

Sulfur Metabolism in Phototrophic Organisms: Advances in Photosynthesis and Respiration Series. Rudiger Hell *et al.* (eds). Advances in Photosynthesis and Respiration (Series Editor, Govindjee), Springer, Dordrecht, The Netherlands, 2007. Vol. 27, 550 pp. Price: US\$ 404.

Sulphur plays a key role in life processes because of its characteristic chemistry. It can exist in various oxidation states, which can be readily changed. Its high reactivity in reduced form is another factor for its importance in several biochemical reactions. Due to this redox property, sulphur has drawn the attention of both biologists and chemists for a long time. The study of the relevance of sulphur in biological system was initially confined to limited areas, including its requirement in plant nutrition. Later on, its role as an electron donor and its participation in the electron transport system in photosynthetic organisms were investigated. Subsequently, the involvement of this element in a wide range of biological events was discovered and it was recognized to be of fundamental importance to life.

In recent years, the growth of our knowledge on multidimensional functions of the element, both in its inorganic and organic forms, has been remarkable. The current knowledge on sulphur biology has not only helped in understanding its role in biological systems but has provided clues to understand the nature and mechanism of several redox-mediated biochemical reactions involved in the electron transport system, metabolism of reactive oxygen species, signal transduction, defence and stress adaptation. An increasing number of original research papers and reviews published in the area demands an integrated story of sulphur biology. Govindjee (the AIPH Series Editor), has rightly decided on publica-

tion of a volume in the area of sulphur metabolism. This volume is edited by four outstanding authorities in the field of sulphur biology. The volume includes chapters on sulphur metabolism in phototrophic organisms, namely algae, bacteria and plants. The book has chapters in sulphur metabolism in general; uptake, distribution and transport, biosynthesis of sulphur-containing amino acids, chemistry of glutathione and sulphur-containing secondary metabolites. The volume contains some important articles on enzymes involved in sulphur oxidation–reduction, ecology of sulphur and its role in agrobiotechnology.

The book is unique in character in a sense that it touches almost all aspects of biological sciences with sulphur as the focal point, indicating universality of the element in biological systems.

There are 24 chapters in the book authored by 55 internationally reputed experts from different countries in Europe, USA and Asia in the field of sulphur metabolism in phototrophic organisms. Each chapter is specific in its own way. The chapters are appropriately grouped into five parts.

Part I contains seven chapters. The first chapter, authored by all the four editors of the volume, describes the fundamentals of sulphur chemistry with emphasis on structural features of biologically important organic and inorganic sulphur compounds, their relevance and metabolic role in phototrophic organisms. The editors have lucidly summarized the historical events starting from late 19th century till date; it emphasizes the expansion of our knowledge in the field of sulphur metabolism. The subsequent chapter by M. J. Hawkesford deals with sulphate uptake, transport, regulation and signal transduction pathway in cyanobacteria, algae and higher plants. The next five chapters focus on biosynthesis and metabolism of cysteine and methionine in phototrophic organisms. A general account of sulphate assimilation, phylogenetic analysis of the assimilation and characteristics of the enzymes involved in the process of sulphate assimilation is provided by S. Kopriva *et al.* On the other hand, R. Hell and M. Wirtz emphasize on the synthesis and the degradation of cysteine and regulation of its flux in plants. Similarly, the metabolism of methionine, its recycling and regulatory aspects of homeostasis are beautifully described by H. Hesse and R. Hoefgen.

C. Hernández-Sebastià *et al.* review molecular phylogeny and functional characterization of plant sulphotransferases, one of the important classes of enzymes in sulphur metabolism. Part I concludes with a chapter by L. Padmavathi *et al.* depicting a critical discussion on the assembly of iron–sulphur cluster and participation of cofactors in the assembly pathway.

Part II of the volume with six chapters reveals the story of biosynthesis and function of sulphur-containing metabolites, specifically in plants and algae. The first chapter highlights the molecular biology and regulatory network of plant sulphate uptake and its subsequent assimilation. The authors H. Takahashi and K. Saito, focus on the modulation of sulphate transport and metabolism by nitrogen, carbon and phytohormone signalling. A chapter by A. J. Meyer and T. Rausch, and another chapter by C. Benning *et al.* summarize the findings on biosynthesis, compartmentation and function of different sulphur containing compounds in plants followed by a chapter by M. Burow *et al.* on the role of sulphur-containing secondary metabolites in plant defence. The next chapter by R. Hänsch and R. R. Mendel emphasizes sulphite oxidation in plants with specific reference to biochemical properties, activities and location of plant sulphite oxidase. Part II concludes with a chapter by N. Shibagaki and A. Grossman on sulphur metabolism in algae that covers topics like global sulphur cycle, novel aspects of biosynthesis and function of volatile metabolites synthesized by marine algae, and adaptation of algae to changing sulphur environment.

There are five chapters on sulphur metabolism specifically in phototrophic prokaryotes in Part III of the volume. The first chapter by J. F. Imhoff describes the characteristics and types of anoxygenic phototrophic bacteria followed by a chapter by C. Dahl, one of the editors of the volume, who has discussed the role of inorganic sulphur compounds as electron donors in purple sulphur bacteria. On the other hand, the next two chapters primarily review the oxidation of sulphur compounds and the enzymes involved in cyanobacteria and green sulphur bacteria. Both the chapters focus on the current development in our understanding of the enzymes involved in the oxidation of sulphur compounds with molecular biology approach.

Y. Shahak and G. Hauska have specifically discussed several physiological and biochemical aspects of sulphide-quinone oxidoreductase, a flavoenzyme that belongs to the large disulphide oxidoreductase family. The chapter provides a critical discussion of the phylogenetic scenario for the descent of the enzyme from a common ancestor. With a more or less similar approach, N. Frigaard and D. A. Bryant summarize the available genome sequence data of few strains of green sulphur bacteria and involvement of genes for the oxidation of sulphur compounds. Part III concludes with a chapter by L. Chan *et al.* highlighting genomic and proteomic studies on sulphur oxidation in *Chlorobium* species.

Part IV comprises of four chapters emphasizing on the ecology of phototrophic sulphur bacteria, sulphur metabolism and possible biotechnological applications and environmental management of phototrophic organisms. Habitats, natural populations and biochemical significance of phototrophic sulphur bacteria are well reviewed by J. Overmann in the first chapter. Acquisition of sulphur in aquatic ecosystem, its subsequent assimilation and sulphur availability as a factor in the evolution, succession and distribution of algae are reviewed by M. Giordano, *et al.* in another chapter. The next chapter by F. Zhao *et al.* focuses on the role of sulphur in plant productivity, sulphur nutrition in the agroecosystem and food quality. On the other hand, T. J. Hurse *et al.* describe the criteria for the selection of suitable phototrophic bacteria for their application for biological sulphide removal during wastewater management in the last chapter.

Part V, the last part of the volume, contains two chapters, one by Alexander Prange *et al.* describing a specific method, namely X-ray absorption spectroscopy as a tool for the detection of sulphur compounds in phototrophic organisms and the other by Meyer and Fricker that highlights the specific technique, namely thiol-based redox imaging in plants.

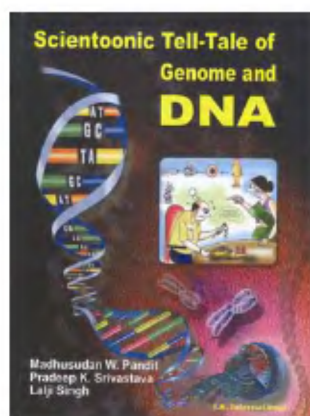
The book in general provides a comprehensive and integrative knowledge of sulphur biology in phototrophic organisms. Most of the chapters in the book are interdisciplinary in character dealing with physiology, biochemistry and molecular biology of sulphur and sulphur-related compounds. The book is, therefore, useful for students and researchers in chemistry, plant and microbial physiology, and molecular biology. It is spe-

cially designed for advanced level graduate students working in the area of photosynthesis and bacterial bioenergetics. An insight into the molecular biology, genomics and proteomics of sulphur biology as highlighted in some of the chapters provides clues for genetic manipulation to generate transgenics with useful traits. The book, therefore, is useful for students working in agro-biotechnology. Several chapters are written with fundamentals of sulphur chemistry and biology in simple language that possibly could be used as textbook material for graduate-level students.

Sulphur compounds play a very crucial role during stress adaptation in phototrophic organisms. Currently many researchers are working on thiol-based stress signalling in green plants in India and elsewhere. Although the concept of stress signalling is highlighted in some of the chapters, the book should have included, in my opinion, one or two chapters specifically in this area. However, this does not detract from the knowledge this book provides us. I strongly recommend this book to libraries of universities and research institutions around the world.

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Scientoonic Tell-Tale of Genome and DNA. M. W. Pandit, P. K. Srivastava and Lalji Singh. I. K. International Publishing House Pvt Ltd, S-25, Green Park Extension, Uphaar Cinema Market, New Delhi 110 016. 2009. 171 pp. Price: Rs 995.

When I read the title and agreed to do a review of this book, I had visions of a book on the lines of a set of book(let)s

from Cold Spring Harbor Laboratory Press published in the nineties. These were called *The Cartoon Guide to Genetics*, *Amazing Schemes Within Your Genes*, *Cells Are Us*, *DNA is Here to Stay*, etc. Cartoons in these books explained scientific concepts with clarity and were meant for the young student as well as for the older layman.

This 'scientoonic tell tale' is a set of casual cartoons of insipid humour with no scientific value, not inspiring nor educational. There is only the pretence of educating ordinary folks... nothing in the text is useful really to the educated layman, although there may be some stray archival information and the cartoons have really nothing to do with the text.

Most laymen interested in being scientifically informed are better off reading the regular Thursday columns in *The Hindu* that present hard scientific information well.

The quality and content of this book is not worth a specific review of what it describes in different 'sections', since the matter inside is considerably trivial and the language of presentation is not redeeming.

In the acknowledgements it is mentioned that 'Several websites have provided us with significant information and thanking individual creators is neither practical nor possible'. The authors seem to dismiss in this one line the fact that they need to acknowledge clearly their source of figures. While it was possible for them to sift through and borrow enough pictures from sites, they do not find it easy to credit their source. Could they not have put the urls to the picture titles as a way of acknowledgement? Someone is bound to call this plagiarism, if he/she prefers to use technical language. Finally, the content or quality of the final product is no way worth the price. I do not recommend this material for any type of readership.

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