

organisms, ethnomedical information on the use of plants, and the biological effects of secondary metabolites.

Walter Lewis and Elvin-Lewis explore the basic, quantitative and experimental research phases of ethnobotany with special reference to the medicinal plants of South America. Search for new drugs cannot succeed unless all the three phases are taken care of. Elaine Elisabetsky and Darrel Posey look at the development of plant-based antiviral compounds, particularly for the treatment of gastrointestinal disorders, based on the experience and practices of Kayapó Indians of Brazil. Another paper based on Brazilian plants, by Craveiro *et al*, deals with natural products' chemistry. It also describes the Living Pharmacy Programme, under which the local people are taught to cultivate and use medicinal plants correctly. Maurice Iwu, Xavier Lozoya and S. K. Jain have reviewed the current status of African, Mexican and Indian ethnobotanical research, respectively. Iwu has listed several Nigerian plants and their medicinal use; Jain has given lists of Indian plants useful in the treatment of intestinal, joint, liver and skin diseases. Lozoya points out that the lack of clinical studies of plant remedies traditionally used in less developed countries is one reason for the failure to come up with new herbal drugs. Could it be that the Western healers and researchers are threatened by the success of the native epistemology which could, unaided by the tools of Western science, discover and retain the knowledge of plant-based cures for millennia? Does the West suffer from a cultural handicap? In this respect, Asian researchers have an advantage over Western researchers, feels Lozoya.

Pei-Gen Xiao gives an account of ethnopharmacology and new drug development in China. There are 7295 species of plants used medicinally in China, and plant-derived drugs make up 45% of the market. Gordon Cragg and coworkers describe the experience of the US National Cancer Institute (NCI) over the past three decades and more in ethnobotany and drug discovery. A welcome feature is a discussion on intellectual property rights, international collaboration and compensation. NCI collects material from foreign institutions such as the Bogor Herbarium in Indo-

nesia and the Botany Department of the Philippines National Museum.

Two researchers from Shaman Pharmaceuticals, Steven King and Michael Tempesta, describe the company's experience in drug development based on leads obtained from native healers. They have a good team of interviewers assisted by competent translators. Shaman's is one major success story among drug companies using the ethnobotanical route to drug discovery. They already have two drugs, Provir for respiratory viral infections and Virend for herpes, in clinical trials. More are expected. Shaman has a scheme of compensating the native people and communities providing the knowledge.

John Barton, who teaches law relating to high technology at Stanford, discusses the intellectual property rights issues involved in ethnobotany and its use in drug development and manufacture. He pins his hope on nongovernmental organizations to develop a uniform agreement on the relative rights of indigenous peoples and of their governments. Gary Martin looks at the prospects of judicious exploitation of plant resources without harming conservation and biodiversity as well as how ethnobotanists working in the field can help in community development and sustainable plant use. Berlin and Berlin raise questions pertaining to preservation, codification and promotion of traditional cultures and knowledge systems, and returns to the native communities. They narrate their experience in Mexico working with the Highland Mayapeople. The book ends with a brief but perceptive conclusion by Ghilleen Prance.

This is an excellent book. It deals with a topic of great current interest and urgency and it has brought together the views and experiences of many of the leading scholars in the field drawn from North America, Europe, Asia, Africa and Latin America. It covers all aspects comprehensively. The conference format has contributed a great deal, as is evidenced by the enormous amount of useful information that has come up in the discussions following each presentation. Indeed, the book would have lost considerably if the discussions were not included. The Ciba Foundation and John Wiley & Sons deserve full marks.

The only flaw in this well-produced book is that some pages shown on the contents page do not match with the beginning pages of the articles.

SUBBIAH ARUNACHALAM

*Central Electrochemical Research Institute,
Karaikudi 623 006, India*

Environmental Health Perspective; Supplements: Molecular Mechanisms of Metal Toxicity and Carcinogenicity. National Institute of Health, USA. 1994, vol. 102.

Environment Health Perspective is regularly published by National Institute of Environmental Health Sciences, National Institute of Health, USA. This journal regularly publishes research papers, review articles and sometimes status report in certain areas related to environmental health. It also publishes supplements containing lead articles on research work presented at international meetings.

This volume of *Environmental Health Perspective, Supplements* (Vol. 102, Supplement 3, September 1994) contains selected papers from the Second International Meeting on Molecular Mechanisms of Metal Toxicity and Carcinogenicity held in Madonna di Campiglio, Italy 10–17 January 1993.

The field of metal carcinogenesis and metal toxicology is changing at a rapid pace, so much so that it is now being looked into not only at the organism level but also at the molecular level. Selected papers published in this volume deal with several important molecular aspects of toxicity and carcinogenicity, such as oxidative and free-radical effects, genotoxicity, mechanism of resistance, carcinogenetic process, relationship between carcinogenesis and metallothionein, cellular and molecular aspects of toxicity, etc.

The articles of this volume contain interesting data on chromium-cadmium-, nickel- and arsenic-induced carcinogenesis. Data on chromate-induced DNA strand breaks, Fenton-reagent-induced generation, powerful oxidants, and evidences for radical species as intermediates in cadmium/zinc-

metallothionein-dependent DNA damage *in vitro*, etc., have been discussed. A series of studies in this category revealed a central mechanism that damages to the DNA molecule are caused by oxidants induced by various metals and their salts. The DNA damage is related to mutagenic response and genetic toxicity.

In an interesting article, Wang *et al.* from Norton Nelson Institute of Environmental Medicine and the Kaplan Cancer Center of the New York University Medical Center, New York, reports that an arsenic-resistant Chinese hamster cell line shows increased resistance to toxic concentrations of arsenic after pretreatment with a nontoxic concentration. Such an induced tolerance can be completely inhibited by actinomycin D or cycloheximide. Another group from China reports that human fibroblasts are ten times more susceptible to sodium arsenic than Chinese hamster ovary cells. According to epidemiologic studies, arsenic is associated with increased risk for certain types of human cancers, including epidermoid carcinomas of skin, lung cancers, and possibly liver cancers. However, inoculations of inorganic arsenic have failed to induce tumours in most laboratory animals. The paper by Je-Chang Lee throws light on the differential susceptibility between humans and experimental animals to arsenic, indicating a possible mechanism as to why human exposure to arsenic may cause cancer.

Although cadmium is an environmental carcinogen, suspected to cause lung and prostate cancer in humans, the exact mechanism of cadmium carcinogenesis is not known. A low molecular-weight (6000–7000 Da) protein metallothionein is known to protect cells against metal toxicity. Timothy P. Coogan and colleagues of National Cancer Institute, Maryland, suggest that metallothionein gene activity is quiescent in the ventral prostate of mice. This tissue-specific quiescence of the metallothionein gene has been suggested to determine tissue's susceptibility to cadmium carcinogenesis.

Although metallothionein (MT) plays an important role in cellular resistance to metal toxicity, very little is known about the degradation of metallothionein and tumour of the metals bound to it. In an interesting article by C. D. Klaassen and colleagues of the

University of Kansas Medical Center, Kansas, it has been reported that lysosomes might be important in degrading metallothionein, and that metal release is a prerequisite for degradation. The order of sensitivity towards degradation is apo-MT >> Sn MT >> Cd MT.

A unique method for fabrication of ultramicrosensors to study metal movement through cell membranes has been described by T. Malinski and colleagues. A number of papers describe the role of various metals in inducing signal transduction mechanisms. Several papers deal with the effects of organometals on cell signalling, effects of low-level dietary supplementation of organic selenium risks arising out of consumption of polluted mussels for lead poisoning, etc.

In general, this volume contains papers dealing with the most up-to-date knowledge in the field of metal toxicity and carcinogenicity, and also with their cellular and molecular mechanisms. Readers would find it quite useful to update their knowledge.

PRASANTA KUMAR RAY

*Bose Institute,
P-1/12, CIT Scheme VIIM,
Calcutta 700 054, India.*

Annual Review of Biochemistry 1994. C. Richardson, ed. Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California, USA. Price: USA \$49, elsewhere \$55. Volume 63.

During the past six decades we have discovered time and again that the excitements in the area of biological chemistry are periodically updated in this series, although its undisputed eminence has been constantly challenged. Part of the answer to the success of this series lies in a set of vibrant articles on contemporary themes published year after year. The current issue comprises 28 chapters describing, in principle, a variety of different and diverse aspects under the general rubric of biochemistry. Of particular interest to the ever-increasing number of practising biochemists is the preparatory overview by

Osamu Hayaishi. The *Sensei* in an inimitable fashion recounts the events that led to the discovery and characterization of a class of ubiquitous enzymes called the oxygenases. In a fitting tribute, the chapter on lipoxygenase translates his original ideas into much broader issues of human health and disease processes.

The chapters can be roughly divided into four groups. The major section of this book focuses on myriad components involved in cell signalling. The body of any organism (yes, it applies even to the unicellular microbes!) probably cannot function without the network of chemical signals – hormones, growth factors, lipid molecules, neurotransmitters – that communicate with diverse population of cells. Research in these areas over the years have proved to be a fertile ground for gaining insight into the complexities of biology – and of Nobel prizes. There are two chapters, one on nitric oxide and the other on polypeptide toxins that exist in the venoms of predators. The former, which gained notoriety as the molecule of the year 1993 is believed to participate as a major regulator in a variety of cellular processes and is also alleged to have a role in influencing the sexual behaviour. Bredt and Snyder provide an excellent description of all one would like to know about NO, but is afraid to ask! Olivera *et al* emphasize the utility of a class of small polypeptide toxins from marine snails and spiders as probes for elucidating the architecture of calcium channels and as therapeutic agents. This chapter is very clear, well written and is reader-friendly! The section on membrane receptors by Krieger and Herz provides a useful compilation of a variety of different problems in this broad field of multiligand lipoprotein receptors. However, the author's proposition of a 'unifying concept' of ligand recognition, at present, appears to be a dangerous exercise. The framework of the processes in the classical paradigm involving the interaction of G protein coupled receptors with ligands leading to the activation of a variety of cellular processes – via kinases and phosphatases – such as perception of odours, increase in the intracellular vesicle trafficking or change in the electrical activity of brain cells is illustrated in chapters by Strader *et al.*, Johnson *et al.*, and