customize their energy portfolios, by choosing the precise mix of CCS, renewable and nuclear technology to decarbonise the power sector, to suit their resource position, and biophysical and socioeconomic environments. Considering that safe sequestration of carbon dioxide and radioactive wastes requires a good understanding of the complex interactions between the pressurized fluids and porous rock, the author emphasizes the need for a great deal of basic and applied research to underpin the new technologies.

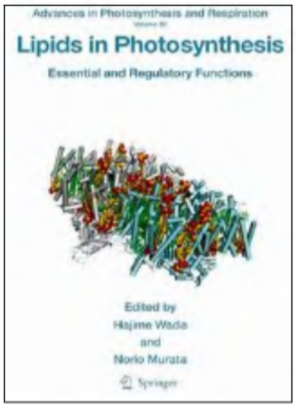
The octogenarian author has done a commendable job in bringing together a variety of techno-socio-economic considerations to focus on energy portfolios. This is a good reference book for energy researchers, university students and policy makers across the globe. Consolidated references provided at the end of each section will help researchers. Lucid presentation of these diverse concepts is the hallmark of the author's blend of vast knowledge and experience. I read this publication twice and I am sure many readers will experience the same temptation of referring to this practical publication many times. Policy makers especially from developing countries should take serious note of the author's suggestion of the need for decoupling economic growth from energy demand, reduction in the use of fossil fuels and improvements in the energy economy through efficient use of end use energy, greater use of renewable sources of energy, CCS on a massive scale and development of carbon free transport.


1. Ramachandra, T. V., *Renew. Sustain. Energy Rev.*, 2009, **13**, 285–317.
2. Ramachandra, T. V., *Renew. Sustain. Energy Rev.*, 2010, **14**(2), 642–654.
3. *World Energy Outlook*, International Energy Agency, Paris, 2007.
4. Ramachandra, T. V., Mahapatra, D. M., Karthick, B. and Gordon, R., *Ind. Eng. Chem. Res.*, 2009, **48**(19), Complex Materials II special issue.



T. V. RAMACHANDRA

*Energy and Wetlands Research Group,*
*Centre for Ecological Sciences,*
*Centre for Sustainable Technologies,*
*Centre for Infrastructure, Sustainable Transportation and Urban Planning [CiSTUP]*
*Indian Institute of Science,*
*Bangalore 560 012, India*
*e-mail: cestvr@ces.iisc.ernet.in*


**Lipids in Photosynthesis: Essential and Regulatory Functions (Advances in Photosynthesis and Respiration: Volume 30).** Hajime Wada and Norio Murata (eds). Springer, The Netherlands. 2009. 474 pp. Price: US$ 279.

An earlier volume on *Lipids in Photosynthesis: Structure, Function and Genetics*, edited by Paul A. Siegenthaler and Norio Murata, volume 6 of the *Advances in Photosynthesis and Respiration* (AIPH) series was published in 1998 (book review: *Current Science*, 1999, **77**, 457–458) and it was received very well by both experts and researchers working on photosynthesis and related fields.

The current volume 30 of the AIPH series *Lipids in Photosynthesis: Essential and Regulatory Functions*, edited by Hajime Wada (University of Tokyo, Japan) and Norio Murata (National Institute for Basic Biology, Japan) gives a uniquely new outlook and approach to photosynthesis research in lipids. As the two eminent editors state in their preface, in the past 10 years, great many advances and leaps forward have been made in areas involving genetics and genomic research, and the elucidation of the role of individual lipid species in regulation of photosynthesis. This new volume is thus new in content and concepts on the role of lipids in the regulation of photosynthetic processes and the importance of photosynthesis in regulating biosynthesis of both membrane and storage lipids. The book contains 20 'in depth' chapters contributed by 52 internationally known experts in the field. The following website provides a complete table of contents, including the front matter and the index of this book: http://www.springerlink.com/content/978-90-481-2862-4.

The introductory chapter (chapter 1), authored by the two editors who contributed immensely to the progress in the theme of the volume, tells us about the recent developments in techniques and provides information and knowledge in the field, namely genome – sequences mutagenesis and transgenics, revealing genes in lipid biosynthesis, crystallographic analyses of soluble and membrane bound proteins and also on the development of techniques in quantifying membrane fluidity, membrane protein trafficking and the role of membranes in stress signal perceptions.

The next five chapters (2–6) deal mostly with the biosynthesis of fatty acids, chloroplasts and mitochondria lipids, plant sphingolipids and, interestingly, with lipids in algae, mosses and lichens. The following three chapters (7–9) discuss molecular genetics of lipid biosynthesis, regulation of lipid synthesis in the model green alga *Chlamydomonas*, regulation in the lipid biosynthesis in cyanobacteria, besides the nitrogen fixing heterocyst envelope glycolipids and their biosynthesis.

Subsequent chapters (10–13) provide details on lipids in the structure and function of photosystem I (PSI) and photosystem II (PSII) as well as Cyt $b_6/f$ complexes of photosynthesis. The lipid filled cavities in PSII and Cyt $b_6/f$ complex are vital in protons and electrons flow in quinine/quinol exchange mechanisms. Also, the high lipid contents in PSII interior facilitates the ability of diffusion of oxygen from oxygen evolving Mn clusters. The key role of phosphatidyl glycerol in photosynthetic and non-photosynthetic function, importance of glycolipid in oxygenic photosynthesis, role of glycolipids in photosynthesis, and role of lipids in the lateral mobility of membrane components and phase transition features are brought out. The next chapter (14) gives a fascinating description of the architecture of thylakoid membranes, their 3D organization and their evolutionary hierarchy. Chapter 15 discusses the involvement of membrane fluidity in gene expression and stress tolerance especially cold, and more importantly in signal perception. The chapter 16 tells the story of lipid homeostasis and the nature of galactolipids as well as the importance of galactolipid precursor in signalling lipid biosynthetic pathways. Further, this chapter describes the molecular mechanisms of lipid trafficking involving glycerolipids.

Chapter17 has an interesting exposition of the regulatory roles of unsaturated fatty acids in photosynthesis and the essential role of polyunsaturated fatty acids in protecting plants from photodamage. The subsequent chapter 18 describes the functions of oxylipins and activated oxygen species mediated lipid peroxidation. Chapter 19 gives an account of the biosynthesis of acyl lipids (seed lipids), sterols, carotenoids and tochromonols. Seed lipids are of relevance in ongoing research as these aspects would promote conversion of plant lipids to biofuel and biomass to liquid. The last chapter 20 gives details on the complexities involved in large scale lipid analysis in cells and organisms as well as in mass spectrometric based lipid profiling.

In summary, this volume of AIPH is useful in that it addresses a wide spectrum of readers as well as the researchers in the field, just as volume 6 did. It would be an attractive addition to the graduate student and research scholar's desks. It contains many beautiful illustrative colour plates. Govindjee, the founding series editor of the AIPH volumes, suggests that this book *Lipids in Photosynthesis* is an outstanding and much needed book, and we the reviewers agree with him in that this book is definitely very timely and much needed for plant scientists, microbiologists and agricultural scientists. The book brings out clearly the message that lipids in photosynthetic apparatus are not mute compositional partners, but vivid and vibrant participants in the essential and regulatory functions in the bioenergetics and biosynthetic processes. All the contributors and the editors deserve greetings for bringing out the current and cutting-edge research information on the topics covered in this book in a precise manner, and for providing recent literature to the readers. However, the prohibiting cost of the book would deter many students from procuring a personal copy unless Springer brings out a low cost paper back edition soon. We recommend this book to all university and research libraries around the world. It is a value added book of the AIPH series.

PRASANNA MOHANTY[1,*]
JOGADHENU SYAMSUNDAR PRAKASH[2]

[1]*Regional Plant Resource Centre, Bhubaneswar 751 015, India*
[2]*Department of Plant Sciences, University of Hyderabad, P.O. Central University, Hyderabad 500 046, India*
**e-mail: photosis@rediffmail.com*