

## BOOK REVIEWS

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medical dictionary also states 'tubercular sometimes is incorrectly used as synonymous with tuberculous'.

There are a few corrections to be made in the book: (a) In chapter 2, from page 3 onwards, while listing the drugs belonging to different ring systems, the heading for the two columns is given for some tables and not for others, which leads to confusion in presentation. This needs to be presented uniformly. (b) There are some slips in chapter 47, 'Biotechnologically derived drugs'. On p. 790, thymine should be shifted from purine bases to pyrimidine bases; uridine should be corrected to deoxyuridine both in the nucleoside and nucleotide structures; in the nucleotide the phosphate is not commonly shown in the ionized form.

Let me end by saying that reading this book has been an enjoyable experience for me. Harkishan Singh the 'Pharmacy Historian' becomes visible at many points and makes the book a classic to read. How vitamins were rechristened to vitamins – as non-amines, I learnt from this book (p. 691). V. K. Kapoor an expert in graphics shows up all the time in his beautiful presentation of the structural formulae, which are like jewels for a book based on chemical structures.

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**Annual Review of Cell and Developmental Biology, 2012.** Randy Schekman, Larry S. B. Goldstein and Ruth Lehmann (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 28. xiii + 797 pp. Price: US\$ 94.

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This volume has 27 reviews, most of which cover broad areas in cell and developmental biology while few are more specialized. A salient feature in almost all the reviews is the presence of excellent graphics that summarize important aspects of the review. This volume begins with reflections on the life and legacy of George Palade, who is considered as the father of cell biology. Palade together with his collaborators, made crucial contributions to the development

of cell biology. The article provides interesting insights into the career of Palade and his work on delineating the secretory pathway in eukaryotic cells.

Recent reports indicate that many metabolic enzymes self-assemble to form large intracellular bodies. Apart from reviewing how and why such structures are formed, O'Connell *et al.* also speculate on models for how these structures form and their functional roles. Excellent illustrations of some higher-order structures within cells give a better perspective of the problem. The review by Levy and Heald on the mechanism of intracellular scaling summarizes cell and organelle size relationships. It also dwells upon experimental approaches to the study of scaling. In the conclusion section, the authors outline how knowledge of intracellular scaling will help in understanding cell physiology and development.

A set of intracellular protein complexes that enable autocatalytic activation of inflammatory caspases is referred to as inflammasomes. Aspects of pathogen recognition, inflammasome composition, structure and various features of its activation are described in the review by Lamkanfi and Dixit. The illustrations give useful insights into the domain architecture of inflammasome components, structure and models for inflammasome activation. The figure on how virulence factors modulate inflammasome signalling is a succinct summary of the events. The authors hope the clinical translation of newer aspects could help in unearthing novel targets for therapies.

The fluid-mosaic model for the plasma membrane proposed by Singer and Nicolson in 1972, has been the starting point for research in membrane biology. Advances in this area over the years have led to a thorough understanding of plasma membrane structure not only as a scaffold, but also in signal transduction and membrane dynamics. These aspects are reviewed by Kusumi and co-workers. The authors outline a model for the plasma membrane as perceived today. The use of single-molecule spectroscopy in the study of membrane dynamics is described in detail.

The unfolded protein response refers to a network of intracellular signalling pathways that maintain protein folding capacity of the endoplasmic reticulum (ER) in eukaryotic cells. Korennykh and

Walter describe how unfolded proteins are detected in the lumen of ER. Control of the unfolded protein response by sensors is explained. The emphasis is on structural and mechanistic aspects of protein complexes involved in the process. Rizo and Südhof review the role of sec1/munc18 proteins in membrane fusion. Since structures of many of these proteins are known, their action in terms of structure is discussed extensively.

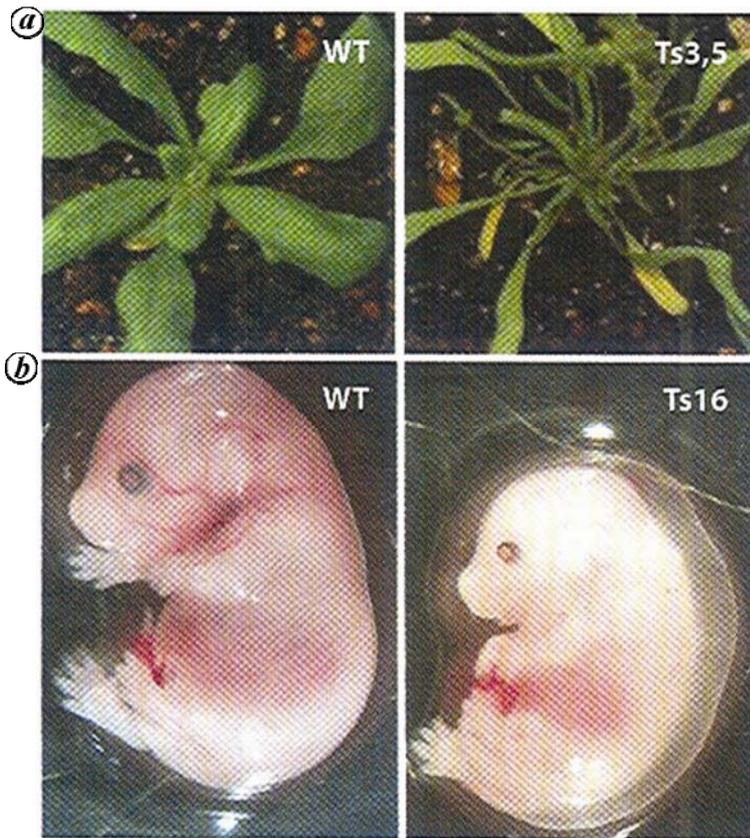
Clathrin has been extensively studied for a large number of years. Brodsky addresses clathrin function beyond conventional receptor-mediated endocytosis. The links between clathrin function and human health and disease are highlighted. Future issues related to newer aspects of function are discussed.

Hanson and Cashikar review the cellular function of multivesicular bodies (MVB), which are organelles in the endocytosis pathway. It covers aspects of how endosomal sorting complexes required for transport, contribute to MVB morphogenesis. The complex protein-protein interactions involving endosomal sorting complexes required for transport (ESCRT) are shown. The link to various human diseases such as cancer, as well as neurodegenerative diseases such as Alzheimer's and Parkinson's is discussed.

Cellular behaviour beyond homeostatic framework is reviewed by Fredolino and Tavazoie. Examples include predictive behaviour of *Escherichia coli* upon transition into host gastrointestinal tract and sequential stresses in *Saccharomyces cerevisiae* during wine-making. The review would be of interest to researchers who design and study cell-environment interactions. The references are annotated, which gives a good perspective to those who are unfamiliar with the area.

Lipid droplets (LD) are storage organelles in eukaryotic cells and perform functions other than passive lipid storage. Saka and Valdivia review the role of LD in immunity and host-pathogen interactions, and current status of LD research. The authors are of the opinion that LD cell biology and links with immune responses should lead to newer insights.

The second messenger bis-(3'-5)-cyclic dimeric guanosine monophosphate (c-di-GMP) is important for the control of different aspects of bacterial physiology. Three newly characterized c-di-GMP effector systems are reviewed by



Examples of the effects of aneuploidy on organisms. **(a)** Aneuploid *Arabidopsis thaliana* rosettes (right, trisomic for chromosomes 3 and 5) show thinner, distorted leaves in comparison with diploid rosettes (left) (from Henry *et al.*, 2010). **(b)** Trisomy 16 (Ts16) mouse embryos (right) are smaller compared with diploid littermates (left) and exhibit a variety of developmental abnormalities including nuchal edema (from Williams *et al.*, 2008). Ts, trisomy; WT, wild type.

Boyd and O'Toole. Illustration of the protein–protein interactions involved indicates the complexity of the process. The diversity and intricacy of c-di-GMP signalling involved in bacterial physiology, particularly in biofilm formation, are highlighted.

Two reviews on plants are related to modulation of plant physiology by hormones. Vanstraelen and Benková discuss hormonal interactions in the regulation of various aspects of plant development such as shaping of embryonic root pole, root development, shoot branching and germination. Pieterse *et al.* review hormonal modulation of plant immunity. In both the reviews, the complex network of protein–protein interactions in the development process as well as the role of well-known plant hormones in the defence against pathogens and insects are revealed.

Mallarino and Abzhanov describe evolutionary development biology appro-

aches to study animal morphological evolution. Aspects such as quantification of morphological variation, identification of candidate developmental causes and functional studies of candidate genes and pathways are illustrated. The review indicates how a multifaceted approach is essential for an in-depth understanding of developmental biology.

Newer techniques for mapping genome-wide interactions have given valuable insights into the role of chromatin-bound elements in nuclear organization in various cell types. Van Bortle and Corces have reviewed recent findings on long-range interactions of regulatory elements such as chromatin insulators and their role in controlling gene expression in the context of specific nuclear domains.

Eukaryotic cells have well-defined programmes to allow cells to grow and divide in an orderly manner. Three reviews are dedicated to different aspects

of the cell division cycle. Cai and Tu have described the contribution of cellular metabolic processes to cell-cycle regulation in budding yeast. Green and colleagues provide an overview of the process of cytokinesis, which is the final step in cell division. The consequences of defects in mitosis which leads to abnormal segregation of chromosomes or aneuploidy are discussed by Siegel and Amon, with emphasis on the impact of aneuploidy on gene expression, cell physiology and diseases such as cancer and neurodegeneration.

Cellular proteins are distributed in an asymmetric manner within the cell and along cellular membranes. This property of cell polarity allows cells to maintain tissue organization and function during development and in the adult stage. The critical importance of cell polarity for these processes is highlighted in a series of reviews in this volume. Wallingford discusses the molecular basis of planar cell polarity, which is the orientation and alignment of cells within a sheet during tissue patterning in development. Epithelial cells display apical–basal polarization which is essential for epithelia to control composition and functions of various organs. Tepan has reviewed advances in the field of apical polarity regulators in *Drosophila*. The contributions of cell polarity and its dysregulation to cancer are highlighted by Muthuswamy and Xue. The germ layers in a developing embryo are specified in a fundamental process termed gastrulation. Solnica-Krezel and Sepich review the molecular mechanisms of cell motility, shape, adhesion and polarity that orchestrate the process of gastrulation in various species. Cell behaviour in embryonic and adult tissues is extensively modulated by extracellular matrix components such as the laminins. Domogatskaya and colleagues have described the molecular complexity, evolution and structure of the laminin protein family.

Since cardiovascular disease is a leading cause of death worldwide, a timely review by Kikuchi and Pan examines the mechanisms of cardiac regeneration in a number of model systems and potential for therapeutic applications. Traumatic nerve injury and many neurodegenerative diseases lead to axon damage. But studies with higher vertebrates have given limited insights into the regulation of axon degeneration and regeneration. Fang and Bonini describe the utility of

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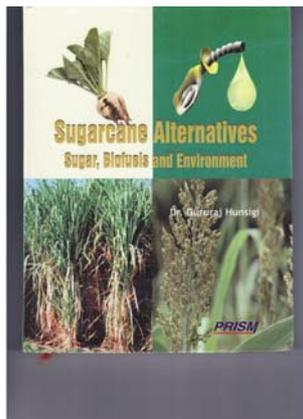
*Drosophila* as a model system to study the key genes that regulate axon degeneration and regeneration. A second review on the nervous system by Thomas and colleagues describes the process of transposition of DNA repeats called LINES in the nervous system and its relevance in development, disease and evolution.

The *Annual Review* series is eagerly awaited, as the volumes give an overview of research in broad as well as specialized areas. In the days of open-access journals, the *Annual Reviews* continue to be sought after for their important insights and future perspectives in various fields. This volume would be of interest not only to researchers in the area of cell and developmental biology but also those would like to work in interface areas of biology, particularly those who are looking for new research problems.

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**Sugarcane Alternatives: Sugar, Biofuels and Environment.** Gururaj Hunsigi. Prism Books Private Limited, Bengaluru. 320 pp. Price: Rs 1500.

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Although sugarcane first originated in New Guinea, circa 6000 BC, scriptures provide evidence that it has been under cultivation for at least 5000 years in India. It is a tropical crop grown typically under long warm conditions around which disputes concerning the sharing of Cauvery waters continue. It is also a crop which controls market forces. For example, while Karnataka grows the cane, the harvesting depends on labourers from Tamil Nadu.

Being an old crop in India many agromonic practices are followed related to

its method of cultivation, use of varieties resistant to fungal pests, harvesting, use of its juice for preparation of jaggery and crystalline sugar and the use of left-over fibrous bagasse for newsprint. It is gratifying to have this book for a quick reference.

Being an old crop, I expected to learn about the breeding work on sugarcane done in India, in particular at Coimbatore, but there is limited or no coverage of this important topic.

I have often wondered which out of the three crop plants; sugarcane, sugar beet and cassava is photosynthetically the most efficient in terms of carbon dioxide fixed into sucrose per hectare. However, there is no discussion of this. On the other hand, there is some useful discussion of sugarcane being developed as an energy crop for manufacture of biofuel ethanol and biodiesel.

The book is printed on good quality paper between an attractive cover and should be useful for agricultural institutions.

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