

CURRICULUM VITAE

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PROFESSIONAL PREPARATION

University of Athens (Greece), School of Physical Sciences and Mathematics: **B.Sc. in Biology** (1970)

Florida State University (Tallahassee), Dept. of Biological Science: **Ph.D. in Biological Sciences**
(Biophysics of Photosynthesis, 1975)

State University of Leiden, The Netherlands, Dept. of Biophysics. **Postdoctoral Training** (1977-79).

Carnegie Institution, Stanford University, California, USA. **Postdoctoral Training** (1979-81).

PROFESSIONAL APPOINTMENTS

Florida State University, Tallahassee:

1971-73	Graduate Student, International Atomic Energy Agency
1973-74	Graduate Teaching Assistant
1974-75	Graduate Research Assistant

Greek Atomic Energy Commission:

1975-76	Research Center Democritos, Athens, Institute of Biology
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German Scientific Exchange Program Fellow (DAAD):

1976-77	Weizmann Institute of Science, Department of Biochemistry
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European Molecular Biology Organization:

1977-79	Research Fellow, State University of Leiden, Holland, Dept. of Biophysics
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Stanford University, Stanford, California:

1979-81	Research Fellow, Carnegie Institution for Science, Dept. of Plant Biology
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University of California, Berkeley:

1981-84	Assistant Professor, Division of Molecular Plant Biology
1984-86	Associate Professor, Division of Molecular Plant Biology
1986-present	Professor, Department of Plant and Microbial Biology
1994-98	Vice Chair, Department of Plant and Microbial Biology
2005-present	Faculty Biologist, EETD, Lawrence Berkeley National Laboratory

FELLOWSHIPS / HONORS

IAEA International Atomic Energy Agency Fellowship (1971-73)

DAAD Deutscher Akademischer Austauschdienst Fellowship (1976-77)

EMBO European Molecular Biology Organization Fellowship (1977-79)

Carnegie Institution Fellowship (1979-81)

Swedish Natural Science Research Council, Invited Professor Fellowship (May-August, 1985)

At University of Lund, Department of Biochemistry

British Science and Engineering Research Council, Invited Professor Fellowship (April-August 1988)

At University of Leeds, Department of Pure and Applied Biology

Pacific Rim Faculty Exchange Program Fellowship (1988-89)

At CSIRO, Plant Industry Division, Canberra, Australia.

NATO International Scientific Exchange Program Fellowship (1992-96)

At University of Hamburg, Germany

Japanese Monbusho (Ministry of Education, Science and Technology) Research Award (1992-94)

At NIBB, National Institute for Basic Biology, Okazaki, Japan

UC Berkeley, College of Natural Resources Distinguished Teaching Award (1994)

DaimlerChrysler "University Research Award" (2003)

US DOE, Hydrogen Program Research Achievement Award (2004)

PROFESSIONAL ACTIVITIES

1. Co-organizer with Professor Yoshihiko Fujita (National Institute for Basic Biology, Japan) of the 28th International NIBB Conference. Held on February 26-29, 1992 in Okazaki, Japan. Title: Dynamics of thylakoid membrane assembly. Attended by 50 individuals.
2. Organizer of the 2nd Western Photosynthesis Conference held on January 12-15, 1993 at the Asilomar Conference Center, Pacific Grove, California. Attended by 155 individuals.
3. Co-organizer and Chair of the '98 International CTI-IEA (Climate and Technology Initiative-International Energy Agency) Workshop at UC Berkeley (11-14 Jan 1998). Attended by 15 delegates.
4. Convener and Chair of the Photosynthesis/Photoinhibition session in the 8th International Conference on the Cell and Molecular Biology of *Chlamydomonas*. Granlibakken Conference Center, Tahoe City, CA. 2-7 June 1998)
5. Convener and Chair, Minisymposium on Algal Physiology. Annual Meeting of the American Society of Plant Physiologists. San Diego, July 15-19, 2000.
6. Review Panel Member for the DOE Hydrogen, Fuel Cells and Infrastructure Technologies Program. Arlington, VA, June 9-13, 2008-2010.
7. Review Panel Member (2008) and Chair of the Panel (2010) for the Science Foundation of Arizona.
7. Organizer and Chair of the College of Natural Resources Undergraduate Honors Research Symposium (1996-present).

PATENTS

1. Melis A, Zhang L, Benemann JR, Forestier M, Ghirardi ML, Seibert M (2006) Hydrogen production using hydrogenase-containing oxygenic photosynthetic organisms. **United States Patent 6,989,252 B2** (issued 24-Jan-2006)
2. Melis A and Chen H-C (2007) Modulation of sulfate permease for photosynthetic hydrogen production. **United States Patent 7,176,005** (issued 13-Feb-2007).
3. Melis A and Mitra M (2010) Suppression of *Tla1* gene expression for improved solar energy conversion efficiency and photosynthetic productivity in plants and algae. **United States Patent 7,745,696** (issued 29-June-2010)

EDITORIAL SERVICE (last 5-years)

Editor-in-Chief, **Planta** (January 2002 - present)

Editorial Board Member for **Photosynthesis Research** (September 1995 - present)

ACADEMIC AFFAIRS

1986-2000: Undergraduate Major Adviser: UC Berkeley Undergraduate Program in Plant Biology

1989-2000: Chair, Plant Biology Curriculum Committee

2007-present: Chair, Agricultural and Environmental Chemistry Interdepartmental Program

REGULARLY SCHEDULED TEACHING DUTIES (last 5-years)

Undergraduate

Physiology and Biochemistry of Plants (PLANTBI 135, 3 semester units)

Laboratory in Physiology and Biochemistry of Plants (PLANTBI 135L, 1 semester unit)

Environmental Plant Biology (PLANTBI 180, 2 semester units)

Graduate

Biochemistry of Biofuels (PLANTBI 222, 1 semester unit)

Plant and Microbial Photosynthesis (PLANTBI 290. 2 semester units)

SOCIETY MEMBERSHIPS

American Chemical Society

American Society for Biochemistry and Molecular Biology

American Society of Plant Biologists

International Society for Photosynthesis Research

The Genetics Society of America

MELIS LAB EXPERTISE AND PHILOSOPHY

The expertise of the Melis lab is in the field of photosynthesis and metabolism. We work with land plants, microalgae, cyanobacteria, and non-oxygenic (anaerobic) photosynthetic bacteria. Our platform includes most aspects of photosynthesis, beginning with organism cultivation, the efficiency of light absorption and utilization, electron transport and biochemical energy generation, and chloroplast and cellular metabolism. Included are the biophysics and biochemistry of the process, the molecular biology and genetics of the organisms, as well as scale ups in the cultivation of the various organisms for product generation.

The concept of "Photosynthetic Biofuels", envisioned and pioneered by us, entails the direct application of photosynthesis for the generation of biofuels and other bio-products, in a process where a single organism acts both as catalyst and processor, synthesizing and secreting ready to use fuels.

The lab contributed with a breakthrough in the field, when in 2000 we demonstrated, for the first time, how to divert the natural flow of photosynthesis in microalgae and to generate hydrogen gas, instead of the normally produced oxygen. This advance pointed to organism genetic engineering, by which to divert the flow of photosynthesis toward alternative high-value bioproducts instead of the normally produced sugars. A number of "blueprints" are currently in the R&D stage, leading to the generation of biofuels, feedstock for the synthetic chemistry industry, and nutraceuticals. The trademark of our approach is product generation directly from photosynthesis, and spontaneous product separation from the organism, bypassing the need to harvest and process the respective biomass.

HYDROGEN AND HYDROCARBON BIOFUELS PRODUCTION VIA MICROALGAL PHOTOSYNTHESIS

Hydrogen and hydrocarbon biofuels may become the primary 21st century energy carriers in California and the nation. Modification of photosynthesis in microalgae may permit the generation of these biofuels as clean, renewable and economically viable commodities. However, specific biological problems associated with a sustained, high yield photosynthetic production of these biofuels remain to be addressed.

RELATED AND CURRENTLY ON-GOING RESEARCH IN THE MELIS LAB:

Maximizing the solar-to-chemical energy conversion efficiency of photosynthesis under mass culture conditions.

Improving the continuity and yield of microalgal hydrogen and hydrocarbon production.

Applying metabolic engineering to redirect photosynthesis toward biofuels, high value bio-products, and feedstocks for the synthetic chemistry industry.

PUBLICATIONS (Last 5-years)

Peer-reviewed Papers, Reviews and Book Chapters

199. White AL, Melis A (2006) Biochemistry of hydrogen metabolism in *Chlamydomonas reinhardtii* wild type and a Rubisco-less mutant. *Intl. J. Hydrogen Energy* 31: 455-464
200. Melis A, Zhang L, Benemann JR, Forestier M, Ghirardi ML, Seibert M (2006) Hydrogen production using hydrogenase-containing oxygenic photosynthetic organisms. United States Patent 6,989,252 B2 (issued 24-Jan-2006)
201. Park S, Polle JE, Melis A, Lee TK, Jin E (2006) Up-regulation of photoprotection and PSII-repair gene expression by irradiance in the unicellular green alga *Dunaliella salina*. *Mar Biotech* 8:120-128.
202. Yokthongwattana K, Melis A (2006) Photoinhibition and recovery in oxygenic photosynthesis: Mechanism of a photosystem II damage and repair cycle. In, *Photoprotection, Photoinhibition, Gene Regulation, and Environment, Advances in Photosynthesis and Respiration* (Series Editor, Govindjee), Volume 21: 175–191; Springer, The Netherlands
203. Melis A, Melnicki M (2006) Integrated biological hydrogen production. *Intl. J. Hydrogen Energy* 31: 1563-1573
204. Park S, Khamai P, Garcia-Cerdan JG, Melis A (2006) *Chlamydomonas reinhardtii* photosystem-II repair protein (REP27) mRNA, complete cds; nuclear gene for chloroplast product. GenBank Accession Number EF127650
205. Melis A, Chen H-C (2007) Modulation of sulfate permease for photosynthetic hydrogen production. United States Patent 7,176,005 (issued 13-Feb-2007)
206. Tetali SD, Mitra M, Melis A (2007) Development of the light-harvesting chlorophyll antenna in the green alga *Chlamydomonas reinhardtii* is regulated by the novel *Tla1* gene. *Planta* 225: 813-829
207. Park S, Khamai P, Garcia-Cerdan JG, Melis A (2007) REP27, a tetratricopeptide repeat nuclear-encoded and chloroplast-localized protein functions in the D1/32 kD reaction center protein turnover and PSII repair from photodamage. *Plant Physiology* 143: 1547-1560
208. Melis A, Seibert M, Ghirardi ML (2007) Hydrogen fuel production by transgenic microalgae. In: Leon R, Gavan A, Fernandez E (eds) *Transgenic Microalgae as Green Cell Factories*. Landes Bioscience, Austin, Texas. Chapter 10, pp. 110-121
209. Melis A (2007) Photosynthetic H₂ metabolism in *Chlamydomonas reinhardtii* (unicellular green algae). *Planta* 226: 1075-1086
210. Bailey S, Melis A, Mackey KR, Cardol P, Finazzi G, van Dijken G, Berg GM, Arrigo K, Shrager J, Grossman A (2008) Alternative photosynthetic electron flow to oxygen in marine *Synechococcus*. *Biochim Biophys Acta* 1777(3): 269-276
211. Seibert M, King P, Posewitz MC, Melis A, Ghirardi ML (2008) Photosynthetic water-splitting for hydrogen production. In: Wall J, Harwood C, Demain A (eds) *Bioenergy*. ASM Press, Washington DC, pp. 273-291
212. Mitra M, Melis A (2008) *Chlamydomonas reinhardtii* RING-like domain protein 1 (RDP1) gene, complete cds. [gi|189354188|gb|EU717142.1|189354188](http://www.ncbi.nlm.nih.gov/nuccore/gi|189354188|gb|EU717142.1|189354188). GenBank Accession Number EU717142
213. Mitra M, Melis A (2008) *Chlamydomonas reinhardtii* RING-like domain protein 1 (RDP1) mRNA, complete cds. [gi|189354190|gb|EU717143.1|189354190](http://www.ncbi.nlm.nih.gov/nuccore/gi|189354190|gb|EU717143.1|189354190). GenBank Accession Number EU717143
214. Berberoglu H, Pilon L, Melis A (2008) Radiation characteristics of *Chlamydomonas reinhardtii* CC125 and its truncated chlorophyll antenna transformants *tla1*, *tlaX*, and *tla1-CW^r*. *Intl J Hydrogen Energy* 33: 6467-6483
215. Lindberg P, Melis A (2008) The chloroplast sulfate transport system in the green alga *Chlamydomonas reinhardtii*. *Planta* 228:951-961
216. Melnicki MR, Bianchi L, De Philippis R, Melis A (2008) Hydrogen production during stationary phase in purple photosynthetic bacteria. *Intl J Hydrogen Energy* 33:6525-6534
217. Ruehle T, Hemschemeier A, Melis A, Happe T (2008) A novel screening protocol for the isolation of hydrogen producing *Chlamydomonas reinhardtii* strains. *BMC Plant Biology* 8:107 (13 pages); (<http://www.biomedcentral.com/1471-2229/8/107>)
218. Mitra M, Melis A (2008) Optical properties of microalgae for enhanced biofuels production. *Optics Express* 16: 21807-21820 <http://www.opticsinfobase.org/oe/virtual_issue.cfm?vid=65>
219. Eroglu E, Melis A (2009) "Density Equilibrium" method for the quantitative and rapid *in situ* determination of lipid, hydrocarbon, or biopolymer content in microorganisms. *Biotech Bioeng* 102:1406-1415

220. Thaipraturum R, Melis A, Svasti J, Yokthongwattana K (2009) Analysis of non-photochemical energy dissipating processes in wild type *Dunaliella salina* (green algae) and in *zea1*, a mutant constitutively accumulating zeaxanthin. *J Plant Res* 122:465–476
221. Hemschemeir A, Melis A, Happe T (2009) Analytical approaches to photobiological hydrogen production in unicellular green algae. *Photosynth Res*. DOI 10.1007/s11120-009-9415-5
222. Melnicki MR, Eroglu E, Melis A (2009) Changes in hydrogen production and polymer accumulation upon sulfur-deprivation in purple photosynthetic bacteria. *Intl J Hydrogen Energy* 34:6157-6170
223. Melis A (2009) Solar energy conversion efficiencies in photosynthesis: minimizing the chlorophyll antennae to maximize efficiency. *Plant Science* 177: 272-280
224. Dewez D, Park S, García-Cerdán JG, Lindberg P, Melis A (2009) Mechanism of the REP27 protein action in the D1 protein turnover and photosystem-II repair from photodamage. *Plant Physiol.* 151:88-99
225. Lindberg P, Park S, Melis A (2010) Engineering a platform for photosynthetic isoprene production in cyanobacteria, using *Synechocystis* as the model organism. *Metabol Engin* 12:70-79
226. Eroglu E, Melis (2010) Extracellular terpenoid hydrocarbon extraction and quantitation from the green microalgae *Botryococcus braunii* var. Showa. *Biores Technol* 101:2359-2366
227. Mitra M, Melis A (2010) Genetic and biochemical analysis of the *TLA1* gene in *Chlamydomonas reinhardtii*. *Planta* 231:729-740
228. Aristilde L, Melis A, Sposito G (2010) Inhibition of photosynthesis by a fluoroquinolone antibiotic. *Environ Sci Tech.* 44:1444-1450
229. Melis A and Mitra M (2010) Suppression of *Tla1* gene expression for improved solar energy conversion efficiency and photosynthetic productivity in plants and algae. **United States Patent 7,745,696** (issued 29-June-2010)
230. Eroglu E, Okada S, Melis A (2011) Hydrocarbon productivities in different *Botryococcus* strains: comparative methods in product quantification. *J Appl Phycol* In Press DOI 10.1007/s10811-010-9577-8

INVITED SEMINARS AND LECTURES (Last 5-years)

96. **College of Natural Resources UC Berkeley, Invited Address to the College Advisory Board.** Title of Lecture: Photons-to-Fuels: Directing photosynthesis to produce energy. Thursday 18-May-2006.
97. **The University of Quebec at Montreal, Department of Chemistry and Biochemistry.** Title of Seminar: Hydrogen production by a process of microalgal photosynthesis. Friday 02-June-2006.
98. **International Conference on Photochemical Conversion and Storage of Solar Energy (IPS-16). Uppsala, Sweden.** Title of Lecture: Directing photosynthesis to produce hydrogen. Monday 03-Jul-2006.
99. **Gordon Research Conference on Photosynthesis.** Bryant University, RI. Title of Lecture: Chlorophyll antenna size adjustments in *Chlamydomonas* involve coordinate regulation of *Tla1*, *CAO* and *Lhcb* gene expression. Thursday 06-Jul-2006 (Delivery made by Melis lab postdoctoral scholar Dr. Mautusi Mitra)
100. **American Society of Plant Biologists. 2006 Annual Meeting,** Oxidative Stress Minisymposium, Boston, MA. Title of Lecture: Photosystem-II damage and repair cycle in chloroplasts. Monday, 07-Aug-2006.
101. **International Symposium on Materials Issues in Hydrogen Production and Storage.** UC Santa Barbara. Title of Lecture: Issues in photobiological hydrogen production. Tuesday, 22-Aug-2006.
102. **EPRI (Electrical Power Research Institute), Palo Alto, CA.** Title of Lecture: Photosynthesis to Hydrocarbons: a Biofuels R&D Program. Tuesday, 10-Oct-2006.
103. **UC Berkeley Institute of Transportation Studies.** Title of Lecture: Photosynthesis-to-Biofuels: Hydrogen and Biodiesel. Monday, 27-Nov-2006
104. **UC Berkeley Energy Symposium.** Title of Lecture: Engineering the next generation of alternative fuels. Wednesday, 21-Mar-2007
105. **University of Minnesota, Department of Plant Biology.** Title of Seminar: Hydrogen production by a process of microalgal photosynthesis. Tuesday, 27-Mar-2007
106. **Ruhr-Universität Bochum, Fakultät für Biologie.** Title of Seminar: Modifying microalgae to produce energy. Wednesday, 02-May-2007.
107. **14th International Congress on Photosynthesis, Glasgow, Scotland; Symposium on Bioenergy and Photosynthesis.** Title of Invited Symposium Plenary Lecture: ***Photosynthetic hydrogen production: genes, proteins and effects.*** Monday 23-July-2007.
108. **The 8th International Hydrogenase Conference.** August 5-10, 2007, Breckenridge, Colorado. Title of Invited Symposium Lecture: ***Genetic engineering for microalgal H₂ production.*** Thursday 09-Aug-2007.
109. **91st Annual Meeting of the Optical Society of America.** September 16-20, 2007. San Jose, California. Title of Invited Symposium Lecture: ***Optical properties of microalgae for enhanced biofuels production.*** Monday 17-Sep-2007.
110. **International Symposium on Material Issues in a Hydrogen Economy.** November 12-15, 2007. Richmond, Virginia. Title of Invited Lecture: ***Material issues in photobiological hydrogen production.*** Tuesday 13-Nov-2007.

111. **17th Western Photosynthesis Conference, Asilomar, Pacific Grove, CA.** Title of Invited Lecture: ***Photosynthetic biofuels - issues and prospects.*** Thursday 3-Jan-2008.
112. **University of California Office of the President, System-Wide Technology Transfer Forum, entitled *Clean Technology*.** Hyatt Regency SFO, Burlingame (an invitation only event). Title of Tech Transfer Presentation: ***Microalgal biofuels: Hydrogen and Hydrocarbons.*** Thursday 03-Apr-2008
113. **University of Nebraska, Lincoln, Redox Biology Center, Biology and Chemistry Seminar Series.** Title of Seminar: ***Photosynthetic Biofuels: Generating Hydrogen and Hydrocarbons.*** Tuesday 08-Apr-2008
114. **XLVII Congress of the Italian Society for Plant Biology. Pisa, Italy.** Title of Plenary Lecture: ***Transgenic microalgae as a source of photosynthetic biofuels.*** Tuesday 01-Jul-2008.
115. **J. Craig Venter Institute, Rockville, Maryland.** Title of Invited Seminar: ***Maximizing light utilization efficiency and hydrogen production in microalgal cultures.*** Thursday 07-Aug-2008.
116. **American Chemical Society 236th National Meeting, Philadelphia, PA.** Title of "Emerging Technologies: Fuel Biotechnology" Symposium Invited Lecture: ***Photosynthetic Biofuels: Renewable in situ generation of hydrogen and hydrocarbons.*** Thursday 21-Aug-2008.
117. **92nd Annual Meeting of the Optical Society of America.** October 19-24, 2008. Rochester, NY. Title of "Optics for Energy" Symposium Invited Lecture: ***Optical properties of microalgae for enhanced biofuels production.*** Thursday 23-Oct-2008.
118. **"Global Energy" International Congress on Biofuels.** October 30 and 31, 2008. University of Alicante, Spain. Title of Keynote Lecture: ***Photosynthetic biofuels from microalgae.*** Thursday 30-Oct-2008.
119. **DOE Frontiers of Science in Radiochemistry and Instrumentation for Radionuclide Imaging Workshop.** November 4-5, 2008. Bethesda, MD. Title of invited lecture: ***Photosynthetic Biofuels: Tracing pathways for the renewable in situ generation of hydrogen and hydrocarbons.*** Tuesday 04-Nov-2008.
120. **National Research Council of Canada, Ottawa.** Special meeting on Bioenergy. Title of Opening Lecture: ***Photosynthetic Biofuels – Renewable in situ generation of hydrogen and hydrocarbons.*** Monday 19-Jan-2009.
121. **University of Umea, Sweden. KBC Workshop on Energy for the Future.** Title of invited Lecture: ***Photosynthetic Biofuels – Renewable in situ generation of hydrogen and hydrocarbons.*** Thursday 12-Feb-2009.
122. **State University of Leiden, Lorentz Center, The Netherlands. International Workshop on Solar Biofuels from Microorganisms.** Title of Opening / Keynote Lecture: ***Photosynthetic Biofuels – Issues and Prospects.*** Monday 30-Mar-2009.
123. **State University of Leiden, The Netherlands. College of Science, Dean's Seminar Series entitled "This week's discoveries".** Title of Invited Lecture: ***Road Map to Renewable Biofuels: Hydrogen, Biodiesel, or Ethanol?*** Tuesday 31-Mar-2009.
124. **British Petroleum Study Session on Economic Methods for Hydrogen Production, London, UK.** Title of Invited Lecture: ***Integrated Biological Hydrogen Production.*** Tuesday 09-Jun-2009.

125. **DOE Office of Basic Energy Sciences Workshop** in Albuquerque, NM, on the topic of "What is the Efficiency of Photosynthesis?" Title of Invited Lecture: **The Solar Conversion Efficiency of Photosynthesis**. Saturday 23-May-2009
126. **American Society of Plant Biologists 2009 Annual Meeting**, Minisymposium 18 on Photosynthesis, Honolulu, Hawaii. Title of Invited Lecture: REP27, a thylakoid membrane protein functioning in the D1/32 kD reaction center protein turnover and PSII repair from photodamage. (Delivered by Melis lab Associate Specialist Dr. Sungsoo Park). Tuesday, July 21, 2009
127. **Ankara Polytechnic University (METU), Department of Chemical Engineering Seminar, Turkey**. Title of Seminar: Integrated Biological Hydrogen Production. Friday 25 September 2009.
128. **International Biotechnology Symposium "BIOTECH METU 2009", Ankara, Turkey**. Title of plenary lecture: Photosynthetic Biofuels. Monday 28 September 2009.
129. **93rd Annual Meeting of the Optical Society of America**. October 11-15, 2009. San Jose, CA. Title of "Optics for Renewable Energy" Symposium Invited Lecture: **Solar production of fuels**. Monday 12-October-2009.
130. **Lawrence Berkeley National Laboratory, Life Sciences and Genomics Divisions**. Title of Invited Seminar: "Photosynthetic Biofuels": *In situ* generation of hydrogen and hydrocarbons. Tuesday 10-November-2009.
131. **University of Illinois at Urbana-Champaign**. Departments of Crop Science and Plant Biology. Energy Biosciences Sponsored Seminar. Title of Invited Seminar: "Photosynthetic Biofuels": *In situ* generation of hydrogen and hydrocarbons. Wednesday 17-February-2010.
132. **Lawrence Livermore National Laboratory. Biosciences and Biotechnology Division (BBTD) Seminar Series**. Title of Invited Seminar: Photosynthesis and the Renewable Generation of Biofuels. Thursday 04-March-2010.
133. **American Chemical Society 239th National Meeting. Division of Petroleum Chemistry (PETR)**. 3rd International Symposium on Hydrogen from Renewable Sources and Refinery Applications. Title of Invited Lecture: Integrated Biological Hydrogen Production. Sunday 21-March-2010.