

*Announcement***Advances in Photosynthesis and Respiration: Focus on Plant Respiration**

I am delighted to announce the publication, in the *Advances in Photosynthesis and Respiration* (AIPH) series, of two books that focus on plant respiration. The first book (Volume 17) '*Plant Mitochondria: From Genome to Function*' has been edited by David A. Day, A. Harvey Millar and James Whelan. The second book (Volume 18) '*Plant Respiration: from Cell to Ecosystem*.' has been edited by Hans Lambers and Miquel Ribas-Carbo. These books follow two other respiration books (both edited by Davide Zannoni) that deal with '*Respiration in Bacteria and Archaea*.' The following is a list of 20 AIPH volumes.

**Published AIPH volumes**

1. *Molecular Biology of Cyanobacteria* (Donald A. Bryant, editor, 1994);
2. *Anoxygenic Photosynthetic Bacteria* (Robert E. Blankenship, Michael T. Madigan and Carl E. Bauer, editors, 1995);
3. *Biophysical Techniques in Photosynthesis* (Jan Amesz and Arnold J. Hoff, editors, 1996);
4. *Oxygenic Photosynthesis: The Light Reactions* (Donald R. Ort and Charles F. Yocum, editors, 1996);
5. *Photosynthesis and the Environment* (Neil R. Baker, editor, 1996);
6. *Lipids in Photosynthesis: Structure, Function and Genetics* (Paul-André Siegenthaler and Norio Murata, editors, 1998);
7. *The Molecular Biology of Chloroplasts and Mitochondria in Chlamydomonas* (Jean David Rochaix, Michel Goldschmidt-Clermont and Sabeeha Merchant, editors, 1998);
8. *The Photochemistry of Carotenoids* (Harry A. Frank, Andrew J. Young, George Britton and Richard J. Cogdell, editors, 1999);
9. *Photosynthesis: Physiology and Metabolism* (Richard C. Leegood, Thomas D. Sharkey and Susanne von Caemmerer, editors, 2000);
10. *Photosynthesis: Photobiochemistry and Photo-biophysics* (Bacon Ke, author, 2001);
11. *Regulation of Photosynthesis* (Eva-Mari Aro and Bertil Andersson, editors, 2001);
12. *Photosynthetic Nitrogen Assimilation and Associated Carbon and Respiratory Metabolism* (Christine Foyer and Graham Noctor, editors, 2002);
13. *Light Harvesting Antennas* (Beverley Green and William Parson, editors, 2003);
14. *Photosynthesis in Algae* (Anthony Larkum, Susan Douglas and John Raven, editors, 2003);
15. *Respiration in Archaea and Bacteria: Diversity of Prokaryotic Electron Transport Carriers* (Davide Zannoni, editor, 2004);
16. *Respiration in Archaea and Bacteria 2 : Diversity of Prokaryotic Respiratory Systems* (Davide Zannoni, editor, 2004);
17. *Plant Mitochondria: From Genome to Function* (David A. Day, A. Harvey Millar and James Whelan, editors, 2004);
18. *Plant Respiration: From Cell to Ecosystem* (Hans Lambers and Miquel Ribas-Carbo, editors, 2005);
19. *Chlorophyll a Fluorescence: a Signature of Photosynthesis* (George C. Papageorgiou and Govindjee, editors, 2004); and
20. *Discoveries in Photosynthesis* (Govindjee, J. Thomas Beatty, Howard Gest and John Allen editors, to be released in 2005).

The readers are requested to go to <http://www.springeronline.com> and search for the Book Series 'Advances in Photosynthesis and Respiration' for further information and to order these books. Please note that the members of the International Society of Photosynthesis Research, ISPR (<http://www.photosynthesisresearch.org/>) and authors receive special discounts. Please contact the Publisher ([noeline.gibson@springer-sbm.com](mailto:noeline.gibson@springer-sbm.com)) for further details.

**Plant Mitochondria: from Genome to Function,  
Volume 17**

The book, *Plant Mitochondria: from Genome to Function*, edited by three outstanding authorities (David A. Day, A. Harvey Millar and James Whelan), provides an up-to-date and in-depth review of the molecular aspects of plant mitochondrial function, with a focus on gene regulation and protein composition. Each chapter has multiple authors, usually from different laboratories and countries, ensuring a balanced and comprehensive review of the different aspects of mitochondrial molecular biology. The three distinguished editors are from a very active mitochondrial research group established at the University of Western Australia and have used their complementary knowledge of biochemistry, molecular genetics and proteomics to compile an exciting view of cutting-edge research on plant mitochondria.

The two main themes running through the book are the interconnection between gene regulation and protein function, and the integration of mitochondria with other components of plant cells. The book is divided into the following 14 chapters (names of authors are given within brackets).

- Chapter 1.* Mitochondrial structure and function (D.A. Day)
- Chapter 2.* Mitochondrial morphology, dynamics and inheritance (D.C. Logan)
- Chapter 3.* Protein targeting and import (J. Whelan and E. Schleiff)
- Chapter 4.* Gene expression in higher plant mitochondria (D. Gagliardi and J.M. Gualberto)
- Chapter 5.* Mitochondria–nucleus interactions: Evidence for mitochondrial retrograde communication in plant cells (D.M. Rhoads and G.C. Vanlerberghe)
- Chapter 6.* Plant mitochondrial genome evolution and gene transfer to the nucleus (K.L. Adams and D.O. Daley)
- Chapter 7.* Mitochondrial mutations in plants (K.J. Newton, S. Gabay-Laughnan and R. De Paepe)
- Chapter 8.* Proteome analyses for characterization of plant mitochondria (H.-P. Braun and A.H. Millar)
- Chapter 9.* Alternative mitochondrial electron transport proteins in higher plants (P.M. Finnegan, K.M. Soole and A.L. Umbach)

*Chapter 10.* Regulation of electron transport in respiratory chain of plant mitochondria (F.E. Sluse and W.J. Kiewicz)

*Chapter 11.* Plant mitochondrial carriers (F. Palmieri, N. Picault, L. Palmieri and M. Hodges)

*Chapter 12.* The uniqueness of tetrahydrofolate synthesis and one-carbon metabolism in plants (S. Ravanel, R. Douce and F. Rebeille).

*Chapter 13.* Photorespiration: Photosynthesis in the mitochondria (D.J. Oliver and P. Gardestrom); and

*Chapter 14.* Roles for reactive oxygen species and antioxidants in plant mitochondria (L.J. Sweetlove and C.H. Foyer).

**Plant Respiration: from Cell to Ecosystem,  
Volume 18**

This book has also been edited by two outstanding authorities: Hans Lambers (of the University of Western Australia, Australia) and Miquel Ribas-Carbo (Universitat de les Illes Balears, Spain). The subject of the book, as provided by our distinguished editors, is: ‘As in all living organisms, respiration is essential to provide metabolic energy and carbon skeletons for growth and maintenance of plants. As such, respiration is an essential component of a plant’s carbon budget. Depending on species and environmental conditions, it consumes 25–75% of all the carbohydrates produced in photosynthesis – even more at extremely slow growth rates. Respiration in plants can also proceed in a manner that produces neither metabolic energy nor carbon skeletons, but heat. This type of respiration involves the cyanide-resistant, alternative oxidase; it is unique to plants, and resides in the mitochondria. The activity of this alternative pathway can be measured based on a difference in fractionation of oxygen isotopes between the cytochrome and the alternative oxidase. Heat production is important in some flowers to attract pollinators; however, the alternative oxidase also plays a major role in leaves and roots of most plants. A common thread throughout this volume is to link respiration, including alternative oxidase activity, to plant functioning in different environments.’

'Plant Respiration: from Cells to Ecosystems' is divided into the following 13 chapters (names of authors are given within brackets).

- Chapter 1.* Regulation of respiration *in vivo* (H. Lambers, S.A. Robinson and M. Ribas-Carbo)  
*Chapter 2.* Calorespiratometry in plant biology (L.D. Hansen, R.S. Criddle and B.N. Smith)  
*Chapter 3.* The application of the oxygen technique to assess respiratory pathway partitioning (M. Ribas-Carbo, S.A. Robinson and L. Giles)  
*Chapter 4.* Respiration in photosynthetic cells (V. Hurry, A.U. Igamberdiev, O. Keerberg, T. Parnik, O.K. Atkin, J. Zaragoza-Castells and P. Gardestrom)  
*Chapter 5.* Effects of light intensity and carbohydrate status on leaf and root respiration (K. Noguchi)  
*Chapter 6.* The Effects of Water Stress on Plant Respiration (J. Flexas, J. Galmés, M. Ribas-Carbo and H. Medrano)  
*Chapter 7.* Responses of plants to changes in temperature (O.K. Atkin and D. Bruhn)  
*Chapter 8.* Oxygen transport, respiration and anaerobic carbohydrate catabolism in roots in flooded soils (T.D. Colmer and H. Greenway)  
*Chapter 9.* Effects of soil pH and aluminum on plant respiration (R. Minocha and S.C. Minocha)  
*Chapter 10.* Understanding of plant respiration: Separation of respiratory components versus a process-based approach (T.J. Bouma)  
*Chapter 11.* Respiratory and carbon costs of symbiotic nitrogen fixation in legumes (F.R. Minchin and J.F. Witty)  
*Chapter 12.* Respiratory costs of mycorrhizal associations (D.R. Bryla and D.M. Eissenstat); and  
*Chapter 13.* Integrated effects of atmospheric CO<sub>2</sub> concentration on plant and ecosystem respiration (M.A. Gonzalez and L. Taneva).

Both books are for the use of advanced undergraduates, graduates, postgraduates, and beginning researchers in the areas of plant and agricultural sciences, plant physiology, plant ecology, bioenergetics, cellular biology and integrative biology.

### **Plant Respiration: a Bit of Early History**

It is a noble employment to rescue from oblivion those who deserve to be remembered – Pliny the Younger, *Letters V*.

### *A 1927 paper by Robert Emerson on Chlorella respiration*

Robert Emerson, who did his PhD work in the laboratory of Otto Warburg, and was later my advisor during 1956–1959, had published in 1927 the following historical paper: Emerson R. (1927) The effect of certain respiratory inhibitors on the respiration of *Chlorella*. *Journal of General Physiology*, Volume x, pp. 469–477. Here, Emerson compared the effects of respiratory inhibitors, including HCN and H<sub>2</sub>S, on the green alga *Chlorella*. What Emerson showed in this 1927 paper is that 10<sup>-4</sup> M HCN (and H<sub>2</sub>S) *stimulated*, not inhibited, respiration in *Chlorella*. However, under 1% glucose (heterotrophic condition), respiration was 4 times faster, but inhibited by 50% by either H<sub>2</sub>S or HCN. All these effects were fully reversible.

### *Early plant respiration books*

I mention here the books by F.F. Blackman; W. Stiles and W. Leach; and W.O. James. Although we may not remember the old, the new is built upon the old directly or indirectly, knowingly or unknowingly. On the personal side, my own training in Plant Respiration, during 1952–1956 at the University of Allahabad, was under Shri Ranjan, who had been a student of Felix Frost Blackman. Blackman studied both respiration and photosynthesis. G.E. Briggs (of Cambridge, UK) has published a book on the work of Blackman after his death (late F.F. Blackman (1954) *Analytic Studies in Plant Respiration*, Cambridge, at the University Press). A great deal of the experimental work in Blackman's laboratory was done by one of his students from India, P. Parija. Most of this work was done in the late 1920s at Cambridge. Regarding the importance of respiration, I quote Blackman and Parija (1928): 'Of all protoplasmic functions, the one which is, by tradition, most closely linked with our conception of vitality is the function for which the name of respiration has been accepted.' In 1932, the year I was born, Walter Stiles and William Leach wrote their small (124 pages) book 'Respiration in Plants', London: Methuen. The theories of two Nobel-laureates Otto H. Warburg and Heinrich O. Wieland on the oxidation–reduction and the enzymatic nature of respiration, both under aerobic and anaerobic conditions, were discussed in this book. It was the

only book I had read during my student days. In 1953, 1 year after I obtained my BSc degree, a new book was published (W.O. James (1952) *Plant Respiration*. Oxford, at the Clarendon Press. It is this book that I studied after I had obtained my M.Sc. degree. Again, on the personal side, I was thrilled to note that James discussed (see p. 99 and 100) unpublished work of my M.Sc. Professor (Ranjan); this work was done while Ranjan was in Blackman's laboratory. It was a 282 page thorough and modern book. James also related respiration, although very briefly, to photosynthesis and commented: 'Possible interactions with respiration have been the bugbear of photosynthetic measurements since their beginning.' He did mention the related work of Bessel Kok; Robert Emerson; Jack Myers James Franck, Hans Gaffron, Melvin Calvin and Andy Benson, among others. A 19-page bibliography was very helpful to me in finding the necessary knowledge on respiration at that time. The advancement in the field of *respiration*, made during the last 50 years, is really remarkable and exciting. To understand the historical evolution of research in 'plant respiration', I encourage the readers to consult the following three books: (1) Harry Beevers (1961) *Respiratory Metabolism in Plants* (Row, Peterson and Company, Evanston, Illinois); (2) Helgi Opik (1980) *The Respiration of Higher Plants*. London: E. Arnold; and (3) Roland Douce and David A. Day (eds) (1985) *Higher Plant Cell Respiration*. *Encyclopedia of Plant Physiology, New Series, Volume 18*, Springer-Verlag, Berlin.

The two AIPH books on 'Plant Respiration', edited by David Day, A. Harvey Millar and James Whelan (Volume 17) and by Hans Lambers and Miquel Ribas-Carbo (Volume 18), are fascinating and provide us with a thorough and current understanding of this important area of plant biology.

### The scope of the series

'Advances in Photosynthesis and Respiration' is a book series that provides, at regular intervals, a comprehensive and state-of-the-art account of research in various areas of photosynthesis and respiration. Photosynthesis is the process by which higher plants, algae, and certain species of bacteria transform and store solar energy in the

form of energy-rich organic molecules. These compounds are in turn used as the energy source for all growth and reproduction in these and almost all other organisms. As such, virtually all life on the planet ultimately depends on photosynthetic energy conversion. Respiration, which occurs in mitochondria and in bacterial membranes, utilizes energy present in organic molecules to fuel a wide range of metabolic reactions critical for cell growth and development. In addition, many photosynthetic organisms engage in energetically wasteful *photorespiration* that begins in the chloroplast with an oxygenation reaction catalyzed by the same enzyme responsible for capturing carbon dioxide in photosynthesis. This series of books spans topics from physics to agronomy and medicine, from femtosecond ( $10^{-15}$  s) processes to season-long production, from the photophysics of reaction centers, through the electrochemistry of intermediate electron transfer, to the physiology of whole organisms, and from X-ray crystallography of proteins to the morphology of organelles and intact organisms. The intent of the series is to offer beginning researchers, advanced undergraduate students, graduate students, and even research specialists, a comprehensive, up-to-date picture of the remarkable advances across the full scope of research on bioenergetics and carbon metabolism.

### Future AIPH books

I encourage students, faculty and librarians to watch for the publication of the following 8 books (Volumes 21–28; not necessarily arranged in the order of future appearance):

- *Photoprotection, Photoinhibition, Gene Regulation and Environment* (Barbara Demmig-Adams, William W. Adams III and Autar Mattoo, editors);
- *Photosystem II: The Light-Driven Water: Plastoquinone Oxidoreductase* (Thomas J. Wydrzynski and Kimiyuki Satoh, editors);
- *The Structure and Function of Plastids* (Robert R. Wise and J. Kenneth Hooper, editors);
- *Chlorophylls and Bacteriochlorophylls: Biochemistry, Biophysics and Biological Function* (Bernhard Grimm, Robert J. Porra, Wolfhart Rüdiger and Hugo Scheer, editors);

- *Photosystem I: The Light-Driven Plastocyanin: Ferredoxin Oxidoreductase* (John H. Golbeck, editor);
- *Biophysical Techniques in Photosynthesis Research II* (Thijs J. Aartsma and Jörg Matysik, editors)
- *Photosynthesis: A Comprehensive Treatise; Biochemistry, Biophysics Physiology and Molecular Biology, Part 1* (Julian Eaton-Rye and Baishnab Tripathy, editors);
- *Photosynthesis: A Comprehensive Treatise; Biochemistry, Biophysics Physiology and Molecular Biology, Part 2* (Baishnab Tripathy and Julian Eaton-Rye, editors); and
- *Sulfur Metabolism in Photosynthetic Organisms* (David Isnaff, Thomas Leustek, Ruediger Hell and Christine Dahl, editors)

In addition to these contracted books, we are already in touch with prospective Editors for the following books:

- Molecular Biology of Cyanobacteria, Part 2
- Protonation and ATP Synthases
- Genomics and Proteomics
- Protein Complexes of Respiration and Photosynthesis
- The Cytochromes
- Molecular Biology of Stress in Plants
- Global Issues in Photosynthesis and Respiration, 2 Volumes

Another book that we would like to publish is: Artificial Photosynthesis, and Global Aspects of Photosynthesis and Respiration. Readers are requested to send their suggestions and future volumes (topics, names of future editors, and of future authors) to me by e-mail (gov@uiuc.edu) or fax (+1-217-244-7246).

In view of the interdisciplinary character of research in photosynthesis and respiration, it is my earnest hope that this series of books will be used in educating students and researchers not only in Plant Sciences, Molecular and Cell Biology, Integrative Biology, Biotechnology, Agricultural Sciences, Microbiology, Biochemistry, and Biophysics, but also in Bioengineering, Chemical Engineering, Chemistry, and Physics.

I take this opportunity to thank David A. Day, A. Harvey Millar and James Whelan; and Hans Lambers and Miquel Ribas-Carbo for their excellent editorial work for volumes 17 and 18 of the AIPH Series. I thank all the 62 authors of these two volumes: without their authoritative chapters, we would not have these books. I owe Jacco Flipsen and Noeline Gibson (both of Springer) special thanks for their friendly working relation with us that led to the production of these books. Thanks are also due to Jeff Haas (Director of Information Technology, Life Sciences, University of Illinois) and Evan DeLucia (Head, Department of Plant Biology, University of Illinois) for their support.

My special and particular thanks go to Phil Johnstone and Larry Orr for their friendly and excellent services during the typesetting of Volumes 17 and 18, respectively. Finally, I am grateful to Ellen Girmscheid (of Springer) for her excellent and friendly interactions during the production of these 'Announcements'.

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