

Announcement

Discoveries in Photosynthesis, Volume 20, Advances in Photosynthesis and Respiration

I am delighted to announce the publication, in the *Advances in Photosynthesis and Respiration* (AIPH) series, of the first book that focuses on the historical aspects of photosynthesis research ‘*Discoveries in Photosynthesis*’, edited by Govindjee, J. Thomas Beatty, Howard Gest and John F. Allen. This new volume (Volume 20) is a sequel to the following 19 volumes.

Published 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 Photobiophysics* (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: Diversity of Prokaryotic Respiratory System* (Davide Zannoni, editor, 2004);
- (17). *Plant Mitochondria: From Genome to Function* (David A. Day, Harvey Millar and James Whelan, editors, 2004);
- (18). *Plant Respiration. From Cell to Ecosystem* (Hans Lambers and Miquel Ribas-Carbo, editors, 2004); and
- (19). *Chlorophyll a Fluorescence: A Signature of Photosynthesis* (George C. Papageorgiou and Govindjee, editors, 2004).

Table of Contents of all the *Advances in Photosynthesis and Respiration* books are available at: <http://www.life.uiuc.edu/govindjee/photosynseries/ttocs.html>. You may obtain further information on the AIPH Series at: <http://www.springer.com>. Please note that the members of the International Society of Photosynthesis Research, ISPR <http://www.Photosynthesisresearch.org> receive special discounts.

The New Consulting Board of the Series

Starting January 2005, and, thus, with Volume 20, we have a new Board of Consulting Editors. I am delighted to welcome on board: David Knaff (USA); Sabeeha Merchant (USA); Agepati S. Raghavendra (India); Julian Eaton-Rye (New

[†]Deceased.

Zealand); Anthony Moore (UK); Gernot Renger (Germany); William Parson (USA); Christine Foyer (USA); and Krishna Niyogi (USA). Greetings!

I am thankful to the outgoing members of the past Board: Christine Foyer (UK); Elisabeth Gantt (USA), John Golbeck, (USA); Susan Golden (USA); Wolfgang Junge (Germany); Hartmut Michel (Germany); Kimiyuki Satoh (Japan), and James Siedow (USA) for their services. *Arrivederci*, but please stay in touch!

Discoveries in Photosynthesis

Discoveries in Photosynthesis is a unique book. It brings to life not only the architects of the 'cathedral of photosynthesis' who unraveled the mysteries of photosynthesis, but the many artisans who provided the necessary data for the understanding of this process on which almost all of our lives depend. It provides an encyclopedic bibliography and the many stories on the development of all aspects of photosynthesis research from the times of Joseph Priestley and Jan Ingen-Housz to the present. Informal and formal photographs of scientists make it a wonderful book to have. This book is meant not only for researchers and graduate students, but also for advanced undergraduates in Biochemistry; Biophysics; Microbiology; Cell Biology; Plant Biology, and History of Science.

The goal of this book was to bring before the readers the excitement of discoveries, and those involved in them, in the words and the styles of more than 100 researchers. The book has 111 chapters, written by 132 authors from 19 countries (Argentina; Australia; Canada; China; Denmark; France; Germany; Greece; Hungary; India; Israel; Japan; Norway; Russia; Sweden; Switzerland; The Netherlands; United Kingdom (Great Britain), and the United States of America). A unique feature of this book is that almost all the chapters include photographs of scientists involved in the research. After a Preface for the entire book; and a special tribute to Martin D. Kamen, co-discoverer of radiocarbon 14, the book begins with three *editorials*. In the first editorial (Govindjee and H. Gest), we recognize and honor Martin Kamen and Robert Emerson;

in the second editorial (Govindjee, J.T. Beatty and H. Gest) Cornelis B. van Niel, Louis N.M. Duysens and Eugene I. Rabinowitch; and in the third editorial (Govindjee, J.F. Allen and J.T. Beatty) Roger Stanier, Germaine Cohen-Bazire and William Arnold. In addition, all the Nobel-laureates related to photosynthesis research are honored there. After the editorials, there are two *overviews* (by Howard Gest and Jack Myers), followed by *timelines* of discoveries in anoxygenic photosynthesis (H. Gest and Robert Blankenship) and in oxygenic photosynthesis (Govindjee and David Krogmann). These are followed by *tributes* to Robin Hill (by David Walker); to James Franck (by Jerome L. Rosenberg); to Hans Gaffron (by Peter Homann); to Samuel Ruben (by H. Gest), and to Henrik Lundegårdh (by Anthony W.D. Larkum).

The rest of the book is arranged around the following themes:

- *Excitation energy transfer in photosynthesis* (in order of appearance: Robert Pearlstein; Jan Amesz (& S. Neerken); Steve Brody; Mamoru Mimuro; John F. Allen; and Pierre Joliot (& Anne Joliot));
- *Reaction centers* (in order of appearance: Roderick Clayton; Jack Fajer; William Parson; James Allen; André Vermeiglio; Horst Witt; Kimiyuki Satoh; Micheal Seibert (& Michael Wasielewski); Vlachyslav Klimov; James Barber; Jack van Rensen; Petra Fromme (& Paul Mathis); Nathan Nelson (& Adam Ben-Shem));
- *Oxygen evolution* (in order of appearance: Gernot Renger; P. Joliot; René Delosme (& P. Joliot); Peter Homann; Alan Stemler, and Thomas Wydrzynski);
- *Light-harvesting and pigment-protein complexes* (in order of appearance: Richard Cogdell (& Hideki Hashimoto & Alastair T. Gardiner); John Olson; Teruo Ogawa; Edith Camm (& Beverley Green), and Nicole Tandeau de Marsac);
- *Electron transport and ATP synthesis* (in order of appearance: Terrance E. Meyer (& Michael A. Cusanovich); Fevzi Daldal (& Meenal Deshmukh & Roger Prince); Antony Crofts; Gunter Hauska; William Cramer; Derek Bendall; Sakae Katoh; Ulrich Heber; André

Jagendorf; Wolfgang Junge, and Richard Dilley);

- *Techniques and application* (in order of appearance: Britton Chance; Robert Porra; Per-Åke Albertsson; René Delosme; Imre Vass; Anastasios Melis (& Thomas Happe); Ling Xiong (& Richard Sayre), and Roger Hangarter (& H.Gest));
- *Biogenesis and membrane architecture* (in order of appearance: Gerhard Drews (& Robert Niederman); L. Andrew Staehelin; Jan Andereson; Samuel Wildman (& Ann Hirsch & S.J. Kirchaski & Donald Spencer), and R. John Ellis);
- *Reductive and assimilatory processes* (in order of appearance: John Ormerod; F. Robert Tabita; Paul Ludden (& Gary Roberts); Andrew Benson; James A. Bassham; David Walker; Samuel Wildman; Archie Portis (& Michael Salvucci); Bob Buchanan (& P. Schürmann & Ricardo Wolosiuk & Jean-Pierre Jacquot); Masateru Shin; Marshal D. Hatch, and Clanton Black (& C. Barry Osmond));
- *Transport, regulation and adaptation* (in order of appearance: Hans-W. Heldt; Pierre Bennoun; William Ogren; Barbara Demmig-Adams; Noam Adir (& Hagit Zer & Susana Shochat & Itzhak Ohad); Arthur Grossman; Michael Madigan, and Judith Armitage (& Klaas Hellinger));
- *Genetics* (in order of appearance: Barry Marrs; Samuel Kaplan; Carl Bauer; Lawrence Bogorad; Jean-David Rochaix; Masahiro Sugiyama, and Sergey Shestakov);
- *Evolution* (in order of appearance: John Olson (R. Blankenship); Radhey Gupta; J. Thomas Beatty; Ralph Lewin, and Carl Woese);
- *Laboratories and national perspectives* (in order of appearance: Yaroslav de Kouchkovsky; Leo Vernon; Alexander Krasnovsky, Jr.; Olga Belyaeva; Alexander Borisov; George Papa-georgiou; Agepati Raghavendra (& Prafulla Chandra Sane & Prasanna Mohanty), and Ting-Yun Kuang (& Chunhe Xu & Lian-Bi Li & Yun-Kang Shen); and
- *Retrospectives* (in order of appearance: Govindjee (& D. Krogmann); Ashish Ghosh; and Hans Rurainski. The book ends with lists of photosynthesis symposia, books and conferences by Govindjee.

'History of Photosynthesis Research', authors of past personal perspectives and names of those whose tributes have been published

Two of the best sources of the past publications in photosynthesis research are the books by (1) Walter Stiles (*Photosynthesis: the Assimilation of Carbon by Green Plants*, Longmans, Green and Company, London, 1924), and (2) Eugene Rabinowitch (*Photosynthesis, Volume I* (1945); *Volume II (Part 1; 1951)*, and *Volume II (Part 2, 1956)*, Interscience Publishers, New York). The book by Aloysius Wild and R. Ball (*Photosynthetic Unit and Photosystems*, Backhuys Publishers, Leiden, 1997) also has an historical context.

The many personal perspectives, published earlier, could not be accommodated in the current book due to space limitations. However, Govindjee and D. Krogmann (see the section on *Retrospectives* in this book) provide full references to perspectives (in chronological order) by Otto Warburg (1964); Hiroshi Tamiya (1966); Cornelis B. van Niel (1967); Hans Gaffron (1969); Robert Hill (1975); C. Stacy French (1979); Severo Ochoa (1980); Roger Stanier (1980); Birgit Vennesland (1981); Martin Kamen (1986, 1989); Norman Good (1986); Roderick Clayton (1988); Melvin Calvin (1989); Louis N.M. Duysens (1989); W. Menke (1990); Joseph Katz (1990); William Arnold (1991); Horst Witt (1991); Britton Chance (1991); Marshall Hatch (1992); A.A. Krasnovsky (1992); Albert Frenkel (1993); Pierre Joliot (1993); Y. Shen (1994); T. Akazawa (1994); André Pirson (1994); Howard Gest (1994); S. Katoh (1995); Philip Thornber (1995), G. Drews (1996); Jack Myers (1996); David Walker (1997); N.E. Tolbert (1997); George Feher (1998, 2002); André Jagendorf (1998); Martin Gibbs (1999); Giorgio Forti (1999); David Krogmann (2000); Isreal Zelitsch (2001), and Andrew Benson (2002). R. Jensen has recently published a perspective on activation of Rubisco (*Photosynth Res* 82: 187–193).

In addition, Govindjee and Krogmann have listed references to tributes published on: G. Akoyunoglou; W. Arnold; D. Arnon; M. Avron; G.T. Babcock; W. Butler; M. Calvin; G. Cheniae; T.M. Cotton-Uphaus; D. DeVault; L.N.M. Duysens; R. Emerson; A. Faludi Daniel; C.S. French; N.E. Good; D.J. Goodchild; D. Hall; R. Hill; G. Horvath; S. Izawa; M.P. Klein; B. Kok; E. Roux; J.B. Thomas; E. Racker; H.P. Kortschak; A.

Moyses; A.A. Krasnovsky; W.R. Sistrom; E. Kondratieva; H. Kortschak; H. Metzner; A. Moyses; E. Rabinowitch; E. Racker; E. Roux; N. Shavit; A. Shlyk; W. Sistrom; H. Tamiya; P. Thornber; N.E. Tolbert; C.B. van Niel; E.C. Wassink; and R. Wurmser. Tributes and/or obituaries have also been published on: Jan Amesz (Photosynth. Res. 71:1–4, 2002); Arnold Jan Hoff (Chemical Physics 294: 223–225, 2003); André Pirson (Photosynth. Res. 82:111–114, 2004); Jean-Marie Briantais (Photosynth. Res. 83:1–3, 2005); Gerald T. Small (Photosynth. Res. 83:5–9, 2005); Lawrence Bogorad (Photosynth. Res. 83:17–24, 2005); August Ried (Photosynth. Res. 83:279–281, 2005); Julio López-Gorgé (Photosynth. Res. 83:283–286, 2005); Gauri Shankar Singhal (Photosynth. Res., 85:145–148, 2005); John Biggins (Photosynth. Res., 85:261–265, 2005). Obituaries of A. H. Brown, F. G. Fogg, Y. Fujita, L. McIntosh, V. G. Tatake, I. Vassilev, and S. Wildman will be published in the forthcoming issues of Photosynthesis Research. Further contributions of Thodor Engelmann have been recently highlighted by G. Drews (Photosynth. Res. 83: 25–34, 2005).

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 this 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 CO₂ 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

The readers of the current series are encouraged to watch for the following books (not necessarily arranged in the order of appearance):

- *Photoprotection, Photoinhibition, gene Regulation and Environment* (Editors: Barbara Demmig-Adams, William Adams III and Autar Mattoo) [to appear as volume 21, but has been delayed];
- *Photosystem II: The Light-Induced Water:Plastoquinone Oxido-reductase* (Editors: Thomas J. Wydrzynski and Kimiyuki Satoh) [it has already been released as volume 22];
- *The Structure and function of Plastids* (Editors: Kenneth Hooper and Robert Wise) [it is scheduled to appear in 2006, as volume 23]
- *Photosystem I: The Light-Induced Plastocyanin: Ferredoxin Oxidoreductase in Oxygenic Photosynthesis* (Editor: John Golbeck) [scheduled to appear as volume 24 in 2006];
- *Chlorophylls and Bacteriochlorophylls: Biochemistry, Biophysics, Functions and Applications* (Editors: Bernhard Grimm, Robert J. Porra, Wolfhart Rüdiger and Hugo Scheer) [scheduled to appear as volume 25 in 2006];
- *Biophysical Techniques in Photosynthesis II* (Editors: Thijs Aartsma and Jörg Matisyck);
- *Photosynthesis: A Comprehensive Treatise: Physiology, Biochemistry, Biophysics and Molecular Biology, Part 1* (Editors: Julian Eaton-Rye and Baishnab Tripathy)
- *Photosynthesis: A Comprehensive Treatise: Physiology, Biochemistry, Biophysics and*

Molecular Biology, Part 2 (Editors: Baishnab Tripathy and Julian Eaton-Rye)

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

- *Anoxygenic Photosynthetic Bacteria II*
- *Sulfur Metabolism in Photosynthetic Systems*
- *Molecular Biology of Cyanobacteria II*
- *Protonation and ATP Synthases*
- *Genomics and Proteomics*
- *Artificial Photosynthesis*
- *Molecular Biology of Plant Stress*
- *Global Aspects of Photosynthesis and Respiration*
- *Chloroplast Bioengineering*

Readers are encouraged to send their suggestions for 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, Chemistry, and Physics.

I take this opportunity to express my heartfelt thanks and appreciation to Howard Gest; J. Thomas Beatty; and John F. Allen (co-editors of the current volume) for the highest quality and friendliness of their editorial work. All of us are grateful to Larry Orr for providing direction to all the AIPH books. We are highly indebted to Ellen Girmscheid (Springer) for her friendly overview

and outstanding suggestions during the production of *Photosynthesis Research* (Volumes 73, 76 and 80) that form the basis of this book. We thank all the authors of Volume 20: without their authoritative chapters, there would be no book. We owe Noeline Gibson special thanks for her friendly and wonderful working relationship during the production of this book. Thanks are also due to Jacco Flipsen (Springer), Anita Rachmat (Springer), Jeff Haas (Director of Information Technology, Life Sciences, University of Illinois at Urbana-Champaign, UIUC) and Evan DeLucia (Head of Plant Biology, UIUC) for their support. Mijin Park, Jill Lynch, Loan (Kelly) Nguyun (now Vu), Aheed Mohiuddin and Rumana Tayyab provided assistance during the preparation of photographs and submission of manuscripts (2001–2004) to the press. The work was initially supported by a National Science Foundation grant to Govindjee and Howard Gest (SES 00-92507).

I thank Teruo Ogawa for providing us the painting of Kazuo Shibata that adorns the cover of this book. My wife Rajni Govindjee deserves my special thanks for tolerating my work habits and for her help when I needed it most. Our daughter Anita Govindjee and her husband Morten Christiansen; our son Sanjay Govindjee and his wife Marilyn Govindjee provided facilities at different times during the preparation of this book.

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