

Kluwer Academic Publications

Advances in Photosynthesis and Respiration Series

# **Photosystem II: The Water/Plastoquinone Oxido-Reductase In Photosynthesis**

T. Wydrzynski and K. Satoh (Editors)

---

**Contents**

**Preface**

**Color Plates**

**Dedication: A Tribute to Jerry Babcock**

C. Yocum

Biology Department  
University of Michigan, U.S.A.

S. Ferguson-Miller

Department of Biochemistry  
Michigan State University, U.S.A.

R. Blankenship

Department of Chemistry & Biochemistry  
Arizona State University, U.S.A.

**Part I: Historical Perspectives**

1 Introduction to Photosystem II\*

Conceptual Development

Govindjee

Center of Biophysics & Computational Biology  
University of Illinois, U.S.A.

Identification of the Chemical Entity

K. Satoh

Faculty of Science  
Okayama University, JAPAN

O<sub>2</sub> Evolution - The Central Question

T. Wydrzynski

Research School of Biological Sciences  
Australian National University, AUSTRALIA

**Part II: Protein Constituents**

2 Distal Antenna Components\*

B. Green

Botany Department  
University of British Columbia, CANADA

- 3 Proximal Antenna Components\*  
J.J. Eaton-Rye  
Department of Biochemistry  
Otago University, NEW ZEALAND  
C. Putnam-Evans  
Department of Biology  
East Carolina University, U.S.A.
- 4 The D1 and D2 Core Subunits  
Peter J. Nixon  
Department of Biochemistry  
Imperial College of Science, Technology & Medicine, U.K.  
Mary Sarcina  
Department of Biology  
University College London, U.K.  
Bruce A. Diner  
CR&D, Experimental Station  
E. I. du Pont de Nemours & Company, U.S.A.
- 5 The Lumenal, Extrinsic Proteins  
Terry M. Bricker  
Department of Biological Sciences  
Louisiana State University, U.S.A.  
Robert L. Burnap  
Department of Microbiology & Molecular Genetics  
Oklahoma State University, U.S.A.
- 6 The Small Subunits: New Insights from Proteomics, Genomics, and Structural Studies  
Leeann E. Chandler, Johnna.L. Roose, and Himadri B. Pakrasi  
Department of Biology  
Washington University, U.S.A.  
Masahiko Ikeuchi  
Department of Biology  
University of Tokyo, JAPAN

### **Part III: Organization of Functional Sites**

- 7 Primary Electron Transfer  
Gernot Renger  
Max-Volmer Institute  
Technical University Berlin, GERMANY  
Alfred R. Holzwarth  
Max Planck Institute for Radiation Chemistry, GERMANY
- 8 The Quinone Binding Sites  
Antony R. Crofts  
Center for Biophysics & Computational Biology  
University of Illinois, U.S.A.

Vasili Petrouleas  
Institute of Materials Science  
NCSR Democritos, GREECE

9 The Redox-Active Tyrosines Y<sub>Z</sub> and Y<sub>D</sub>

Bruce A. Diner  
CR&D, Experimental Station  
E. I. du Pont de Nemours & Company, U.S.A.  
R. David Britt  
Department of Chemistry  
University of California – Davis, U.S.A.

10 The Catalytic Manganese-Cluster

Vittal K. Yachandra  
Melvin Calvin Laboratory, Physical Biosciences Division  
Lawrence Berkeley National Laboratory, U.S.A.

11 The O<sub>2</sub> Evolving Site\*

R. J. Debus  
Department of Biochemistry  
University of California - Riverside, U.S.A.

12 Side Path Electron Donors: Cytochrome b559, Chlorophyll Z and β-Carotene

Peter Faller and A. William Rutherford  
Département de Biologie Joliot-Curie  
CEA-Saclay, FRANCE

**Part IV: Static Structure**

13 Molecular Analysis by Vibrational Spectroscopy

Takumi. Noguchi  
Institute of Material Sciences  
University of Tsukuba, JAPAN  
Catherine Berthomieu  
Laboratoire de Bioénergétique Cellulaire  
CEA-Cadarache, FRANCE

14 Configuration of Electron Transfer Components Studied by EPR Spectroscopy

Robert Bittl  
Fachbereich Physik  
Freie Universität Berlin, GERMANY  
Asako Kawamori  
Faculty of Science and Technology  
Kwansei Gakuin University, JAPAN

15 Spectroscopy of the Manganese Cluster

Karin Ahrling  
Research School of Biological Sciences  
The Australian National University, AUSTRALIA  
Ron J. Pace

Department of Chemistry  
The Australian National University, AUSTRALIA  
M.C.W. Evans  
Department of Biology  
University College London, U.K.

16 Knowledge (Computer)-Based Analysis\*

B. Svensson  
Department of Chemistry  
University of Minnesota, U.S.A.

17 Electron Microscopic Analysis

Ben Hankamer, James Barber, and Jon Nield  
Department of Biological Sciences  
Imperial College of Science, Technology & Medicine, U.K.

18 3D Crystal Structure\*

J.-R. Shen  
Department of Biology, Faculty of Science  
Okayama University, JAPAN  
N. Kamiya  
Harima Institute  
The Institute of Physical & Chemical Research, JAPAN

19 3D Crystal Structure\*

H. T. Witt and Norbert Krauss  
Max-Volmer Institute  
Technical University Berlin, GERMANY

**Part V: Molecular Dynamics and Oxygen-Evolving Reactions**

20 Energy Capture and Distribution\*

R. van Grondelle  
Department of Physics & Astronomy  
Vrije University, The NETHERLANDS  
D. Klug  
Department of Chemistry & Biochemistry  
Imperial College London, U.K.

21 The Roles of Carotenoids in Energy Quenching

B.J. Pogson and H.M. Rissler  
Department of Biochemistry & Molecular Biology  
Australian National University, AUSTRALIA  
H.A. Frank  
Department of Chemistry  
University of Connecticut, U.S.A.

22 The Calcium and Chloride Cofactors

Hans J.van Gorkom  
Department of Biophysics

Leiden Universtiy, The NETHERLANDS  
Charles F. Yocum  
Departments of Biology and Chemistry  
University of Michigan, U.S.A.

23 Bicarbonate Requirements

J.J.S. van Rensen  
Laboratory of Plant Physiology  
Wageningen University, The NETHERLANDS  
V.V. Klimov  
Institute of Basic Biological Problems  
Russian Academy of Sciences, RUSSIA

24 Flash-Induced Oxygen Evolution and Other Oscillation Processes

Vladimer Shinkarev  
Department of Plant Biology  
University of Illinois, U.S.A.

25 Mechanisms of Water Oxidation

Warwick Hillier  
Department of Chemistry  
Michigan State University, U.S.A.  
J. Messinger  
Max-Planck-Institut für Strahlenchemie  
Mülheim an der Ruhr, GERMANY

**Part VI: Assembly and Biodynamics**

26 Assembly of the Inorganic Core and “Inorganic Mutants” of the Mn-Cluster

G. Charles Dismukes  
Department of Chemistry and Princeton Environmental  
Institute  
Princeton University, U.S.A.  
Gennady M. Ananyev  
Department of Environmental Biophysics & Molecular  
Ecology  
Rutgers University, U.S.A.  
Richard Watt  
Department of Chemistry  
University of New Mexico, U.S.A.

27 Photoinactivation and Mechanisms of Recovery

Wah Soon Chow  
Research School of Biological Sciences  
Australian National University, AUSTRALIA  
Eva-Marie Aro  
Department of Biology  
University of Turku, FINLAND

- 28 Transcriptional and Translational Regulation in Biosynthesis and Repair  
Kenichi Yamaguchi and Stephen P. Mayfield  
Department of Cell Biology and Scaggs Institute for  
Chemical Biology  
The Scripps Research Institute, U.S.A.  
Mamoru Sugita  
Center for Gene Research  
Nagoya University, JAPAN
- 29 Transport and Post-Translational Processing in Biosynthesis and Homeostasis  
Steven M. Theg  
Section of Plant Biology  
University of California Davis, U.S.A.

**Part VII: Origin and Comparison with Other Natural/Artificial Systems**

- 30 The Origin and Evolution of Photosynthetic Oxygen Production  
G. Charles Dismukes  
Department of Chemistry and Princeton Environmental  
Institute  
Princeton University, U.S.A.  
Robert E. Blankenship  
Department of Chemistry & Biochemistry  
Arizona State University, U.S.A.
- 31 Mechanistic Comparisons between Photosystem II and Cytochrome *c* Oxidase\*  
G. Brudvig  
Department of Chemistry  
Yale University, U.S.A.  
M. Wikström  
Department of Medical Chemistry  
University of Helsinki, FINLAND
- 32 Mimicking the Properties of the Oxygen Evolving Complex in the Reaction  
Centers from Purple Bacteria  
JoAnn C. Williams and James P. Allen  
Department of Chemistry & Biochemistry  
Arizona State University, U.S.A.  
Lázló Kálmán  
Department of Biophysics  
University of Szeged, HUNGARY
- 33 *De Novo* Protein Design in Respiration and Photosynthesis  
Brian R. Gibney  
Department of Chemistry  
Columbia University, U.S.A.  
Cecilia Tommos  
Department of Biochemistry and Biophysics  
Stockholm University, SWEDEN

34 Towards a Deeper Understanding of Photosystem II by Artificial Photosynthesis

Ann Magnuson and Stenbjörn Styring

Chemical Center

University of Lund, SWEDEN

L. Hammarström

Department of Physical Chemistry

Uppsala University, SWEDEN

**Index**