

BOOK REVIEWS

Annual Review of Cell Biology 1992. Volume 8. G. E. Palade, ed. Annual Reviews Inc., 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94306, USA. 611 pp. Price: USA \$46, elsewhere \$51.

This *Annual Review of Cell Biology* covers a very wide range of topics. 'Polarity of epithelial and neuronal cells' which is more of a classical cell biology type article to such topics as the 'role of p34 kinases in the G1 to S-phase transition' and 'post transcriptional steps in the expression of chloroplast genes' which are reviews of great interest to workers in the areas of genetics, cell biology and biochemistry. Anyone interested in the molecular and cellular aspects of modern biology will find at least a few topics of his interest in this volume, which contains 19 excellent reviews.

In the review by S. I. Reed of the role of p34 kinases in the G1 to S-phase transition; the author has critically examined the role of the most important components of the 'master regulator' of cell division cycle. The kinase p34 and its role in the G1, S, and G1 to S phase transition is discussed. The concept of 'START' and other terms are properly explained so that a reader not familiar with the subject can also understand. Regulatory pathways are explained by line diagrams. The role of p34 kinases in budding yeast, fission yeast, embryonic cells and cells in tissue culture is discussed in separate sections to avoid confusion. The literature is carefully reviewed and the gaps in our understanding of the role of p34 kinase are also pointed out; e.g. 'Although the critical phosphorylation events mediated by the *cdc28* kinase at the START transition have not been defined, some likely target proteins have been identified'.

The review by J. D. Rochaix summarizes recent work on the 'post transcriptional steps in the expression of chloroplast genes' during chloroplast biogenesis. Chloroplast transformation, first reported in 1988 has made it possible to perform reverse genetics by directed gene disruption and site-directed mutagenesis to produce and test *in vivo* chimeric chloroplast genes and define their functions. The role of RNA

stability and self-splicing and trans-splicing in gene expression is also discussed.

The article on 'molecular motors' describes the founding members and the new members of each motor protein family. Myosins, kinesins and dyneins families are discussed with respect to the primary structure of proteins, phenotype of mutants and genetic approaches that are being applied for the analysis of their function.

The importance of membrane transport to the cell is exemplified by the fact that almost 20% of the *E. coli* genes so far identified are associated with transport function. The review by C. F. Higgins considers the largest and the most diverse of these families, the ABC super family. These transporters contain a highly conserved ATP-binding cassette (hence the name ABC transporters), and are associated with many important biological processes in both prokaryotes and eukaryotes, as well as with clinical disorders such as cystic fibrosis, multi-drug resistance of cancer and antigen presentation.

M. Kozak has provided an excellent review of various aspects of 'regulation of translation in eukaryotic systems' and pointed out differences from prokaryotes. Regulatory proteins which bind to specific mRNAs and act as repressors or activators of translation of certain mRNAs are discussed. Global regulation of translation by protein phosphorylation and the mechanisms of virus infection-induced shutoff of host protein synthesis are reviewed in a separate section.

H. Charbonneau and N. K. Tonks have emphasized the role of protein tyrosine phosphatases in the regulation of various cellular processes such as cell proliferation, growth and differentiation. They have suggested that the number of protein phosphatases in eukaryotes may be as large as one thousand (1002 protein phosphatases?). This is based on the recent spurt in the number of genes identified that code for receptor and non-receptor type phosphatases.

The articles in this volume also provide an excellent source of important references for more detailed reading. On the whole the choice and the range of topics covered provide a very useful source of excellent reviews by the experts in the field. I strongly re-

commend it for everyone who is interested in these topics.

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Annual Review of Microbiology 1992. Vol. 46. L. N. Ornston, A. Balows and E. P. Greenberg, eds. Annual Reviews Inc., Palo Alto, California 94303, USA. 1992. 757 pp. Price: USA \$45, elsewhere \$50.

This volume contains twenty-three reviews dealing with the physiology, biochemistry, genetics and molecular biology of microorganisms. These microorganisms may be grouped under bacteria, viruses, fungi, yeast and protozoa. The prefatory chapter by Bernard D. Davis gives a delightful account of a scientist's tribulations and successes in scientific research, his personal tensions between the heart and the head and the relations between science and society.

The article 'Genetics of *Campylobacter* and *Helicobacter*' by D. E. Taylor deals with a group of organisms which have attracted a lot of attention in recent days because of their pathogenicity to animals, including humans. It examines the current genetic analysis and genetic exchange in these organisms. The latter includes conjugative plasmid transfer and natural transformation.

'Genetics of ribosomally synthesized peptide antibiotics' by R. Kolter and F. Moreno gives an account of several important features shared by microcins produced by different strains of gram-negative bacteria. The authors discuss their synthesis and transport and the structural and regulatory genes involved in these processes.

An economically important problem in microbial ecology concerns the efficacy of rhizobial inoculants for the formation of nitrogen-fixing nodules on legume crop plants such as beans, alfalfa and clover. However, attempts to improve nitrogen fixation under agricultural conditions with such strains often fail, as a result of the presence of indigenous rhizobia competing with these strains.

This problem has been dealt with in detail by E. W. Triplett and M. J. Sadowsky in their article 'Genetics of competition for nodulation of legumes'.

The genus *Rhodococcus* consists of bacteria which exhibit broad metabolic activity, particularly to hydrophobic compounds, such as hydrocarbons, chlorinated phenolics, petroleum, etc. Bio-processing systems employing various *Rhodococcus* strains are operational for industrial and environmental applications. Certain members of the genus are known pathogens for humans, animals and plants. Knowledge of the genetic systems of rhodococci are limited. 'The biology and genetics of the genus *Rhodococcus*' by W. R. Finnerty reviews the latest advances in biochemistry, genetics, pathogenicity and environmental applications of rhodococci.

'Molecular biology of methanogens' by J. N. Reeve discusses anaerobic degradation by these organisms terminating in methane production, a process universally applied in the generation of biogas from human and animal wastes. The substantial progress made over the past decade, reviewed in this article, in understanding the molecular biology of these organisms should provide a data base for considering genetic approaches to improving this process.

The last two articles reviewed above indicate the biodiversity in nature to deal with environmental pollutants. This aspect has been described in detail further in the article 'Bio-diversity as a source of innovation in biotechnology' by A. T. Bull, M. Goodfellow and J. H. Slater. The authors discuss the impact of an ecological approach to the search and discovery of novel organisms.

Antibiotics exemplify the reverse aspect of microorganisms present in the environment, namely biosynthesis of compounds which are of medicinal importance.

The article penicillin and cephalosporin biosynthetic genes: structure, organization, regulation and evolution' by Y. Aharonowitz, G. Cohen and J. F. Martin discusses the molecular biology of a class of important antibiotics. DNA hybridization screening of streptomyces demonstrates that β -lactam biosynthetic

genes may be more widespread in nature than is indicated by conventional antibiotic screening. They offer the possibility of expanding the search for organisms to make new β -lactam antibiotics.

There are two important articles on human immunodeficiency virus (HIV). 'The natural history and pathogenesis of HIV infection' by H. W. Sheppard and M. S. Ascher discusses a new hypothesis that AIDS pathogenesis, in all its manifestations, is the outcome of one central process, namely, excess immune activation generated by the interaction of the virus with the CD4 receptor. 'Human immunodeficiency virus and the central nervous system' by D. C. Spencer and R. W. Price discusses models of the interaction of HIV and immune responses that might account for brain injury in AIDS patients.

Among articles dealing with other viruses, 'Treatment of the picornavirus common cold by inhibitors of viral coating and attachment' by M. A. McKinlay, D. C. Pevear and M. G. Rossman deserves special mention. The vast majority of the work cited in this review has been published within the last ten years. This article deals with the history and current status of research that has focused on the inhibitors of the early steps in the viral cell cycle: attachment to the cellular receptor and uncoating of the viral RNA. It illustrates the approach directed at these targets by figures of computer-based structure of rhinovirus type 14 and the drug-binding pocket in the virus.

Molecular biologists will find a number of interesting articles in this book. Perhaps the most important is the article 'Positive regulation in the gram-positive bacterium: *Bacillus subtilis*' by A. Klier, T. Msadek and G. Rapoport. A significant majority of regulatory mechanisms in *B. subtilis* involve positive regulation, in contrast to gram-negative bacteria like *Escherichia coli*. This review describes the different types of positive regulators in *B. subtilis*. These include accessory regulatory polypeptides, classical positive regulators that bind to target sites located just upstream from the promoter, ambivalent regulators

that act both positively and negatively, antiterminators and positive regulators associated with specific secondary sigma factors. Other articles in molecular biology include 'Functional and evolutionary relationships among diverse oxygenases' by S. Harayama, M. Kok and E. L. Neidle, 'Arrest of bacterial DNA replication' by T. M. Hill and 'Autoregulatory factors and communication in actinomycetes' by S. Hironouchi and T. Beppu.

The article on the parasite trypanosomatids is of particular interest to persons residing in the tropics. This group of flagellated protozoa differs from all other organisms in their ability to conjugate glutathione and spermidine to form trypanothione which is involved in the defence against damage by oxidants, certain heavy metals and possibly xenobiotics. 'Metabolism and functions of trypanothione in the kinetoplastida' by A. H. Fairlamb and A. Cerami reviews the progress made in delineating the metabolism and function of this peptide which was only discovered less than ten years ago. The potential importance of this compound as a target for drug development is brought out by the fact that several existing trypanocidal agents appear to act on the trypanothione system (trypanothione and its related enzymes glutathionylspermidine synthetase, trypanothione synthetase and trypanothione reductase).

Other articles in this review include 'Replication cycle of *Bacillus subtilis* hydroxymethyluracil-containing phages' by P. P. Hoet, M. M. Coene and C. G. Cocito, 'Control of cell density and pattern by intercellular signalling in *Myxococcus* development' by S. K. Kim, D. Kaiser and A. Kuspa, 'The structure and replication of hepatitis delta virus' by J. M. Taylor and 'Double-stranded and single-stranded RNA viruses of *Saccharomyces cerevisiae*' by R. B. Wickner.

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