

## **CURRICULUM VITAE**

### **ANASTASIOS (Tasios) MELIS, Ph.D.**

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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**

(Emphasis on the Biophysics of Photosynthesis, 1975)

**Rijksuniversiteit 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:

1971-75 International Atomic Energy Agency Fellow (1971-73); Graduate Teaching Assistant (1973-74); Graduate Research Assistant (1974-75).

Greek Atomic Energy Commission:

1975-76 Research Center Democritos, Athens, Institute of Biology

German Scientific Exchange Program Fellow (DAAD):

1976-77 Weizmann Institute of Science, Rehovot-Israel, Department of Biochemistry

European Molecular Biology Organization:

1977-79 Research Fellow, Rijksuniversiteit Leiden, Holland, Dept. of Biophysics

Stanford University, Stanford, California:

1979-81 Research Fellow, Carnegie Institution for Science, Dept. of Plant Biology

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

### **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

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

DaimlerChrysler "University Research Award" (2003)

US DOE, Hydrogen Program Research Achievement Award (2004)

Elected to the rank of Fellow, American Association for the Advancement of Science (AAAS), 2011

## **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. DOE Hydrogen, Fuel Cells and Infrastructure Technologies Program Review Panel (June 2008-2010)
7. Organizer and Chair of the College of Natural Resources Undergraduate Honors Research Symposium (1996-present).
8. Science Foundation of Arizona (SFAz) Review Panel Member (2008) and Chair of the Panel (2010).
9. DOE ARPA-E workshop plenary speaker and workshop participant (December 2010).
10. DOE Office of Science on Biological and Environmental Research Review Panel (February 2011).
11. DOE Office of Biomass Programs on Algae Biomass Review Panel (April 2011).
12. DOE Hydrogen and Fuel Cells Program Review Panel (May 2011).
13. DOE BioEnergy Technologies Office Review Panel (May 2013).

## **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 conversion efficiency and photosynthetic productivity in plants and algae. **United States Patent 7,745,696** (issued 29-June-2010)
4. Melis A (2011) Short chain volatile hydrocarbon production using genetically engineered microalgae, cyanobacteria or bacteria. **United States Patent 7,947,478** (issued 24-May-2011)
5. Melis A (2012) Short chain volatile hydrocarbon production using genetically engineered microalgae, cyanobacteria or bacteria. **United States Patent 8,133,708** (cyanobacteria; issued 13-Mar-2012)
6. Melis A, Lindberg P (2014) Isoprene hydrocarbon production using genetically engineered cyanobacteria. **United States Patent 8,802,407** (issued 12-August-2014)
7. Melis A, Bentley FK, Wintz H-C Chen (2015) Continuous diffusion based method of cultivating photosynthetic microorganisms in a sealed photobioreactor to obtain volatile hydrocarbons. **United States Patent 8,993,290** (issued 31-March-2015).

## **EDITORIAL SERVICE (last 5-years)**

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

Associate Editor, **BioEnergy Research** (July 2012-present).

## **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)

Bioenergy (PLANTBI 122, 2 semester units)

### Graduate

Biochemistry of Biofuels (PLANTBI 222, 1 semester unit)

Plant and Microbial Photosynthesis (PLANTBI 290. 1 semester unit)

## **SOCIETY MEMBERSHIPS**

American Association for the Advancement of Science; 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 fuels and chemicals, in a process where a single organism acts both as catalyst and processor, synthesizing and secreting ready to use commodity products.

The lab contributed with a breakthrough in the field, when in 2000 we demonstrated, for the first time, how to sustainably divert the natural flow of photosynthesis in microalgae and to generate hydrogen gas, instead of the normally produced oxygen. In 2010, the Melis lab pioneered yet a new platform for the renewable generation of isoprene (C<sub>5</sub>H<sub>8</sub>) hydrocarbons, derived entirely from sunlight, carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O) from microalgae and cyanobacteria. The process of generating isoprene (C<sub>5</sub>H<sub>8</sub>) hydrocarbons, currently serves as a case study in the development of technologies for the renewable generation of a multitude of biofuels and other useful bio-products.

The Melis lab also pioneered and currently leads an international effort to improve, by up to 300%, the efficiency and productivity of photosynthesis in mass cultures under bright sunlight conditions. This can be achieved upon genetically minimizing the array of chlorophyll molecules that serve as antennae in the absorbance of sunlight for the photosynthetic apparatus.

In sum, the Melis lab has succeeded in diverting the flow of photosynthesis toward alternative high-impact bio-products instead of the normally produced sugars. A number of "blueprints" are currently in the R&D stage, leading to the generation of fuels and feedstock for the synthetic chemistry industry. 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 feedstock for the synthetic chemistry industry.

## PUBLICATIONS (Past 5-years)

### Peer-reviewed Papers, Reviews and Book Chapters

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 A (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* 23:763-775
231. Ort DR, Zhu X-G, Melis A (2011) Optimizing antenna size to maximize photosynthetic efficiency. *Plant Physiol.* 155(1):79-85
232. Eroglu E, Melis A (2011) Photobiological hydrogen production: Recent advances and state of the art. *Biores. Technol.* 102:8403-8413
233. Blankenship RE, Tiede DM, Barber J, Brudvig GW, Fleming G, Ghirardi ML, Gunner MR, Junge W, Kramer DM, Melis A, Moore TA, Moser CC, Nocera DG, Nozik AJ, Ort DR, Parson WW, Prince RC, Sayre RT (2011) Comparing photosynthetic and photovoltaic efficiencies and recognizing the potential for improvement. *Science* 332:805-809
234. Melis A (2011) Short chain volatile hydrocarbon production using genetically engineered microalgae, cyanobacteria or bacteria. **United States Patent 7,947,478** (green microalgae; issued 24-May-2011)
235. Bentley FK, Melis A (2012) Diffusion-based process for carbon dioxide uptake and isoprene emission in gaseous/aqueous two-phase photobioreactors by photosynthetic microorganisms. *Biotech Bioeng* 109:100-109 DOI 10.1002/bit.23298
236. Mitra M, Ng S, Melis A (2012) The *TLA1* protein family members contain a variant of the plain MOV34/MPN domain. *Amer J Biochem Mol Biol.* 2(1): 1-18
237. Melis A (2012) Photosynthesis-to-Fuels: From sunlight to hydrogen, isoprene, and botryococcene production. *Energy Environ. Sci.* 5(2): 5531-5539. DOI: 10.1039/c1ee02514g
238. Kirst H, Garcia-Cerdan JG, Zurbriggen A, Melis A (2012) Assembly of the light-harvesting chlorophyll antenna in the green alga *Chlamydomonas reinhardtii* requires expression of the *TLA2-CpFTSY* gene. *Plant Physiol* 158: 930-945
239. Mitra M, Dewez D, García-Cerdán JG, Melis A (2012) Polyclonal antibodies against the *TLA1* protein also recognize with high specificity the D2 reaction center protein of PSII in the green alga *Chlamydomonas reinhardtii*. *Photosynth Res* 112:39-47
240. Melis A (2012) Short chain volatile hydrocarbon production using genetically engineered microalgae, cyanobacteria or bacteria. **United States Patent 8,133,708** (cyanobacteria; issued 13-Mar-2012)
241. Zurbriggen A, Kirst H, Melis A (2012) Isoprene production via the mevalonic acid pathway in *Escherichia coli* (Bacteria). *BioEnergy Res* 5(4): 814-828, DOI 10.1007/s12155-012-9192-4
242. Hong S-Y, Zurbriggen A, Melis A (2012) Isoprene hydrocarbons production upon heterologous transformation of *Saccharomyces cerevisiae*. *J Appl Microbiol* 113: 52-65
243. Xie D-Y, Melis A (2012) Special Issue on metabolic plant biology (Editorial). *Planta* 236:763-764
244. Kirst H, Garcia-Cerdan JG, Zurbriggen A, Ruehle T, Melis A (2012) Truncated photosystem chlorophyll antenna size in the green microalga *Chlamydomonas reinhardtii* upon deletion of the *TLA3-CpSRP43* gene. *Plant Physiol.* 160(4):2251-2260
245. Mitra M, Kirst H, Dewez D, Melis A (2012) Modulation of the light-harvesting chlorophyll antenna size in *Chlamydomonas reinhardtii* by *TLA1* gene over-expression and RNA interference. *Phil. Trans. R. Soc. B* 367:3430-3443
246. Bentley FK, García-Cerdán JG, Chen H-C, Melis A (2013) Paradigm of monoterpene ( $\beta$ -phellandrene) hydrocarbons production via photosynthesis in cyanobacteria. *BioEnergy Res.*

- 6:917–929; DOI: [10.1007/s12155-013-9325-4](https://doi.org/10.1007/s12155-013-9325-4)
247. Melis A (2013) Carbon partitioning in photosynthesis. *Curr Opin Chem Biol.* 17:453–456; <http://dx.doi.org/10.1016/j.cbpa.2013.03.010>
  248. Chen H-C, Melis A (2013) Marker-free genetic engineering of the chloroplast in the green microalga *Chlamydomonas reinhardtii*. *Plant Biotech J.* 11: 818–828; DOI: [10.1111/pbi.12073](https://doi.org/10.1111/pbi.12073)
  249. Kirst H, Melis A (2014) The chloroplast *Signal Recognition Particle* pathway (CpSRP) as a tool to minimize chlorophyll antenna size and maximize photosynthetic productivity. *Biotechnology Advances* 32: 66–72 DOI: [10.1016/j.biotechadv.2013.08.018](https://doi.org/10.1016/j.biotechadv.2013.08.018)
  250. Bentley FK, Zurbriggen A, Melis A (2014) Heterologous expression of the mevalonic acid pathway in cyanobacteria enhances endogenous carbon partitioning to isoprene. *Molecular Plant* 7:71-86; doi:[10.1093/mp/sst134](https://doi.org/10.1093/mp/sst134)
  251. Formighieri C, Melis A (2014) Regulation of  $\beta$ -phellandrene synthase gene expression, recombinant protein accumulation, and monoterpene hydrocarbons production in *Synechocystis* transformants. *Planta* 240:309–324 DOI: [10.1007/s00425-014-2080-8](https://doi.org/10.1007/s00425-014-2080-8)
  252. Kirst H, Formighieri C, Melis A (2014) Maximizing photosynthetic efficiency and culture productivity in cyanobacteria upon minimizing the phycobilisome light-harvesting antenna size. *Biochim Biophys Acta - Bioenergetics* 1837(10):1653-1664 DOI: [10.1016/j.bbabi.2014.07.009](https://doi.org/10.1016/j.bbabi.2014.07.009)
  253. Melis A, Lindberg P (2014) Isoprene hydrocarbon production using genetically engineered cyanobacteria. **United States Patent 8,802,407** (issued 12-August-2014)
  254. Formighieri C, Melis A (2014) Carbon partitioning to the terpenoid biosynthetic pathway enables heterologous  $\beta$ -phellandrene production in *Escherichia coli* cultures. *Arch Microbiol* 196(12):853-861 DOI [10.1007/s00203-014-1024-9](https://doi.org/10.1007/s00203-014-1024-9)
  255. Chaves JE, Kirst H, Melis A (2015) Isoprene production in *Synechocystis* under alkaline and saline growth conditions. *J Appl Phycol* 27:1089–1097 DOI: [10.1007/s10811-014-0395-2](https://doi.org/10.1007/s10811-014-0395-2)
  256. Melis A, Bentley FK, Wintz H-C Chen (2015) Continuous diffusion based method of cultivating photosynthetic microorganisms in a sealed photobioreactor to obtain volatile hydrocarbons. **United States Patent 8,993,290** (issued 31-March-2015).
  257. Formighieri C, Melis A (2015) A phycocyanin\*phellandrene synthase fusion enhances recombinant protein expression and  $\beta$ -phellandrene (monoterpene) hydrocarbons production in *Synechocystis* (cyanobacteria). *Metab Eng* 32:116–124 <http://dx.doi.org/10.1016/j.ymben.2015.09.010>

#### **INVITED SEMINARS AND LECTURES (past 5-years)**

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 239<sup>th</sup> National Meeting. Division of Petroleum Chemistry (PETR).** 3<sup>rd</sup> International Symposium on Hydrogen from Renewable Sources and Refinery Applications. Title of Invited Lecture: Integrated Biological Hydrogen Production. Sunday 21-March-2010.
134. **DOE ARPA-E workshop on "Applied Biotechnology for Transportation Fuels: Meeting Today's Energy Needs by Maximizing Photon Capture".** Title of invited “workshop introductory lecture” (one of three): Photosynthesis to Fuels - Enhancing Fuel Production in Cyanobacteria and Microalgae. Thursday 02-December-2010.
135. **Gordon Research Conference on Renewable Energy: Solar Fuels.** Ventura, CA. Title of Invited Lecture: Photosynthesis for the Direct Generation of Fuels. Tuesday 18-January-2011
136. **US Department of Energy. Hydrogen and Fuel Cells Program Webinar, Washington, DC.** Title of Invited Webinar Presentation: Photosynthesis for Hydrogen and Fuels Production. Monday 24-January-2011. <[http://www1.eere.energy.gov/hydrogenandfuelcells/webinar\\_archives.html](http://www1.eere.energy.gov/hydrogenandfuelcells/webinar_archives.html)>

137. **Yale University, Climate and Energy Institute, Annual Conference on Technological Innovation for a Secure Energy Future, New Haven, CT.** Title of Science Keynote Lecture: Photosynthesis for Hydrogen and Isoprene Production. Saturday 09-April-2011.
138. **Gordon Research Conference on Photosynthesis.** Davidson College, in Davidson, North Carolina. Title of Invited Section Lecture: Photosynthesis for hydrogen and isoprene production. Thursday 16-June-2011
139. **International Conference on Hydrogen Production (ICH2P-11).** Thessaloniki, Greece. Title of Invited Plenary Lecture: Photosynthesis for Hydrogen and Fuels Production. Monday 20-June-2011.
140. **American Society of Plant Biologists 2011 Annual Meeting, Applied Plant Biology Minisymposium,** Minneapolis, Minnesota. Title of Invited Presentation: Photosynthetic isoprene (C<sub>5</sub>H<sub>8</sub>) production in cyanobacteria and microalgae. (Delivered by Melis-lab Postdoctoral Research Scholar Dr. Fiona K. Bentley). Monday, August 08, 2011.
141. **Department of Energy, Hydrogen Production Tech Team Conference.** National Renewable Energy Laboratory, Golden Colorado. Title of Invited Lecture: Maximizing Light Utilization Efficiency and Hydrogen Production in Microbial Cultures. Thursday, September 1, 2011.
142. **Colorado State University, Fort Collins. Department of Biology.** Title of Invited Seminar: "Photosynthesis for hydrogen (H<sub>2</sub>) and isoprene (C<sub>5</sub>H<sub>8</sub>) production". Tuesday, September 27, 2011.
143. **Universität Bielefeld, Centrum für Biotechnologie (CeBiTec) Distinguished Lecture, Germany.** Title of Invited Distinguished Lecture: "Photosynthesis for hydrogen (H<sub>2</sub>) and isoprene (C<sub>5</sub>H<sub>8</sub>) fuels production. Monday, November 7, 2011.
144. **Energy Biosciences Institute, UC Berkeley.** Title of Invited Seminar: "Photosynthesis-to-Fuels: From sunlight to hydrogen and isoprene production". Tuesday, January 31, 2012
145. **AIChE (American Institute of Chemical Engineers) Northern California Section,** February 2012 Dinner Meeting. Title of Invited Lecture: "Photosynthesis-to-Fuels: Converting sunlight to hydrogen and hydrocarbons". Thursday, February 23, 2012
146. **American Chemical Society 243rd National Meeting & Exposition, San Diego, CA.** Title of Invited Plenary Lecture in the Symposium "Hydrogen Production and Application": Photobiological hydrogen production. Sunday 25-Mar-2012
147. **American Chemical Society 243rd National Meeting & Exposition, San Diego, CA.** Title of Invited Lecture in the Symposium "Microalgae-Derived Products": Hydrogen, isoprene, and botryococcene production via microalgal photosynthesis. Monday 26-Mar-2012
148. **The Royal Society, Theo Murphy International Scientific Meeting on "Structure and Dynamics of the Thylakoid Membrane,** Chicheley Hall, UK. Title of Invited Lecture: Lateral heterogeneity and the photosystem-II damage and repair cycle. Thursday 3-May-2012
149. **2012 Symposium on Sustainable Production of Food and Fuel for the 21st Century, La Jolla, CA.** Title of Invited Lecture: Sunlight energy conversion to hydrogen (H<sub>2</sub>) and isoprene (C<sub>5</sub>H<sub>8</sub>). Saturday 12- May-2012
150. **Synthetic Genomics, Inc., La Jolla, CA.** Title of Invited Lecture: Driving Microalgae to Fuels Production. Friday 08-June-2012.
151. **2nd International Conference on Algal Biomass, Biofuels and Bioproducts. San Diego, CA.** Title of Primary Lecture in Session 1A: Photosynthesis-to-Fuels: from sunlight to hydrogen (H<sub>2</sub>) and isoprene (C<sub>5</sub>H<sub>8</sub>) production. Monday 11-June-2012.

152. **Scripps Institution of Oceanography, UC San Diego, La Jolla, CA.** Title of Invited Marine Biotech Lecture: Microalgal Photosynthesis for Direct Fuels Production. Thursday 14-June-2012.
153. **American Society of Plant Biologists 2012 Annual Meeting. Minisymposium 4 on Algae,** Austin, Texas. Title of Invited Presentation: Photosynthetic generation of isoprene in cyanobacteria via heterologous expression of the *Pueraria montana* (kudzu) isoprene synthase gene. (Delivered by Melis-lab Postdoctoral Research Scholar Dr. Fiona K. Bentley). Saturday, July 21, 2012.
154. **American Society of Plant Biologists 2012 Annual Meeting.** Austin, Texas. **Minisymposium 4 on Algae,** Title of Invited Presentation: Assembly of the light-harvesting chlorophyll antenna in the green alga *Chlamydomonas reinhardtii* requires expression of the TLA2-CPFTSY gene. (Delivered by Melis-lab Postdoctoral Research Scholar Dr. Henning Kirst). Saturday, July 21, 2012.
155. **Federation of the European Societies of Plant Biology 2012 Congress.** Freiburg, Germany. **Symposium on Photosynthesis.** Title of Invited Presentation: Photosynthesis-to-Fuels: Isoprene production in cyanobacteria upon heterologous expression of the *Pueraria montana* (kudzu) isoprene synthase gene. Tuesday, July 31, 2012
156. **EU Photosynthesis Workshop: from Science to Industry. Marie Curie Program on Training in BioSolar Research.** Title of Plenary Invited Presentation: Using and abusing photosynthesis to produce fuels and chemicals. Tuesday, October 9, 2012.
157. **University of Alabama, Tuscaloosa, College of Engineering.** Title of Invited Interdepartmental Seminar: Using photosynthesis to make fuels and chemicals. Thursday February 21, 2013.
158. **Olomouc Biotechnology 2013: Plant Biotechnology G4G-II.** Czech Republic. Title of Invited Presentation: Photosynthesis-to-Fuels: maximizing solar-to-product efficiencies. Thursday, June 20, 2013.
159. **16<sup>th</sup> International Congress on Photosynthesis Research,** St. Louis August 11-16, 2013. Contributed Talks Session 1 on Light Harvesting. Title of selected oral presentation: The chloroplast-localized CpFTSY and CpSRP43 proteins in the green alga *Chlamydomonas reinhardtii* facilitate assembly of the light-harvesting chlorophyll antenna. (Delivered by Melis-lab Postdoctoral Research Scholar Dr. Henning Kirst.) Monday, August 12, 2013.
160. **16<sup>th</sup> International Congress on Photosynthesis Research,** St. Louis August 11-16, 2013. Contributed Talks Session 8 on Bioenergy. Title of selected oral presentation: Photosynthetic isoprene (C<sub>5</sub>H<sub>8</sub>) production in the cyanobacterium *Synechocystis* sp. PCC 6803 (Delivered by Melis-lab Postdoctoral Research Scholar Dr. Fiona K. Bentley.) Wednesday, August 14, 2013.
161. **University of California, Davis.** Plant Sciences Departmental Seminar Speaker. Title of invited seminar: Photosynthesis for Fuel and Chemicals Production. Friday, February 21, 2014.
162. **The 4<sup>th</sup> Korea Carbon Capture and Storage International Conference.** Jeju, South Korea. Title of invited plenary lecture: Microalgal photosynthesis for carbon sequestration and fuel and chemicals production. Wednesday, February 26, 2014.
163. **Hanyang University, Seoul, South Korea.** Departmental of Biology Seminar Speaker. Title of invited seminar: Measurement of theoretical maximum and experimentally achievable productivity of photosynthesis. Thursday, February 27, 2014.
164. **Inha University, Incheon, South Korea.** Department of Biological Engineering Seminar Speaker. Title of invited seminar: Photosynthesis for Fuel and Chemicals Production. Friday, February 28, 2014.

165. **ITC Limited, Bangalore, India.** ITC Technology Day 2014 Invited Keynote Address. Title: Metabolic engineering to redirect photosynthesis toward biofuels, high value bio-products and nutraceuticals from tobacco. Friday, June 6, 2014.
167. **IUPAB International Biophysics Congress 2014, Brisbane, Australia.** Invited Keynote Presentation. Title: Solar energy conversion efficiencies in photosynthesis: Minimizing the chlorophyll antennae to maximize efficiency. Wednesday, August 6, 2014.
168. **University of Crete, Greece.** Department of Chemistry and Biochemistry. Title of invited seminar: Photosynthesis for Fuel and Chemicals Production. Friday, October 3, 2014.
169. **Washington University, Saint Louis.** Department of Biology Seminar Speaker. Title of invited seminar: Photosynthetic generation of fuel and chemicals. Monday, April 6, 2015.
170. **First International Solar Fuels Conference, Uppsala, Sweden.** Title of invited Opening Plenary Lecture: Photosynthesis for fuel and chemicals production. Sunday, April 26, 2015.
171. **International Conference on Photosynthesis Research for Sustainability, Crete, Greece.** Title of invited plenary lecture: Photosynthesis for fuel and chemicals production. Tuesday, September 22, 2015.
172. **International Plant Molecular Biology Congress, Iguassu Falls, Brazil.** Title of invited Symposium lecture: Photosynthetic generation of terpene-derived fuel and chemicals. Tuesday, October 27, 2015
173. **2015 USDA AES Multistate Research Project NC1200 Annual Meeting, Saint Louis, MO.** Title of presentation: "Regulation of photosynthetic processes. Saturday, November 7, 2015