

## Young research investigators honored at the 2011 Gordon research conference on photosynthesis: ambiance and a perspective

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**Abstract** Using photographs taken at the conference site, we provide a perspective on (i) the awards that were given to four young investigators at the 2011 Gordon Research Conference on Photosynthesis, and (ii) the ambiance at this conference, held at Davidson College, North Carolina, during June 12–17, 2011.

**Keywords** Aaron M. Collins · Nicholas J. Cox · Joshua K. Endow · Yan Lu

### Introduction

Gordon Conferences on Photosynthesis have taken place since 1969 (see: <http://www.grc.org/conferences.aspx?id=0000207>) These conferences are traditionally limited in size to 100–150 participants and are very intense with morning and evening sessions, as well as poster sessions in the afternoons with ample opportunity for one-to-one

discussions during the afternoons and late evenings often going past midnight.

From the present to the past, photosynthesis conferences were chaired by: Krishna (Kris) K. Niyogi (2011); Doug Bruce (2009); Willem (Wim) F. J. Vermaas (2008); R. David (Dave) Britt (2006); Sabeeha Merchant (2005); Marilyn Gunner (2003); Donald (Don) A. Bryant (2002); Gary W. Brudvig (2000); John H. Golbeck (1999); Melvin (Mel) Okamura (1997); Charles (Charlie) F. Yocum (1996); Marion C. Thurnauer (1994); Bruce A. Diner (1993); Robert (Bob) E. Blankenship (1991); William (Bill) A. Cramer (1990); Colin A. Wraight (1988); Richard (Dick) Malkin (1987); Gerald (Jerry) T. Babcock (1985); Richard (Dick) Dilley (1984); Paul A. Loach (1983); Richard (Dick) E. McCarty (1981); William (Bill) W. Parson (1980); David (Dave) W. Krogmann (1978); Roderick (Rod) Clayton (1975); Anthony (Tony) San Pietro (1973); and Donald (Don) R. Keister (1969).

The 2011 conference was held during June 12–17, 2011, at the Davidson College, North Carolina. It was chaired by Krishna Niyogi, University of California at Berkeley and the Vice-Chair was Richard Debus, University of California at Riverside. The program and the list of participants of the conference are available at: <http://www.grc.org/programs.aspx?year=2011&program=photosyn>.

Below we provide a personal perspective on (i) the awards that were given to four young investigators at the 2011 conference; and (ii) the ambiance at this conference through some photographs.

### The awards

Four Young investigators honored with awards at the 2011 Gordon Research Conference on Photosynthesis are

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**Fig. 1** The 2011 Gordon Research Conference on Photosynthesis chair Krishna (Kris) Niyogi (*far left*) joins the four recognized Young Investigators. They are (*left to right*) Aaron Collins, Joshua Endow,

(in alphabetical order): Aaron M. Collins (Sandia National Laboratories, Albuquerque, New Mexico, USA); Nicholas (Nick) J. Cox (Max-Planck Institute for Bioinorganic Chemistry, Mülheim/Ruhr, Germany); Joshua K. Endow (University of California, Davis, California, USA); and Yan Lu (Michigan State University, East Lansing, Michigan, USA): see Fig. 1. A committee, based on a range of criteria including the novelty and quality of research, as

Yan Lu, and Nicholas (Nick) Cox as well as the 2011 Vice-Chair and the 2012 Chair-elect Richard (Rick) Debus, and Govindjee

well as technical and artistic aspects of the poster, selected these honored young investigators.

Each of the young investigators was invited to present a talk, based on his/her poster, in the Thursday (June 16, 2011) evening session at the conference. Each of the four awardees gave the audience a fascinating view of the exciting original research performed by them. In addition to the recognition by the Conference, one of the authors (Govindjee), the

**Fig. 2** Govindjee presents books from the Series “Advances in Photosynthesis and Respiration” to featured Young Investigators at the 2011 Gordon Research Conference on Photosynthesis. Clockwise from *top left* Aaron Collins, Nick Cox, Yan Lu, and Joshua Endow



founding Series Editor of *Advances in Photosynthesis and Respiration*, Springer, personally presented a gift of one of the current volumes of this Series to each winner in recognition of his/her exceptional talent (see Fig. 2).

### The awardees

We provide below brief statements about the academic background of the 2011 awardees; these are based on the information provided by the investigators themselves. We have arranged the awardees alphabetically.

Aaron M. Collins

Aaron Collins received his Ph.D. in Chemistry from the Washington University in St. Louis, Missouri, USA, in 2010. His graduate work, with Professor Robert (Bob) Blankenship, involved biochemical and spectroscopic characterization of the photosynthetic apparatus from *Roseiflexus castenholzii*, a filamentous anoxygenic phototroph. He is currently a post-doctoral researcher at Sandia

National Laboratories with Dr. Jerilyn Timlin. Aaron's research involves using emerging microscopy techniques to understand the global distribution of photosynthetic complexes and pigments in vivo and how this distribution is related to overall function of these complexes. His Gordon Conference poster was on "Quantitative Biochemical Characterization of *Chlamydomonas reinhardtii* Mutants with Altered Antenna Size by Hyperspectral Confocal Fluorescence Microscopy." In this collaborative work, with the laboratory of Prof. Richard (Dick) Sayre, at the Donald Danforth Plant Science Center, multivariate analysis and hyperspectral fluorescence microscopy were used to spectrally resolve, quantify and localize Photosystem II, Light Harvesting Complex II and carotenoid pigments in individual living cells of the green alga *Chlamydomonas*.

Nicholas J. Cox

Nick Cox received his Ph.D., in 2008, in Physical Chemistry from the Australian National University, Canberra, Australia under the supervision of Dr. Ron Pace and Prof. Elmarz Krausz. Currently, he is a Post-doctoral fellow at



**Fig. 3** Photosystem II researchers engaged in thought-provoking discussions at the Gordon Research Conference on Photosynthesis. *Top row (left to right)* Jian-Ren Shen (Japan), William (Bill) Rutherford (UK), Ron Pace (Australia). *Bottom row (left)* Gennady Ananyev, Charles (Chuck) Dismukes (his picture is included although

he was physically not there, but he was there in spirit, and through three of his students, who attended the conference, not shown) and Nikolai Lebedev (all of them from USA); *(middle)* Johannes Messinger (Sweden); *(right, top)* Junko Yano (USA); *(right, bottom)* Robert (Rob) Burnap (USA)



**Fig. 4** The growing field of biofuels was well represented at the 2011 Gordon Research Conference on Photosynthesis. Clockwise from *top left* Sabeeha Merchant (USA), Alison Smith (UK) & Ursula

Goodenough (USA), Anastasios (Tasso) Melis (USA), Willem (Wim) Vermaas (USA), and Robert (Bob) Blankenship (USA)

the Max-Planck Institute (MPI) of Bioinorganic Chemistry, in Mülheim/Ruhr, Germany, with Prof. Wolfgang Lubitz. Nick's research is focused on the study of biological samples using both magneto-optical and magnetic resonance spectroscopy. His research interests include: exciton coupling within large pigment assemblies, the EPR (Electron Paramagnetic Resonance) of transition metals, particularly of metallo-cofactors, the EPR of radicals involved in electron transfer within the biological photosynthetic apparatus and recently the development of synthetic enzymes and catalysts. He is currently working on the application of high field EPR for the detection of substrate binding to the oxygen-evolving complex of Photosystem II. His Gordon Conference poster was entitled "Detection of Water Binding to Photosystem II, a Multifrequency  $^1\text{H}/^2\text{H}/^{15}\text{N}/^{17}\text{O}$ -ENDOR Study; an Experimental Determination of the Protonation State of the  $\text{S}_2$  State." This study represents a collaborative effort between the MPI Mülheim/Ruhr, CEA (Centre Energie Atomique), Saclay, France, Ruhr Universität Bochum, Germany and Umeå University in Sweden.

Joshua K. Endow

Joshua Endow received his B.S., in 2008, in Horticulture from the California State Polytechnic University, Pomona, USA. He is currently working toward a Ph.D. in Plant

Biology in the laboratory of Professor Kentaro Inoue at the University of California, Davis, USA. Joshua is interested in how proteins are specifically sorted within the chloroplast to the correct compartment and orientation that allows them to perform photosynthetic and other functions. His dissertation study is focused on a protein called Plastidic type I signal peptidase 1 (Plsp1) that is fascinating both in its targeting to two chloroplast membranes and its role in removing the sorting signals of other proteins. Joshua is utilizing chloroplast protein import assays, genetic complementation, confocal microscopy, BN-PAGE (Blue native polyacrylamide gel electrophoresis) and co-immunoprecipitation to investigate these aspects of Plsp1. His Gordon Conference poster was titled "Towards Understanding the Mechanism of Sorting and the Functional Organization of Plastidic Type I Signal Peptidase 1."

Yan Lu

Yan Lu received her Ph.D. in Botany from University of Wisconsin-Madison in 2005. During her Ph.D., she studied the pathway and regulation of starch degradation and maltose metabolism in the laboratory of Professor Thomas (Tom) D. Sharkey. After graduation, Yan has been working on a chloroplast functional genomics project in the laboratory of Professor Robert L. Last at the Michigan State University. The major focus of this project is parallel



**Fig. 5** The soccer match has long been a tradition of the Photosynthesis Gordon Research Conferences. *Top* Players break for water and a group photo, *left bottom* Sergei Savikhin spar on the field, *right*

*bottom* Enthusiastic fans watch from the sidelines (from *left to right* Laura Houille-Vernes, Lærke Marie M. Lassen, Carolyn Wetzel, and Aparna Nagarajan)



**Fig. 6** High (92°F) temperature and busy science sessions didn't stop intense play on the field. Clockwise from *top left* Sergei Savikhin (striped shirt) with another player; Gary Brudvig takes a tumble

against Steven Burgess, Bill Rutherford gears up for a kick, with Lisa Olshansky watching; Sergei Savikhin protects the ball against Nickolas Ross; Lisa Olshansky defends against Kris Niyogi



**Fig. 7** Photosynthesis researchers gather to say goodbye until the next Gordon Conference. *Top left* Rick Debus (USA), Rob Burnap (USA), Gary Brudvig (USA), Terry Bricker (USA) and Kevin Redding (USA); *Top right* Jeremy Hall (USA), Kelsey McNeeley (USA), David Vinyard (USA), Govindjee (USA), Liron David

(Israel), Lærke Marie M. Lassen (Denmark) and Nicholas Skizim (USA); *Bottom left* Jayashree Sainis (India), Bob Blankenship (USA), Sangeeta Negi (USA), Preston Dilbeck (USA), Aparna Nagarajan (USA), Alka Gupta (India); *Bottom right* Nicholas Skizim (USA) and Gail McLean (USA)

phenotypic screens of ~4000 *Arabidopsis* T-DNA insertion lines of nuclear-encoded plastid-targeted genes. While working on this project, Yan discovered a number of novel genes that are important for photosynthesis. The title of her 2011 Gordon Conference poster was “The Role of a Zinc Finger Protein in Photosynthesis and Light Stress Tolerance”. Yan’s work on the zinc finger protein was recently accepted by *Plant Cell*. This example shows that the functional genomics approaches can be used to identify previously unknown genes and mechanisms controlling photosynthesis and other chloroplast functions.

### The ambiance

News Reports, when accompanied by photographs, always attract attention. See, e.g., (1) Govindjee, A.W. Rutherford and R.D. Britt (2007). Four young research investigators were honored at the 2006 Gordon Research Conference on Photosynthesis. *Photosynth. Res.* 92: 137–138; additional

photographs are available at: <http://www.life.illinois.edu/govindjee/g/Photo/Gordon%20Research%202006.html>. (2) Govindjee (2009) Young research investigators honored at the 2008 and 2009 Gordon Research Conferences on Photosynthesis: ambiance and a personal perspective. *Photosynth. Res.* 102:1-6. Choice of photographs has always been a challenging job; it depends mainly upon their availability, and thus it often becomes a random choice, with no offence to others not pictured. In addition to the photographs shown in this News Report for the 2011 conference, the readers will find other photographs, especially of the soccer game at: <http://sergei.physics.purdue.edu:7925/Gordon> and of others at <http://www.life.illinois.edu/govindjee/g/Photo/Gordon2011.html>.

To name just one example of the many exciting scientific presentations, we mention the 1.9 Å atomic level structure of Photosystem II, particularly of the  $Mn_4CaO_5(H_2O)_4$  complex (Umena et al. (2011) Crystal structure of oxygen-evolving photosystem II at a resolution of 1.9 Å. *Nature* 473: 55–60). The plenary lecture by Jian-Ren Shen (Okayama University, Japan, Fig. 3) was followed by a

presentation by Johannes Messinger (Umeå University, Sweden, Fig. 3). These talks resulted in a highly thought-provoking and exciting informal discussion on Photosystem II, particularly of the mechanism of oxygen evolution (some of the key players are pictured in Fig. 3).

Another highlight of the 2011 Gordon Research Conference on Photosynthesis was the session on biofuels, which was led by Alison Smith (University of Cambridge, Fig. 4). Through presentations by Nanette Boyle (University of California, Los Angeles), Willem (Wim) Vermaas (Arizona State University, Fig. 4), Anastasios (Tasso) Melis (University of California, Berkeley, Fig. 4), and Ursula Goodenough (Washington University, Fig. 4), multiple approaches for utilizing energy from photosynthesis for our own energy needs were discussed. This section was followed by an exciting and inspiring lecture by Donald (Don) R. Ort (USDA Agriculture Research Station, Urbana, IL) on “Photosynthetic efficiency: limits and opportunities.” We refer interested readers to a recent highly relevant review coauthored by many of the conference’s attendees (Blankenship et al. (2011) Comparing photosynthetic and photovoltaic efficiencies and recognizing the potential for improvement. *Science* 332:805–809).

No Gordon Research Conference on Photosynthesis would be complete without the annual soccer match. As the field becomes more connected it is harder to delineate teams into USA versus Rest of World (ROW). Many conference participants took advantage of the brief breaks from science to partake in friendly matches (see Figs. 5 and 6).

### Concluding remarks

The 2011 Gordon Research Conference on Photosynthesis provided leading and up-and-coming researchers the

opportunity to present the latest developments in our field and was a wonderful environment for socializing with colleagues both old and new. Many attendees (such as those pictured in Fig. 7) happily await the next conference in 2012.

We wish success to Richard (Rick) Debus and David (Dave) Kramer, who will serve as Chair and the Vice-Chair, respectively, at the next Gordon Research Conference on Photosynthesis to be held in 2012 (July 8–13, Davidson College). In 2013, however, we hope to see everyone at the 16th International Photosynthesis Congress to be held in Saint Louis, Missouri, USA during August 11–16, 2013. The co-organizers of this congress are Bob Blankenship (St. Louis, Fig. 4) and Don Ort (Urbana, Illinois, USA). Information on previous international photosynthesis congresses can be found in Govindjee and D. Knaff (*Photosynth. Res.* 89: 1–2, 2006) and in Govindjee and H. Yoo (*Photosynth. Res.* 91: 95–105, 2007).

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