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.

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

Nuofer and Balch. There are over 20 odd G proteins which receive and coordinate signals from more than 300 receptors. Despite this complexity, works in several laboratories have linked abnormal G proteins to pituitary and testicular tumours, cholera, leukaemia and other forms of cancer. These three chapters are complementary and anyone with some basic knowledge should be able to follow the flow of the theme. The gods of science lately have smiled fondly on people who took up this messy and elusive area and made it elegantly crisp. Finally, in recent years contributions from the fields of genetics and molecular biology have led to the explosive growth in the number and variety of steroid/thyroid superfamily of intracellular messengers Tsai and O'Malley have summarized the current understanding of their action, at the molecular level and have identified the issues for the future.

In the second section several chapters discuss various cellular processes and cytological organelles. These include synaptic transmission, intermediate filaments and centrosome. Bennet and Scheller emphasize largely the role of synaptic proteins in vesicular fusion, while Kennedy discusses the molecular events underlying synaptic transmission. Although these two chapters are written independently, the authors make a valiant effort in speedily bringing the oriented reader up to date but the unfamiliar reader may find it essential to consult some textbooks. Intermediate filaments are responsible for a myriad of housekeeping and specialized functions in multicellular eukaryotes. Fuchs and Weber summarize the recently gained exciting insights into the functions of intermediate filaments and their liaison in human disease. In the chapter on centrosome, Kellog *et al.*, discuss the components and their general organization.

In the third group, three separate chapters deal with different and diverse aspects that fall under the general category of energy transduction. Trumpower and Gennis illustrate the way by which prokaryotic and eukaryotic organisms couple the redox energy available from the reduction of molecular oxygen, while Howard and Rees point out that the study of nitrogen fixation has grown exponentially during the past few decades to accommodate not only bioinorganic chemists and spectroscopists but also microbial physiologists. Hartman and Harpel bring us up to date in the continuing saga of engineering plants with catalytically most efficient Rubisco. Although it continues as a paradigm for protein engineering, even the most modest goal of converting the less efficient bacterial enzyme into the somewhat more efficient plant enzyme has not been achieved. However, as discussed, the contributions from the application of atomic genetic and molecular biological tools have clarified the mechanics of energy transduction. Spectroscopic studies have erroneously attributed a role for a covalently bound form of quinone in several enzymatic functions. Although the intimation of quinones as redox cofactors seems to be correct, the article by Klinman and Mu encapsulates the problems and clarify the status of quino-cofactors in biology.

Molecular recognition is the underlying dictum of all chemical and biological processes from protein folding– and catalysis– to genetic recombination. This theme is best illustrated in a set of articles in this group. There are two articles related to HIV, although a part of it was covered in the previous volume. This bias is perhaps understandable in light of its immense importance in public health. Katz and Skalka's chapter describes retroviral enzymes, in general, that also serve as focal points for designing therapeutic drugs. A more direct emphasis is found in the article by Jones and Peterlin on transcription initiation at the HIV-1 promoter with analogies drawn to the eukaryotic systems. The function of DNA polymerase is discussed (Joyce and Steitz) mostly from a structural point of view and the mechanistic connections are less clear. The article on the regulation of DNA replication by Coverly and Laskey is more fascinating than that of the simple information carrier. Of particular interest in this section is the punchiest article on homeodomain proteins (Gehring *et al.*). The authors give the reader an idea of the rewards when chemists and biologists ultimately speak in the same terms in order to understand a complex developmental circuitary system. Over the last decade a combination of genetic, biochemical and structural studies have revealed a new level of mechanistic details in steps underlying the mechanism by which the integrity and fidelity of chromosomes is maintained. The chapters on DNA repair, single-strand DNA-binding proteins and homologous pairing and DNA strand exchange discuss in general the proteins involved and the mechanisms of these processes. Research in these areas is so vibrant that it is discussed almost every year in this series. Indeed, many of the same approaches originally designed for microbial systems have now been successfully applied to higher eukaryotic systems.

I have tried to find faults with this book and in some cases found them. It is regrettable that plant biochemistry, lipids, carbohydrates and methodology have been largely overlooked. Another shortcoming, albeit minor, is the article on Caulobacter differentiation, which belongs, in my opinion, either to the *Annual Reviews of Genetics* or *Annual Reviews of Microbiology*. Despite this, I consider the book to be a highly useful reference on a compendium of topics of diverse nature, containing up-to-date bibliography and appropriate illustrations; consequently, I rate it a shoulder above other series in this league. If the goal(s) of the authors is to inspire the newcomers to the subject, in most cases, it is certainly realized. I am confident that the 'jewel in the crown' of biological chemistry will shine again!

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