

beginning to be understood in recent years, thanks to the molecular biology tools. This volume of *Annual Review of Nutrition* devotes 5 chapters to these aspects. The role of peptide transporters, pept 1 and pept 2 in the intestine and the kidney has been discussed by Leibach and Ganapathy. Both types of receptors have been cloned and found to transport di- and tri-peptides using a transmembrane electrochemical H^+ gradient. They have pharmacological importance in the transport of peptide-like drugs. A family of transport proteins for glucose and fructose have been identified. They have different properties and tissue distribution. (Olson and Pessin), and are involved in the regulation of blood and tissue glucose.

A complex set of cytoplasmic, and nuclear proteins for vitamin A and its active metabolite retinoic acid have been identified. A recent hypothesis that the cytoplasmic proteins are involved in retinoid metabolism is discussed by Li and Norris in the chapter 'Structure/function of cytoplasmic vitamin A binding proteins'. Identification of retinoids which stimulate selective responses through nuclear receptors has helped to elucidate the molecular mechanisms involved. Besides these, synthetic agents also have therapeutic effects according to Pfahl and Chytil.

A. C. Antony's article on 'Folate receptors', discusses the structure, functions and regulation of folate receptors. These receptors bind folate and anti-folate compounds. Folate receptors have been exploited for uptake of toxic proteins or drugs (packed in liposomes and conjugated to folate), by target cells. This is a new approach for targeting drugs to cancer cells. Folate receptors also play a crucial role in transplacental transport of folate.

The 16th volume also includes a variety of other topics such as, mechanism of food allergy, effects of food on drug absorption, dietary change and traditional food systems of indigenous people, parenteral nutrition in low-birth-weight infants, and some more. It is indeed a mixed and interesting fare with something for anybody interested in food, nutrition and health.

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Annual Review of Biochemistry 1996. Charles C. Richardson. Annual Reviews Inc., 4139 El Camino Way, Palo Alto, California 94303-0139, USA. Vol. 65. Price: USA \$59, elsewhere \$65.

Every biochemist eagerly looks forward to the *Annual Review of Biochemistry* not only for its exhaustive reviews in the area of one's interest but also as a possible source for the search of new research problems. The personalized account of research by well-known scientists in the prefatory chapter is also something one looks forward to. This volume of *Annual Review of Biochemistry* has 25 articles including the prefatory article by Daniel Koshland Jr, the former editor of *Science*. Interestingly, in 11 of the 24 reviews, there is some reference to disease and/or suggestions for improved therapies. While in some of the articles, there may be justification, in others the connection is less apparent! Generally, the *Annual Review of Biochemistry* covers a broad spectrum of areas and grouping them into categories is not easy. However, 11 of the articles are related to biology of nucleic acids. The other topics cover enzyme biochemistry, various aspects of protein structure, cellular signalling and drug resistance in *M. tuberculosis*.

Aspects of DNA repair have been covered in four reviews. Friedberg and Sancar explore the biochemistry of DNA excision repair in detail in prokaryotes and eukaryotes with emphasis on repair mechanisms in humans and coupling of transcription and nucleotide excision. Defective excision repair in humans has been recognized to be associated with hereditary diseases xeroderma pigmentosum, cockayne's syndrome and trichthiodystrophy. Since the transcription factor TFIIH appears to have an obligatory role in nucleotide excision repair, newer approaches can be adopted to study the molecular basis of these hereditary diseases. How mismatch-directed repair in *E. coli* takes place and the genes responsible for this are discussed by Modrich and Lahue. Since these reactions appear to be conserved during evolution, the reviewers suggest that inactivation of their homologous genes in mice and humans results in a large increase in spontaneous mutability and consequently predisposition to tumour development. In the review on DNA repair in eukaryotes

by Wood, the emphasis is on how DNA glycosylases and endonucleases carry DNA repair. Other articles related to DNA biochemistry describe how DNA helicases unwind duplex DNA, the regulation of telomere length which includes the biochemistry of the enzyme telomerase and other telomere-binding proteins and an update on DNA topoisomerases. The connection between cellular senescence, aging, cancer and telomeres is discussed in some detail in the review on telomere length regulation and should be of interest to those working in the molecular biology of cell division and malignant transformation.

Three articles discuss the biochemistry of ribonucleic acids with specific emphasis on mRNA. Splicing of mammalian pre mRNA has been extensively investigated and has also been the subject of several reviews. It is becoming increasingly evident that like in eukaryotic transcription and DNA repair, several proteins are involved in the splicing reaction of mammalian mRNA. The review by Kramer focuses attention on the various factors having splicing activities. The article has a table which indicates structural motif in these proteins which should be useful to those interested in correlating structure with function in nucleic acid-binding proteins. mRNA decay in eukaryotic cells is highly specific. The factors that initiate mRNA decay are covered in a review by Jacobson and Peltz. Recording, i.e. re-programming of translation is extensively discussed by Gesteland and Atkins.

The review on molecular mechanisms of drug resistances in *M. tuberculosis* by Blanchard is relevant as the appearance of multidrug-resistant strains poses serious health problems, particularly as only few drugs are effective therapeutic agents against this microorganism. The development of resistance even against fluoroquinolone class of antibiotics calls for new strategies to combat tuberculosis. One suggestion by the reviewer is combined administration of β -lactams and β -lactamase inhibitors. Since a large number of β -lactams are characterized, this approach could be both exploring as well as cost-effective compared to *de novo* synthesis and clinical evaluation of new compounds.

Mammalian amino acid transport with emphasis on genes coding for the various transporters and their regulation is

reviewed by Malandro and Kilberg. Characterization of transporter genes should help in understanding the molecular basis of the autosomal recessive genetic disease cystinurea which is characterized by high levels of urinary cystine and cationic amino acids leading to cystine stones and renal disease.

Biochemistry of the '21st amino acid' selenocysteine and the enzymology of selenocysteine-containing proteins is reviewed by Stadtman. Proteasome are essential components of ATP-driven proteolytic pathway in eukaryotic cells. They are also involved in the conversion of transcription factors NF- κ B and NF- κ B2 from inactive to active forms and antigen presentation. These aspects are reviewed by Coux, Tanaka and Goldberg. The physico-chemical factors that influence interaction of sugars with lectins are becoming clear with the determination of the X-ray structures of several lectin-carbohydrate complexes. These aspects are dealt with by Weis and Drickamer. The 3D structures of the primary subunit, TATA box-binding protein and the core promoter of the transcription factor 11D have helped in understanding its molecular architecture. These aspects and recent functions on the complex interactions of the basal transcription machinery with regulatory transcription factors, especially through co-activators have been reviewed in detail by Burley and Roeder. Various aspects of structure and function of connexons and connexins, i.e. proteins that form gap-junctions that aid in inter-cellular communication, electron transfer in proteins and hematopoietic receptor complexes are subject of reviews that deal with protein structure.

In the area of cellular signalling there are reviews on signal transduction in the early stages of development in *Dictyostelium* (Parent and Devreotes), lipo-chitooligosaccharide molecules as signal factors used by rhizobia (Dénarié, Debelle and Promé) and cross-talk between the nucleus and the mitochondrion that enable assembly and proper functioning of proteins in the mitochondria (Poyton and McEwen).

Protein prenylation and protein transport across the endoplasmic reticulum and bacterial inner membranes have been popular topics for reviews and essays in recent years. Hence, it is somewhat surprising to find reviews on these two

areas. While almost all the reviews are topical and exhaustive, four articles related to DNA repair are perhaps unnecessary in one volume.

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Deterministic Chaos: Complex Chance Out of Simple Necessity. N. Kumar. University Press, 3-6-272, Himayatnagar, Hyderabad 500 029. 1996. pp. 96 + xiii. Rs 70.

About a decade ago in *The New Physics* (ed. Paul Davies), Joseph Ford wrote a chapter entitled, 'What is chaos, that we should be mindful of it?*' . The asterisk at the end is for a footnote informing us that this is in fact a quote from Psalms in the *Bible*. The chapter begins with a quotation from *Hamlet*, 'There are more things in Heaven and earth, Horatio/Than are dreamt of in our philosophy'. The subject of chaos has truly linked together such diverse aspects of human intellectual existence, from spirituality to aesthetics to . . . well, the hard core determinism of classical physics. Deterministic equations governing the change in space and time of realistic natural objects are inevitably non-linear. Chaos is a consequence of nonlinearity. No other branch of theoretical physical sciences has generated so much excitement in the last decade as chaos. Hoards of papers and a large number of books have appeared on this.

Spirituality and quotations aside, most books on chaos address Ford's question in colourful pictures of beautiful objects, real and abstract. In such a crowd of books on chaos, why another book? Well, for one, most of these fascinating books are nothing but library treasures and that too only available in a few libraries in a country like India. N. Kumar's book is a greatly needed monograph affordable for every college student.

But does it have everything that those books that are tens or hundreds of times more expensive have? Not really. But then, none of those books has everything you want to know about chaos either. James Gleick's popular book is nice to

read once over, but it is too pedestrian for any serious student of science. Books with colourful pictures of turbulent smoke and fractal landscapes are attractive, but there is always something missing. Of course, books like the one by Georg Schuster are more comprehensive and certainly a necessity for most researchers in this area.

The JNCASR monographs are meant to be educational for students and teachers who may or may not be engaged in active research. This is where Kumar's concise and yet comprehensive monograph wins over the rest. It provides a reasonably comprehensive answer to Ford's question cited above.

Kumar starts the first chapter with a general overview, intentionally written in a discursive style. The second chapter elaborates the basic concepts like phase space, flows and Poincaré section, etc. Then come four chapters on details – simple models, strange attractors, conservative systems and fractals. A chapter on concluding remarks is followed by four appendices. These, though required as supplements to the text at different points, may be looked at right after the first chapter. Another appendix with a detailed analysis of an oscillating chemical reaction may have been useful.

There are a number of frontier problems judiciously left untouched except for brief comments in the concluding remarks. These include quantum chaos and controlling chaos. While these are important questions currently being pursued by active researchers, detailed discussion on these could not be made part of such a concise monograph with the specific purpose that it has – namely to supplement texts on nonlinear differential equations, classical physics, or statistical mechanics.

Kumar is one of the most well-known Indian physicists. The long span of his research career in classical physics and his experience as a physics teacher brings an authenticity to his rendering of the subject matter. In addition, he has a rare combination of smooth and precise diction. At times, however the necessary brevity makes the reading a bit condensed and for a beginner, it is likely to be difficult. For a graduate student, on the other hand, it should be a useful pocketbook to carry around. A major lacuna, and a surprising one from Kumar, who is known to indulge in problem-solving with any student who approaches him, is the absence of exercise problems. This is compensated by occa-