

## The Structure and Function of Plastids.

Robert R. Wise and J. Kenneth Hooper (eds). *Advances in Photosynthesis and Respiration* (Series Editor, Govindjee), Springer, Dordrecht, The Netherlands. Vol. 23, 2006, 575 pp. Price: 267.50 Euros.

Conversion of light energy to useful chemical energy through the process of photosynthesis by tiny plastids is one of the most important events on this planet. This leads to the production of biomass and bioenergy, both needed for our expanding human population. Although plastids play the major role of light harvesting, they also carry on other non-photosynthetic functions, no less important than photosynthesis. This book provides adequate coverage of non-photosynthetic metabolism of plastids. Although different plastid forms exhibit some level of structural divergence, they possess a common architectural design; the plastids in eukaryotic cells look very different from the rest of the cellular organelles. In addition to the structure of the plastids, the book focuses on the various functions of different plastid forms.

The book includes 27 chapters, authored by 59 internationally reputed experts from 11 countries, in different fields of plastid structure and function. The related chapters are appropriately grouped under five well-defined sections. In the beginning, Brian Gunning, Friederike Koenig and Govindjee provide a nice historical dedication, highlighting significant contributions of pioneers of research that reveal the development of our knowledge in the field.

There are five chapters in section I (Plastid origin and development). Editors, Wise and Hooper, have written two introductory chapters for this book. Wise describes plastid forms in different plant groups and different tissue systems, their interconversion during plant development and some features of the chloroplast,

the major plastid form in green plants. Hooper, on the other hand, describes the origin and divergence of the plastids, chloroplast development and provides an overview of photosynthesis. This chapter also critically summarizes our recent knowledge in the area of synthesis of chlorophyll and its interaction with the thylakoid proteins, thylakoid biogenesis and regulation of gene expression during the development of the photosynthetic organelle. These two chapters are followed by an interesting one by Vothknecht and Soll that tells the story of the molecular mechanism of protein transport to chloroplast, variation in the structure of protein transport machinery and the evolutionary origin of transport components. The next chapter by Sato, deals with the origin, evolution and genomic background of plastid diversity. This is followed by a chapter on the mechanism of plastid division by Miyagishima and Kuroiwa.

Section II (The plastid genome and its interaction with nuclear genome), with five chapters, reveals the story of chloroplast biogenesis in the background of our recent knowledge of the molecular biology of chloroplast and interorganellar communication systems. This section begins with a chapter on the thylakoid proteome by van Wijk followed by Rochaix (Switzerland) on nucleus–chloroplast interactions. Subsequently, Cahoon, Komine and Stern describe the features of plastid transcription. The mechanism of signal transduction systems, which operates during communication between the nucleus and the plastids, has been discussed by Strand and Kleine and Chory. Section II ends with a chapter authored by Merchant on metalloprotein complex, transport of metal ions and their metabolisms.

Section III (Photosynthetic metabolisms in plastids) consists of four chapters that focus on carbon metabolism of the photosynthetic organelle. Dai, Hallberg and Eklund, and Schurmann provide an up-to-date knowledge of the light–dark regulation of chloroplast metabolism, with specific reference to the redox reactions associated with thylakoids and enzymes of the Calvin–Benson cycle. The chlororespiratory enzymes and their physiological role have been critically discussed by Nixon and Rich. Bartlett, Mitra and Moroney summarize the CO<sub>2</sub> concentrating mechanisms. In the last chapter of this section, the transport and partitioning of sugars are discussed by Weber.

Non-photosynthetic metabolism in plastids is covered in section IV that includes six chapters. Chapters on the synthesis of chlorophyll by Willows and on the carotenoids by Cuttriss *et al.* cover biosynthesis and regulation of these pigments associated with thylakoid membranes. The next four chapters review several specific aspects of chloroplast metabolism which have been ignored in many earlier published textbooks on plastids. Chapters on the synthesis of lipids by Dormann and amino acids in plastids by Lancien and Lea, and Azevedo focus on specific metabolic reactions, the enzymes involved in the synthesis of lipids and amino acids, and their interlink with other cellular metabolic pathways. The subsequent two chapters of this section deal with the specific role of sulphur and calcium in chloroplast metabolism. Pilon-Smits and Pilon describe the biosynthesis of sulphur compounds, their biosynthetic pathways and function in the plastids. Johnson, Shingles and Ettinger describe calcium fluxes across the plastid membrane and their light–dark regulation.

Section V, the last section of the book, comprises seven chapters that cover the area of plastid differentiation, its response to environmental factors, and the features of plastids harboured in animals. The first two chapters critically discuss the transformation of plastids during fruit ripening and leaf senescence. Bouvier and Camara describe the changes in fruit plastids with particular reference to carbohydrate and carotenoid metabolism. On the other hand, Krupinska highlights the dismantling of chloroplast structures and subsequent transformation of the photosynthetic organelle to gerontoplasts. Although a research monograph with details of molecular mechanism of transformation of chloroplast to gerontoplast has been published by U. C. Biswal, B. Biswal and M. K. Raval (*Chloroplast Biogenesis from Proplastid to Gerontoplast*, Springer, 2003), the present chapter updates the knowledge in this field. The next two chapters are unique in character. Rumpho, Dastoor and Manhart, and Lee summarize the characteristic feature of kleptoplasty, a process that helps some animals harbour functional chloroplasts from photosynthetic organisms; this makes the heterotrophic animals photoautotrophic! Funes and Perez-Martinez, Reyes-Prieto and Gonzalez-Halphen describe the apicoplast, another fascinating organelle believed to be derived from the chloroplast.

The nature of its plastid-like DNA, expression of the genome and its physiological role in apicomplex are discussed. Although our knowledge on these two fascinating plastids is still limited, this chapter provides a new dimension to photosynthesis research that needs further attention. The last three chapters describe the responses of the plastid to environmental factors like gravitation, light and oxygen. Palmieri and Kiss describe gravitation responses, Sato and Kadota describe light responses, whereas Logan discusses oxygen responses. Light-induced chloroplast movements mediated by different photoreceptors, and molecular mechanism of the receptors' action, have been reviewed earlier in advanced-level books on plant physiology.

This is the first book in the *Advances in Photosynthesis and Respiration* series (Series Editor, Govindjee) that comprehensively describes the complete story of plastids, including their diversity, origin, evolution, interconversion, different physiological functions, communicating systems with other cellular organelles and their responses to various environmental factors. The chapters covering these areas provide the most recent and relevant information.

A complete 'Table of contents' of this book is available at: <http://www.life.uiuc.edu/govindjee/References/Volume%2023%20By%20Chapter.htm>. Members of the International Society of Photosynthesis Research (website: <http://www.photosynthesisresearch.org/>) receive a 25% discount.

Although the book succeeds in providing a broad view of the structure and function of plastids to students and researchers in chemistry and biology, some of the chapters are specifically designed for advanced students in the fields of photosynthesis, molecular biology, biochemistry and plant physiology. Several chapters are suited for use as textbook materials for courses in plant physiology. We recommend this book to all major libraries.

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**Geology of Haryana and Delhi.** Jawahar Lal Thussu. Geological Society of India, P.B. No. 1922, Gavipuram PO, Bangalore 560 019. 2006, 191 pp. Price: Rs 250; US\$ 25.

The book under review provides useful compiled information with figures and tables on the subject with a reasonably priced tag. It is part of the ongoing activities of the present publisher to bring out the geology of various states in India as a textbook series.

The book consists of two parts which describes the geology of Haryana and Delhi respectively. Part I consists of 12 chapters in 145 pages. Chapter 1 provides the introductory aspects on Haryana, viz. history, location, climate, industries, geological investigation. Chapters 2 and 3 deal with the geomorphic landforms and geological history of Haryana respectively. It illustrates the region as a vast featureless Indo-Gangetic Plain separated by two contrasting litho-tectonic assemblages embedded in the oldest (Aravallis) and youngest (Himalaya) mountain in India. Chapter 4 describes in detail (in 50 pages – largest chapter in this book) the geology of Haryana. It demonstrates that geologically 95% of Haryana is covered by Quaternary sediments and the rest 5% by Proterozoic rocks. Chapter 5 highlights the palaeontological studies mainly in the Siwalik sediments. Chapter 6 provides the various geophysical techniques employed in Haryana for mineral exploration, basement topography evaluation, engineering–environmental projects, geothermal exploration and other investigations. Chapter 7 deals with mineral resources and their occurrence in Haryana. Tin mineral exploration at Tosham, Bhiwani District, Haryana besides other economic metallic and nonmetallic minerals at various places are also provided. Chapter 8 explains the various geoenvironment evaluations (natural and anthropogenic hazards) with respect to rapid urbanization and industrial growth in Haryana. Chapter 10 accounts for groundwater aspects of Haryana, viz. water chemistry (types of water, ratios, correlation) and origin of salinity (classification, cluster analysis, factor analysis). Chapter 11 deals with drainage migration in the Indo-Gangetic Plain of Punjab–Haryana. Chapter 12 exposes the various problems, gaps and remedial measures with respect to geology, basement configuration, geophysics, salinity, copper and iron mineralization,

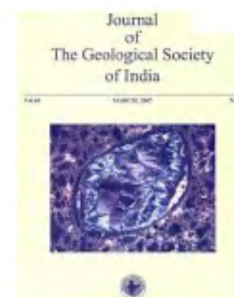
desertification, modification of landforms due to quarrying, urbanization, etc.

Part II of the book consists of nine chapters in 26 pages. It deals with the introduction, physiography, geological investigation, geology, mineral resources, groundwater, geophysical survey and geo-environment evaluation with possible remedies in Delhi.

The information in the book is based on work (unpublished in journals) carried out by mostly Officers of the Geological Survey of India (GSI) in the last few decades. The references cited include mostly unpublished GSI reports. However, as the book is based mostly on unpublished work, the cited references in the book are not generally available for the readers to seek clarification/any enhanced information on the subject matter. Thus the book does not provide the readers with complete information on the subject. A little more care by the author and editor would have helped to avoid spelling and grammatical errors. The book is recommended for the general public as well as specialists interested in the exploration and management of various earth resources, geo-environment monitoring and urban development in the Haryana and Delhi.

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**Special Issue on Kimberlite and Related Rocks of India.** Fareeduddin and M. S. Rao (Guest Editors). Geological Society of India, No. 63, 12th Cross, P.B. No. 1922, Gavipuram, Bangalore 560 019. Vol. 69, 2007, 261 pp. Price: Rs 20.

The special issue under review comprises papers presented at a Group Discussion on Kimberlites and Related Rocks of India organized by the Geological Society of