

BOOK REVIEWS

attention is needed in this direction about which the author has expressed great concern in his concluding part of the introduction and elsewhere.

The monograph will be useful to mycologists, plant pathologists, ecologists, molecular biologists and plant conservationists, and will remain an essential ready reference for researchers in the field of smut fungi.

As a member of the mycological fraternity, I thank Kalman Vanky for this contribution which will be helpful for scholars, teachers, students and those who are passionate about smut fungi and congratulate the author for the timely, long-awaited monumental work.

The American Phytopathological Society (APS) Press also deserves credit for quality plate composition, flawless and superb production.

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Annual Review of Cell and Developmental Biology, 2011. Randy Schekman, Larry Goldstein and Ruth Lehman (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 27. xiii + 816 pp. Price not mentioned.

The book under review is a comprehensive compilation of pioneering and critical reviews on a number of specialized topics in the area of cell and developmental biology. There are 30 chapters, including one contributed by Martin Raff, an eminent immunologist and neurobiologist, giving a detailed account of his scientific pursuit and revealing once again his versatile scientific contribution in the area of cell and developmental biology. The authors of each chapter have, in general focused on path-breaking discoveries, and have also discussed the controversies in the respective fields. They have also organized the text in a lucid format, incorporating separate sections on summary and future issues/implications at the end of the review, which will help the readers gain a clear and deep insight into the respective topic.

The common theme of the book is cellular dynamics and development. It exhaustively discusses intracellular trafficking, signalling and intercellular interaction and development.

The chapter titled 'Membrane protein insertion at the endoplasmic reticulum' deals with the energetics of membrane protein insertion and the influence of distant sequence elements on membrane protein topology, in addition to the basic topology of membrane proteins. The review also discusses the challenges and limitations of membrane topology prediction methods and critically analyses the challenges in understanding co-translational and post-translational protein insertion.

The basic conceptual framework of the book is to understand cellular physiology in relation to the energetic constraints of a system. For instance, the Golgi complex is one of the most studied organelles of the cell. Innumerable studies and references talk about its principal functions and its peculiar shape. However, there are only a handful of studies which actually throw light on the mechanism by which its size is controlled. The chapter titled 'Control of organelle size: the Golgi complex' discusses specific exam-

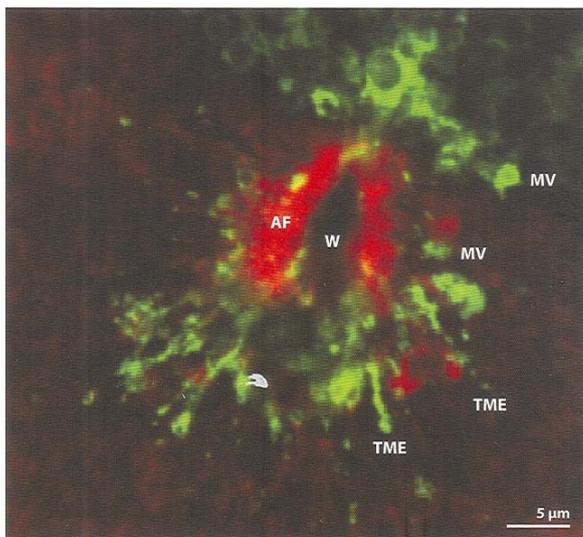
ples which explain the process of change in size of the Golgi complex. The study also discretely highlights that the altered cargo load leads to feedback inhibition of transcription of Golgi complex enzymes.

One of the principal discoverers of membrane trafficking and fission is S. L. Schmid. The book has incorporated a recent review from his research group. The review 'Dynamins: functional design of a membrane fission catalyst' not only incorporates the initial discoveries in the field, but also highlights the most recent developments. The authors have commented on the energetics of tubule formation by dynamin self-assembly and also on the metastable state of the membrane on a much shorter timescale. However, they have not incorporated the role of dynamin inhibitors like dynasore and their role in diseases like epilepsy. Autophagy has gained the attention of researchers throughout the globe due to its role in various diseases. From an elaborate discussion on the endoplasmic reticulum, Golgi and membrane fission, the book subsequently moves on to autophagosomes and 'The role of Atg proteins in autophagosome formation' (chapter 4).

Schematic diagrams of unconventional myosin and descriptions of classical experiments draw a picturesque introduction to the subject (chapter 5). Subsequently, the next chapter 'Force generation, transmission, and integration during cell and tissue morphogenesis' describes load-dependent kinetics of myosin II and the difference in its behaviour under forward and reverse tension. The actin network has been described to behave like a viscoelastic solid under applied force. This phenomenon explicitly explains how a cell ruptures when actin exceeds its elastic limit.

The review on transmembrane collagen receptors discusses the evolutionary significance of collagen and its receptors (chapter 10). Interestingly, Wang *et al.* (2006) have shown that DDRs suppress cell migration in MDCK cell line, whereas many other studies have shown that DDRs induce cell migration in other cell lines. The review has explicitly discussed the role of DDRs in disease progression, as in atherosclerosis. The future implication of $\alpha 2\beta 1$ and glycoprotein VI as drug targets for antiplatelet therapy have also been discussed.

After an intricate discussion on statics and dynamics of a single cell, the book moves on to the details of interaction of



Fluorescence micrograph of late stages of wound healing in a *Xenopus* oocyte. Actin filaments (AF) have almost completely closed over the original wound (W). A marker for membrane (green) reveals the existence of extracellular microvesicles (MVs) and tubular membrane extensions (TMEs) apparently derived from the patching membrane.

one cell with its immediate environment. For such interactions, cooperation between integrins and growth factor receptors is a prerequisite (chapter 11). Interestingly, controversies related to integrin function have been critically analysed. For example, identifying the role of $\alpha 5 \beta 3$ in angiogenesis has led to a long-lasting debate as different approaches have resulted in contradictory results. Chapter 12 entitled 'Regulation of integrin activation' describes the cell-ECM (extra cellular matrix) interactions. These interactions are responsible for the development of multicellular organisms from a single cell. Integrins are the key players in these interactions. The chapter also discusses how integrins transmit information on chemical identity and physical state of ligands to regulate migration, survival and growth.

Subsequent to cell-ECM interactions the book takes the readers through the details of embryogenesis. The review (chapter 13) describes how epithelial cells are converted to mesenchymal cells, and also deals with the inducers of EMT (epithelial to mesenchymal transition) like Snail and Twist Factors, which lead to loss of E-cadherin. The review provides comparative analysis of epithelial plasticity during embryonic development and in cancer. The next two chapters (chapters 14 and 15) deal with the development of morphogen gradient, its role in organogenesis, and limb regeneration. The review on limb regeneration has

placed emphasis on the neurotrophic hypothesis, where neuronal secretions impart proliferative quality to blastema cells. However, in the future implications, the author could have mentioned stem cell therapy for organ regeneration.

We know that cancer cells have high energy requirement, and unlike normal cells they depend on glycolysis. The review on aerobic glycolysis (chapter 16) has not only discussed this peculiarity of cancer cells, but has also elaborated the role of important transcription and growth factors like HIF-I (hypoxia inducible factor-I) and VEGF (vascular endothelial growth factor) in tumour induction.

'Cyclin dependent kinases in brain development' (chapter 17) discussed the role of cdk5 in synaptic plasticity, behaviour and cognition. The synaptic vesicle cycle requires cdk5 phosphorylation of presynaptic proteins required in both exo- and endocytosis. 'Epithelial progenitor cells in lung development, maintenance, repair and disease' (chapter 18) discusses the role of stem/progenitor cells in treating lung disease. The Hedgehog signalling pathway plays a major role in organism development. Gli proteins (chapter 19) are important transcriptional activators/repressors of this pathway, and their role in disease and development has been dealt with efficiently.

Chapter 20 entitled 'Mechanisms of T cell development and transformation' discusses the role of T cells in various

diseases. However, developments on Th-17 cells, T cell-based therapies and vaccine development could have been incorporated under future implications. The chapter 22 deals with the role of polyploidy in cancer X chromosome inactivation and answers critical questions on how pluripotency factors identify their target genes and how they act to ensure activation/repression.

The role of methyl-CpG binding protein 2 (MeCP2) in the brain (chapter 24) deals with critical questions on whether MeCP2 is a multifunctional protein or primarily a transcriptional repressor. The review presents independent and unbiased views on two different schools of thought regarding its role; one that believes MeCP2 is a regulator of brain development and the other that believes it helps maintain neuronal/glial function. The chapter 25 deals with the role of insulin and IGF present in CSF in controlling prenatal growth and brain size regulation. More importantly, it discusses the potential clinical implications also.

Chapter 26 addresses questions on how distinct neuron types, which share terminal differentiation genes, are regulated by different terminal selectors and how the selection determines the terminal molecular signature of neurons. Chapter 27 deals with proteins which are rich in LRRs (leucine-rich repeats), and their role in organizing neuronal connectivity and nervous system disorders like epilepsy and schizophrenia.

After an elaborate discussion on brain development and function, sensory perceptions and scientific issues of aging are also discussed (chapter 29).

Overall, this book which contains 29 reviews, has been orchestrated in a beautiful sequence that imparts clear and conceptual knowledge in the field of cell and developmental biology. The beauty of the book lies in its organization, which results in a continuous flow of the subject. The book is practically error-free and will prove to be a wealth for biologists engaged in research in the area of cell and developmental biology.

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