transition is among the landmark achievements. Lower-dimensional quantum gases are the subject of Chapters 23 (pancake or two-dimensional regime) and 24 (cigar or one-dimensional regime). Another interesting paradigm is the ultra cold dipolar gases such as atoms with magnetic moments or induced electric dipole moments. All of these topics are briefly covered in the last part of the book.

The great quality of this book is its high readability, and it can make an undergraduate student easily comfortable in advanced topics. Adequate introductions and explanations on the physical concepts rule out the need for referring to other books on related topics. This is a highly recommended book for graduate students working in the area of ultra cold atoms or degenerate quantum gases. Though the field has advanced rapidly into various horizons, the basic elements covered in the book are inevitable for any researcher in related topics. In the current edition, the authors have added very recent developments in cold atom research, making it timely for young researchers entering the field. The vast amount of topics covered in the book make it a lifelong companion. The material presented in the book can be covered as advanced courses in two semesters for doctoral or Master's students in universities/institutions. More and more books will appear in the field of cold atom research, but can never replace this one.

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Annual Review of Plant Biology, 2016. Sabeeha S. Merchant, Wilhelm Gruissem and Donald Ort (eds). Annual Reviews, 4139 E1 Camino Way, P. O. Box 10139, Palo Alto, California 94303-0139, USA. Vol. 67, vii + 729 pp. Price: US$ 109.

The advancements in cutting-edge technology and rigorous efforts from researchers have broadened almost every aspect of cell functions in plants. This trend is well captured by the *Annual Review of Plant Biology* (*ARPB*) this year, as always, with articles from renowned scientists on various aspects of plant biology associated with cellular energy dynamics, nutrient sensing, hormonal regulation and stress responses.

The book begins with historical perspectives on thioredoxin and redox regulation in bacteria and plants by Buchanan, whose career journey was almost synonymous with the field, along with many other colleagues of his time. He has described his early work on bacterial ferredoxin (Fdx) and CO_2 fixation, as well as work performed later on the identification of thioredoxins and redox regulation in plants. He has nicely illustrated the various aspects of CO_2 fixation and explained how the discovery of reverse citric acid cycle provides the basis for CO_2 fixation via multiple pathways.

Chloroplasts play a significant role in redox regulation, photorespiration and photosynthesis. The article by Peltier *et al.* describes the origin and evolution of NDH-complexes and their role in oxygenic photosynthesis. In cyanobacteria, the same cellular compartment is used for oxygenic photosynthesis and respiration, whereas these processes are compartmentalized in higher plants.

The article highlights various genetic and biochemical approaches, which helped to decipher the high degree of complexity of NDH-1s in cyanobacteria and chloroplasts. Chloroplasts, like mitochondria, are semi-autonomous organelles; they act as environmental sensors to regulate developmental cues and stress responses through retrograde signalling. In retrograde signalling, the expressions of nuclear genes is regulated by signals sent from chloroplasts to nucleus. The article by Xun *et al.* provides a mechanistic view of retrograde signalling not only in the context of organelles communication between chloroplast and nucleus, but also the interaction with hormone signalling and adaptive responses.

An important aspect presented well in this edition is nutrient sensing mechanism involving target of rapamycin (TOR) signalling. Despite the embryo lethal phenotype of *tor* null mutants, a wealth of information is available for TOR signalling in plants. This article describes not only the evolutionary conservation of TOR-signalling complexes but also reflects specific evolution that occurred in plants. TOR complexes in plants lack many components known in other eukaryotes and the known substrates such as S6K kinase and PP2A phosphatase-associated proteins are available in plants, but many others hitherto undiscovered. A comprehensive molecular view of TOR-regulated metabolic pathways such as nitrogen, starch and lipid metabolism among others is coherently presented. This is of particular interest to the present reviewers, as we are exploring signalling mechanisms in nutrient response and nutrient use efficiency, especially nitrogen and phosphorus[1,2].

Endocytosis dynamically regulates the membrane composition and cellular trafficking, besides mediating efficient communication between cell surface and interior in plants. Valencia *et al.* have provided updated information on clathrin-dependent and -independent endocytosis as well as regulating components in plants. The components of endosomal trafficking, including recycling of plasma membrane receptor proteins are regulated by stress factors and major phytohormones, and thus constitute an indispensable part of cell signalling. The function of FLS2 protein, a MAMP (microbe-associated molecular pattern) receptor, is endocytotically regulated upon binding of Flg22 ligand. Endocytosis regulates the receptor protein turnover and desensitizes the reactions. In contrast, the endocytosis of regulator of G-protein signalling (AtRGS1) allows sustained activation of G-protein signalling in *Arabidopsis*[3] and therefore provides a unique opportunity for the study of endosomal origin of signalling in plants.

Transcription factors (TFs) regulate development and environment-driven cellular homeostasis in plants. The advancement in computational biology tools led to the generation of huge datasets that govern complex transcriptional circuitry involved in spatio-temporal regulations of various genes and associated pathways. The article by Gaudinier and Brady deeply explores the mapping of transcriptional networks and also their biological implications. To delineate the complexity of TF networks, the authors have discussed both the transcription factor/gene centred approaches with specific examples of ethylene insensitive 3 (EIN3), speechless (SPCH) and vascular NAC domain 6 (VND6) as well as *ab initio* approaches involving DNase I hypersensitivity assays. They have explained how the miscellaneous information helps generate strong hypotheses of TF networks in the context of regulation of diverse biological processes in plants.

Like animals, plants also show organ-to-organ signal transmissions between the site of signal perception and the remote target tissues to maintain cellular homeostasis. Choi *et al.* have provided excellent information about the rapid long-range signalling pathways mediated by calcium (Ca^{2+}), reactive oxygen species (ROS) and electrical signal in plants subjected to various environmental cues. They have proposed that these signals constitute a signalling cassette, which couples a myriad of signalling networks. The long distance ROS-based signalling network is closely linked with systemic Ca^{2+} signalling. The importance of plasma membrane glutamate receptor-like (GLR) channels and the vacuolar two pore channel 1 (TPC1) is highlighted in the context of systemic signalling response.

In the context of biotechnological application, the articles by Yusibov *et al.* on 'antibody production in plants and green algae' and Kantar *et al.* on 'perennial grain and oilseed crops' have provided additional value to the readers. The cost-effective production of antibodies, including monoclonal antibodies have always been a challenging task. Plants and green algae could be potential sources not only to reduce the cost, but also improve the efficacy of antibodies. The authors have highlighted the positive as well as negative aspects of various post-translation modification(s) on the production of antibodies in plants. Over the decades, plant breeders have put a lot more effort to improve the yield of annual crops. Despite improved crops yield, the equilibrium between growing human population and food security remains a major challenge. The article by Kantar *et al.* starts with a glimpse of food security and importance of perennial crops, and provides the history as well as strategy for development of perennial crops with improved yields. In June 2017, Hu and his colleagues (Yunnan University, China) held an international event to showcase their successful development of several high-yielding perennial rice lines of *indica* and *japonica* for upland and lowland cultivation. With perennial buckwheat, wheat, sorghum, sunflower and legumes under development in USA, China and elsewhere, it seems that we will soon witness the contribution of perennial crops towards sustainable agriculture. They save labour, tillage, sowing, transplantation, soil carbon, greenhouse gas emissions from the soil and much more. Unfortunately, there is no research programme in India on perennial crops and it seems that we are not even thinking seriously in that direction, as monoculture and urea continue to dominate our policies and research activities. Unless we act swiftly, the era of globalization will not allow us to 'catch up' as we could do in the years of the Green Revolution.

In conclusion, *ARPB* 2016 has once again lived up to its reputation of providing timely reviews on topics of contemporary interest that are comprehensive, yet concise and easy-to-read, catering to the needs of students and scientists alike in the frontiers areas of plant biology.

1. Chakraborty, N. *et al.*, *Plant Mol. Biol.*, 2015, **89**(6), 559–576; doi: 10.1007/s11103-015-0374-2.
2. Chakraborty, N. *et al.*, *PLoS ONE*, 2015, **10**(2), e0117819; doi: 10.1371/journal.pone.0117819.
3. Urano, D. *et al.*, *Nature Cell Biol.*, 2012, **14**(10), 1079–1088; doi:10.1038/ncb2568.

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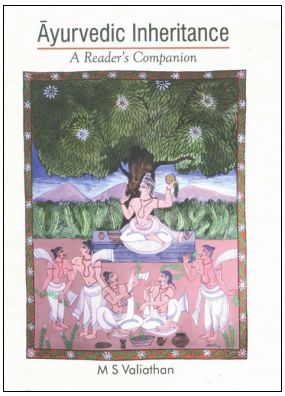

Āyurvedic Inheritance: A Reader's Companion. M. S. Valiathan. Manipal University Press (MUP), Behind Post Office, Manipal 576 104. 2017. 244 pages. Price: Rs 650. ISBN: 978-93-82460-58-9.

This book is indeed an engaging and deeply insightful reader's companion. Discerning students of history of medicine, particularly those interested in India's medical heritage can get a broad sweep of the evolution of Ayurveda from Vedic times to the 21st century. It will be a glimpse only because a single book can hardly be expected to provide the reader access to the various dimensions of Ayurveda elaborated in an estimated 20,000 medical manuscripts. This book would definitely be of value and interest to healthcare professionals who wish to develop a general appreciation of Ayurveda; they can certainly anticipate insights in an uncommonly refreshing and contemporary perspective. Such appreciation by medical professionals is perhaps important in the emerging scenario of complementary medicine, integrative healthcare and medical pluralism that is already evident in the health-seeking behaviour of citizens all over the world. The recently released National Health Policy has adopted medical pluralism as one of its governing principles.

The first chapter on the 'Roots of Ayurveda', traces the origins of this system of medicine. The author conveys the understanding explicit in Ayurvedic texts that the roots of Ayurveda lie in the observations of nature. The observations acknowledged in Ayurvedic literature have three sources. First, Caraka exhorts his students to learn from the health practices of communities living close to nature, viz. the forest dwellers and shepherds. Unfortunately today, the symbiotic relationship between the codified and folk traditions is deeply eroded. The second source is the behaviour of birds and insects like kites and bees, mammals and reptiles like pigs, mongoose and snakes, who heal themselves. References to such behaviour are mentioned in the hymns of the *Atharveda*. The third source is from the direct observations of thoughtful and intuitive persons, the rishis and munis who in meditative states of mind were perhaps 'one with nature'. Ayurveda thus did not emerge out of nothing. It emerged, as does all knowledge, from communion with life and nature. The book informs us that the first account of medicine is found in Vedic literature, particularly the *Atharveda*. This is followed by specific foundational texts which were regarded as upaangas or upavedas like *Susruta Samhita* and *Caraka Samhita*. Today only redacted versions of the original texts are available. The redacted version on *Susruta Samhita* was written by Nagarjuna in