American Chemical Society, Orange County Section

Please vote in both the national and section elections!
So far only about 2% of the members have voted in the Section election.

Join us as we celebrate the INTERNATIONAL YEAR OF CHEMISTRY

NOVEMBER DINNER MEETING

Thursday, November 17, 2011

The DoubleTree Club Hotel
7 Hutton Centre Drive, Santa Ana
Phone: 714-751-2400

Social: 6:00 PM ~ Dinner: 6:30 PM ~ Program & Presentation: 7:00 PM

Structure-Function Studies of Diverse Forms of ADPGlucose Pyrophosphorylase

Christopher R. Meyer
Professor of Chemistry, California State University, Fullerton

Abstract: One of the research focuses in the Meyer Lab is on the complete molecular characterization of the glycogen and starch biosynthesis pathways in bacteria and plants using the tools of modern biochemistry, molecular biology, and biotechnology. The highly regulated ADPGlucose Pyrophosphorylase (ADPG PPase) serves as the rate-limiting enzyme in these pathways. There is increasing demand for the renewable and biodegradable carbon source starch in the food, chemical, electronic, and pharmaceutical industries. Starches and modified starches serve as starting materials for the synthesis of bio-ethanol and organic acids and in the making of biodegradable plastics, packaging materials, adhesives, and detergents, lessening dependence on oil resources. These renewable and biodegradable carbon sources can serve as inexpensive starting materials for bio-ethanol, organic acids, and antibiotic synthesis and have great potential for use in the making of specialty plastics, adhesives, detergents, surfactants, and packaging materials. The ADPG PPase might even serve as a target for inhibition in some pathogenic bacteria given that the mammalian pathway utilizes a different enzyme to make sugar nucleotides as well as different rate-limiting step. The activity of ADPG PPase is modulated by the binding of various metabolites that serve as allosteric effector molecules depending on the carbon utilization pathway of the organism. A complete molecular comparison of this family of diverse enzymes will allow us to perform protein engineering and directed evolution with the goal of enhancing function. The successful engineering of ADPG PPase as well as other enzymes in the pathway would allow for the overproduction of novel starches in transgenic plants. Given that enhanced starch biosynthesis has been recently shown to stimulate photosynthesis, engineered plants and/or microbes may be able to more efficiently sequester carbon thus removing CO2 from the atmosphere to combat climate change.

Our eclectic approach has led to the forging of several important interdisciplinary collaborations to complement our biochemistry expertise with x-ray crystallography and molecular modeling, analytical chemistry, and plant biotechnology. Seminal data we have produced include the first cloned and expressed ADPGlc PPase genes from particular regulatory classes, the first recombinant purification and characterization of several of these enzymes, the identification of functional amino acids by mutagenesis, and the first three-dimensional structure of a bacterial ADPGlc PPase. We are well poised to make the next step in engineering this important pathway which will meaningfully contribute to agricultural and environmental biotechnology.

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Biography: Christopher R. Meyer has extensive experience in plant biochemistry, agricultural biotechnology, and comparative enzymology. All of his higher education has taken place at agricultural or Land Grant universities—Chico State University, University of California, Riverside, and Michigan State University for his undergraduate, graduate, and postdoctoral training, respectively. After completing his undergraduate degree in chemistry, he went on to specialize in plant biochemistry at Riverside where his advanced course work in plant physiology, plant biochemistry, and photosynthesis included instruction from Randolph T. Wedding, Irwin P. Ting, Dan Arp, Justin K. M. Roberts, and Distinguished Visiting Lecturer Martin Gibbs. Meyer's graduate work in the Wedding Lab focused on the biochemical characterization of phosphoenolpyruvate carboxylase form C4 and CAM plants. He went on to postdoctoral work in the laboratory of Jack Preiss, where he conducted research in starch biosynthesis and published several papers on the molecular characterization of bacterial and plant forms of ADPGlucose pyrophosphorylase, the rate limiting enzyme in starch biosynthesis. As an independent faculty member at CSUF, Chris Meyer has focused on structure-function studies and protein engineering of diverse bacterial forms of ADPGlucose pyrophosphorylases, utilizing the eclectic tools of biochemistry, molecular biology, bioinformatics, molecular modeling, crystallography, and genomics) has increased our understanding of the active and allosteric sites of this complex enzyme and yielded the first structure of a bacterial form of the enzyme.

As a Professor of Biochemistry at CSUF and now Chair of the Department of Chemistry and Biochemistry, Chris Meyer has taught a variety of innovative biochemistry and biotechnology lab and lecture courses (including the topic of photosynthesis) to diverse chemistry, biochemistry, and biological science undergraduate and MS majors and created and developed general education modules in biotechnology, including CHEM 303C: Biotechnology, Agriculture, and the Environment. His research lab plays an active role in training undergraduate and MS students which has made them competitive candidates for graduate and professional schools (including UCLA, UC Irvine, UC San Diego, University of Wisconsin, Madison, Harvard, and Yale) as well as industrial positions (including Amgen and Allergan). He has also served as a local organizer for a number of workshops held at CSUF, the most recent being the NSF GCAT Microarray Workshop, held in July, 2008.

As a rotating Program Director at NSF in 2008-2009 (BIO MCB BMS), Chris Meyer participated in managing the Metabolic Biochemistry Panel, which included a number of awards in the general area of photosynthesis, and also assisted with Molecular Biochemistry. He collaborated with a number of other Program Directors to co-fund interdisciplinary research spanning engineering, computational biology, microbiology, chemistry, and biophysics. He also represented MCB on the Metabolic Engineering Working Group, an interagency program including various NSF divisions as well as DOE, USDA, and NIH. A number of the interdisciplinary proposals coming to this group addressed energy and biofuel needs.

Chris Meyer was recently honored to serve as the PI as well as a mentor and organizer for the recent NSF Photosynthesis Ideas Lab conference held at Asilomar, CA in September 2010 entitled "Surpassing Evolution: Transformative Approaches to Enhance the Efficiency of Photosynthesis".

All Reservations: Please contact us no later than 12 noon on Monday, November 14, 2011 at OCACS@sbcglobal.net, and indicate if you will be attending the dinner or the program only. Please list the names of all attendees.

Dinner Cost: $25 for members; $25 for member's significant other; $30 for non-members or those without reservations. **Note:** OCACS pays the hotel on the basis of the number of dinner reservations made. Your RSVP for dinner is a commitment to pay for dinner.

Program: Members and guests are invited to attend the program at 6:30PM. There is no charge for the program but reservations are requested. Space may be limited.

Directions: Take the Costa Mesa Freeway (55), exit at MacArthur Blvd. and go west (towards South Coast Plaza). Take the first left at MacArthur Place. The DoubleTree Club Hotel is straight ahead on the left. Do not turn right at MacArthur Place to the DoubleTree Hotel, which is not the same as the DoubleTree *Club* Hotel.