farms.

The results of analysis show that in soils which have grown cereals and grass since 1940s, the cadmium and polyaromatic hydrocarbons (PAHS) have increased, cadmium since 1940s and PAHS since 1980, irrespective of whether they have used fertilisers or other man-made additives. The increases are due to man's non-farming activities. While cadmium inputs may decline in response to the control of emissions from sources, PAHS which entered the atmosphere from low temperature combustion of organic matter are probably coming from diffused sources. These certainly need critical monitoring.

A new technique has been developed for rapid and sensitive detection of potato virus Y and potato leaf roll virus in tubers and leaf. The technique uses a soluble dye and thus aids the amplification of colour from plant sap. Assays are possible in simple laboratories or on the farm itself. Tests for seed-borne mosaic of pea are being done through ELISA. The specificity of polyclonal antisera to the Sumatra disease bacterium (SDB) of cloves and the *Pseudomonas solanacearum*, a serious bacterial pathogen in the tropics, was improved to enable discrimination between SDB of cloves and *P. solanacearum* using ELISA.

Highly active pyrethroids, for instance, esters of cyclopropane acids, have R groups containing some form of unsaturation. This unsaturation may be aromatic, olefinic or imine-like. The cyclopropane group can be considered as containing latent unsaturation and so can be used as a test of the function of unsaturation in binding to the lethal site. Bioassays show that the cyclopropane compounds were intermediate in insecticidal activity between the allyl and propyl. It appears, therefore, that π electrons available, either directly or consequent on ring opening, are an important feature for high activity. Work on the chain length and activity of N-alkylamides is underway.

Work is in progress with various types of semiochemicals now being developed for pest control, need to be presented to pests in ways different from those used for conventional toxicants. For example, antifeedants must be applied uniformly to surfaces and formulated so that their biological effect is long-lasting. On the other hand, alarm pheromones need to be applied as quick release formulations that produce rapid change in the concentration of the active ingredient as a vapour.

Vesicular arbuscular mycorrhizae (VAM) can be identified now on the basis of the mobility of diagnostic fungal enzyme bands during gel electrophoresis of infected root extracts. Intensity of the staining of the bands in the gel is proportional to the amount of mycorrhizal infection in the root sample, thus offering a method of quantifying individual fungi present in multiple infections, especially when fungi are anatomically similar. There is now experimental evidence in *Vigna radiata* (mung bean) that VAM ameliorates Mn toxicity. It would appear there is a certain degree of success in culturing VAM on solid, porous granular base which could be used in inoculation experiments.

The crop science division is working on the biochemistry and molecular biology of nitrogen metabolism including photorespiration and aminoacid biosynthesis in crop plants.

The first report of the recently formed soils and crop production division is presented. The former soil microbiology, soils and plant nutrition and physiology and environmental physics departments and field experiments section are now included in this new division. This new arrangement offers possibilities of research on all aspects of soil-plant system under one division. The reports discuss soil fertility in relation to crop physiology studies on crop nutrition and on mechanisms controlling nutrient uptake and redistribution by crops.

The effect of soil microbial populations and soil physical factors on soil fertility and on root activity are being studied alongside interactions between crop nutrition and other agronomic factors affecting crop growth.

The report, as usual, has been prepared excellently and will be useful for all the agricultural research institutions.

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