14. Shatrugna, V., Kulkarni, B., Kumar, P. A., Rani, U. and Balakrishna, N., *Osteoporos. Int.*, 2005, **16**, 1827–1835.
15. Conigrave, A. D., Brown, E. M. and Rizzoli, R., *Annu. Rev. Nutr.*, 2008, **28**, 131–155.
16. Muthayya, S. *et al.*, *Eur. J. Clin. Nutr.*, 2006, **60**, 791–801.
17. Whincup, P. H. *et al.*, *JAMA*, 2008, **300**, 2886–2897.
18. Edison, R. J. *et al.*, *Pediatrics*, 2007, **120**, 723–733.
19. Woolette, L. A., *Annu. Rev. Nutr.*, 2008, **28**, 97–114.
20. Olson, C. M., *Annu. Rev. Nutr.*, 2008, **28**, 411–423.
21. Dali-Youcef, N., Lagouge, M., Froelich, S., Koehl, C., Schoonjans, K. and Auwerx, J., *Annu. Med.*, 2007, **39**, 335–345.
22. Delage, B. and Dashwood, R. H., *Annu. Rev. Nutr.*, 2008, **28**, 347–366.
23. Lillycrop, K. A. *et al.*, *Br. J. Nutr.*, 2007, **97**, 1064–1073.
24. Mato, J. M., Martinez-Chanter, M. L. and Shelly C. Lu, *Annu. Rev. Nutr.*, 2008, **28**, 273–293.
25. Innis, S. M. and Davidson, A. G. F., *Annu. Rev. Nutr.*, 2008, **28**, 55–72.

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Annual Review of Cell and Developmental Biology, 2008. Randy Schekman, Larry Goldstein and Janet Rossant (eds). Annual Reviews, 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 24. 652 pp. Price not mentioned.

The topics reviewed in this volume highlight recent trends in the fields of cell biology and developmental biology. Reviews on cell division, gene regulation and evolution, neuronal circuitry, cell–cell interactions, cell polarity and intracellular transport are likely to be of special interest to workers in the field. In the 'Perspective' chapter honouring his pioneering work on light microscopy, Shinya Inoué gives an engaging account of his early experiments on polarized light microscopy of dividing cells, which proved the existence and function of the mitotic spindle.

There has been a surge of interest in the past decade in understanding the intricacies of mitosis and meiosis, which has been made possible by the convergence of different conceptual approaches. The molecular mechanism and role of the cohesin complex in sister-chromatid cohesion is discussed by Koshland and coworkers. A key mechanism that drives mitosis to completion is the rapid degradation of certain mitotic proteins by the anaphase-promoting complex (a multisubunit E3 ubiquitin ligase), and Pesin and Orr-Weaver review the regulation of this process. Bhalla and Dernburg describe the various mechanisms of pairing and synapsis of homologous chromosomes during meiosis in different organisms. An important aspect of chromosome biology is the maintenance of large clusters of genes in a transcriptionally active or silent state. McStay and Grummt describe how active and silent rDNA clusters are distinguished by their pattern of DNA methylation, specific histone modifications and distinct nucleosome positions; furthermore, heterochromatin formation together with transcriptional silencing help maintain the structural integrity of nucleoli and genetic stability of rDNA repeats.

An enormous amount of information is now available on genome sequences, transcript profiles (transcriptomes) and protein profiles (proteomes) of a large number of organisms and of specific tissue or cell types. This has enabled scientists to use a 'systems biology' approach to understand biological systems as a whole. Methods to identify gene regulatory networks in plants from large datasets are highlighted by Long and colleagues. It is also now possible to examine the genetic basis and evolution of diverse aspects of cellular physiology that are seen across many species in nature. Different strategies adopted by placental mammals for evolution and diversification of genes involved in placental development such as appearance of new genes, use of alternative promoters and multigene families are described by Rawn and Cross. The evolutionary trends of coloration patterns are reviewed by Protas and Patel. An unusual aspect of animal development is the ability of some species to regenerate large parts of the body, and Brockes and Kumar deal with the evolutionary origins and functional aspects of this process. This review which includes important aspects of progenitor or stem cell functions during regeneration, as well as a review on spermatogomal stem cells by Oatley and Brinster are likely to be of interest to those in the field of stem cell biology. An inevitable outcome of normal growth and development is the process of ageing. Genome-wide comparisons between species suggest a significant conservation between longevity pathways in yeast and multicellular organisms. This newly emerging area of work is reviewed by Steinkraus and colleagues.

Colouration differences in cichlids. In the Great Lakes of East Africa, there are almost 2000 species of cichlids that have evolved relatively recently with a wide variety of colour patterns (images are courtesy of R. Roberts).

A central question in neurobiology that continues to dominate research in the field is how synaptic connections are established in the brain during development. Early models proposed the requirement for 'chemical tags' that allowed specific neuronal circuits to be established. Subsequently, a large number of recognition molecules have been discovered, and include those that confer properties of either adhesion or repulsion, both of which play crucial roles in specifying neural circuitry. Hattori and colleagues describe the properties of the Dscam family of cell adhesion molecules; alternative splicing at the *Drosophila* locus can potentially generate tens of thousands of Dscam1 isoforms and this exquisite diversity is essential for neural circuitry. During post-natal development, neural circuits are strengthened by sensory experiences that trigger specific signalling pathways between the nucleus and the synapse, as discussed in the review by Cohen and Greenberg. The formation of synapses occurs through long and intricate steps, and Jin and Garner highlight the molecular mechanisms of presynaptic differentiation.

Cell–cell and cell–matrix interactions are involved in the basic aspects of cell adhesion, locomotion and polarity, which are in turn crucial for cell differentiation and development. Takai and colleagues present a detailed account of the properties of nectins, which are key molecules involved in the formation of cell–cell

junctions, together with or independent of cadherins. Specialized cell–cell junctions, called immunological synapses, are formed by immune T cells when they interact with dendritic or target cells. Dustin has described the amoeboid locomotory events and signalling molecules involved in the formation of an immunological synapse. Cell polarity or asymmetry is initiated by an extrinsic polarizing signal that leads to polar distribution of signalling molecules through the action of Rho GTPases, cytoskeletal proteins and vesicular trafficking. Yang has focused his review on cell polarity mechanisms in plants and discusses how a conserved plant sub-family of Rho GTPases participates in cell polarity signalling in *Arabidopsis*. The polar localization of carrier proteins or receptors that bind to auxin, the major plant hormone, is of fundamental importance in plant development and growth. The mechanisms that are involved in the regulation of auxin and its directional intercellular transport during plant development are described in two reviews by Mockaitis and Estelle, and Kleine-Vehn and Friml respectively.

One of the most fascinating aspects of cell physiology is the process by which newly synthesized proteins are targeted to their correct destinations within the cell or secreted out of the cell. Classical secretory pathways involve protein transit through the endoplasmic reticulum (ER) and Golgi apparatus, followed by transport to the cell surface and these processes are mediated by vesicular carriers. Nickel and Seedorf discuss two pathways of unconventional protein targeting to plasma membranes. The first involves direct transport from the ER to the plasma membrane, independent of the Golgi, as observed in the case of yeast polytopic membrane protein, Ist2. The second pathway mediates the direct secretion of soluble proteins without transit through the ER or Golgi, as observed for some cytokines and growth factors. These proteins do not bear the post-translational modifications characteristic of the ER or Golgi compartments, and both vesicular and non-vesicular pathways have been proposed for their transport. Vesicular trafficking is also a key feature of molecular transport into the cell via the endocytic pathway. Pelkmans and co-workers discuss the complex regulation of the endocytic machinery by protein kinases, and present models for integrating these two components into general kinase signalling networks of the cell. The ER is also the site for specific protein folding and assembly, such as that of MHC class I molecules bound to peptides in immune cells. Peaper and Cresswell have described the steps required for the formation of stable MHC class I/peptide complexes in the ER prior to their egress to the cell surface. Interestingly, T lymphocytes also recognize foreign and self-lipids in association with non-classical MHC class I molecules known as CD1 proteins, and the mechanisms involved in this interaction are discussed by Silk and colleagues. Mamathambika and Bardwell review the folding pathways of disulphide-rich proteins under both *in vitro* and *in vivo* conditions.

A useful feature of this volume is that it covers work on various animal, plant and microbial systems and is thus attractive to readers from diverse fields in biology. An essential review series for all libraries and research groups in biology.

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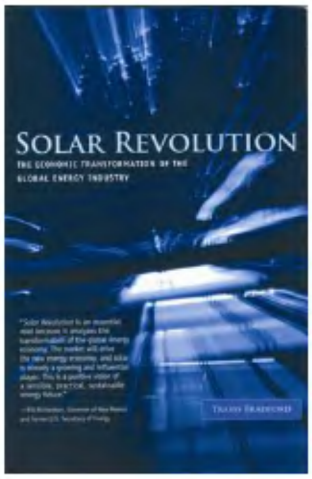

Solar Revolution: The Economic Transformation of the Global Energy Industry. Travis Bradford. The MIT Press, 55 Hayward Street, Cambridge, Massachusetts 02142, USA. 2006. 238 pp. Price: US$ 14.95/£9.95.

The book, in its entirety, is an attempt to provide an economic perceptive of the global energy transformations, with particular reference to solar energy. The book is organized in three parts comprising ten chapters. The chapters progressively build a case for the solar future, photovoltaic (PV) electricity in particular, with the final chapter presenting forecasts and trends indicating an increasingly PV-integrated energy scenario. The book is aimed at the general reader and is a well-stitched (research) literature-based composition, but more in consonance with trends in highly industrialized nations (Japan and Germany in particular).

The first chapter 'A new path on the horizon' is an overview of global energy trends and the likely widespread integration of solar energy in the modern world. The chapter justifies the need for an alternate energy setup given the volatility in current global energy production and consumption patterns, climate change, peaking in oil and gas reserves, and an aging (fossil fuel) energy infrastructure. While this has been explained well from an economic perspective on development, crucial transitions such as climate change, environmental instability and changing geo-political dominance (BRIC countries) have not been considered. The concept of energy has been lucidly explained in terms of (financial) income, savings and expenditure, besides concurring to the fact that societal choices are generally governed by immediacy rather than long-term foresight. While the stress is on a secure energy future for a wealthier world, there is little mention of the ever-pertinent inequitable distribution of wealth, deprivation and starvation, and exploitation in the developing nations (validating the Pareto principle). Besides economic stability, a sustainable world needs to address these issues as well. The chapter also provides a historic account to the electricity connected world. The author's mention that renewable energy is sun-based is untrue; tidal wave, nuclear and geo-thermal energy are non-solar renewable sources.

The second chapter 'A brief history of energy' ingeniously interprets the first law of thermodynamics to mechanisms by which living organisms harness, process and store energy, with evolution being characterized by increasing skill and precision in harnessing energy. The chapter traces the history of human civilization with its intimate relationship with energy. The impact (and dominance) of human civilization on earth has been