Final Report

DE-SC0005763

Support for Chemistry Symposia at the 2011 American Association for the Advancement of Science Meeting

Project Summary

This proposal supported Chemistry Symposia at the 2011 American Association for the Advancement of Science (AAAS) Meeting in Washington, DC February 17-21, 2011. The Chemistry Section of AAAS presented an unusually strong set of symposia for the 2011 AAAS meeting to help celebrate the 2011 International Year of Chemistry. The AAAS meeting provided an unusual opportunity to convey the excitement and importance of chemistry to a very broad audience and allowed access to a large contingent of the scientific press.

Excellent suggestions for symposia were received from AAAS Chemistry Fellows and from the chairs of the American Chemical Society Technical Divisions. The AAAS Chemistry executive committee selected topics that would have wide appeal to scientists, the public, and the press for formal proposals of symposia. The symposia proposals were peer reviewed by AAAS. The Chemistry Section made a strong case to the program selection committee for approval of the chemistry symposia and 6 were approved for the 2011 annual meeting.

The titles of the approved symposia were: (1) Powering the Planet: Generation of Clean Fuels from Sunlight and Water, (2) Biological Role and Consequences of Intrinsic Protein Disorder, (3) Chemically Speaking: How Organisms Talk to Each Other, (4) Molecular Self-Assembly and Artificial Molecular Machines, (5) Frontiers in Organic Materials for Information Processing, Energy and Sensors, and (6) Celebrating Marie Curie's 100th Anniversary of Her Nobel Prize in Chemistry.

The Chemistry Section of AAAS is provided with funds to support only 1-2 symposia a year. Because of the much greater number of symposia approved in conjunction with observance of the 2011 International Year of Chemistry, additional support was sought from DOE to help support the 30 invited speakers and 8 symposia moderators/organizers. Support for the symposia provided the opportunity to highlight the excitement of current chemical research, to educate the public about the achievements of chemistry and its contributions to the well-being of humankind. The 2011 AAAS Annual Meeting provided an important opportunity to play a prominent role in the global celebration of the 2011 International Year of Chemistry.

Support for Chemistry Symposia
at the 2011 American Association for the Advancement of Science Meeting

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Project Description

The 2011 American Association for the Advancement of Science (AAAS) Meeting was held in Washington, DC February 17-21, 2011. This meeting brought together a broad and diverse audience of about 10,000 including a large contingent from the scientific press. In conjunction with the 2011 International Year of Chemistry, six chemistry symposia were presented at the meeting. Funding from DOE helped support the 30 invited speakers and 8 symposia moderators.

A. The International Year of Chemistry 2011 (IYC 2011) is a worldwide celebration of the achievements of chemistry and its contributions to the well-being of humankind. IYC 2011 will emphasize that chemistry is a creative science essential for sustainability and improvements to our way of life. Its unifying theme is "*Chemistry—our life, our future*". The goals of IYC 2011 are to increase the public appreciation of chemistry in meeting world needs, to encourage interest in chemistry among young people, and to generate enthusiasm for the creative future of chemistry. The year 2011 is the 100th anniversary of the Nobel Prize awarded to Madame Marie Curie—an opportunity to celebrate the contributions of women to science.

The IYC 2011 is an initiative of IUPAC (the International Union of Pure and Applied Chemistry), and of UNESCO (the United Nations Educational, Scientific, and Cultural Organization). In December 2008, the 63rd General Assembly of the United Nations adopted a resolution proclaiming 2011 as the International Year of Chemistry. For more information on IYC 2011, see: http://www.chemistry2011.org/

B. Selection of Chemistry Symposia for the 2011 AAAS Meeting.

The Chemistry Section of AAAS sought suggestions for symposia from all AAAS Chemistry Fellows and also from the chairs of the American Chemical Society Technical Divisions. Many excellent suggestions were received and the Executive Committee of the AAAS Chemistry Section helped to pick topics that would appeal to a wide range of scientists, the public, and the

press. Symposia organizers submitted seven proposals for chemistry symposia. AAAS peer reviewed all proposed symposia. The Chemistry Section of AAAS made a case to the AAAS meeting program committee for approval of a large number of chemistry symposia for the following reasons: (1) the importance of educating the public (and other scientists) about the achievements of chemistry and its contributions to the well-being of humankind, (2) the currency and excitement of chemistry, and (3) the opportunity for the 2011 AAAS Annual Meeting to play a prominent role in the global celebration of International Year of Chemistry 2011. Peer review of the chemistry proposals went well. The Chemistry Section was delighted that six chemistry symposia were selected for the 2011 AAAS Meeting.

C. Chemistry Symposia for the 2011 AAAS Meeting.

Powering the Planet: Generation of Clean Fuels from Sunlight and Water. Every major change in the living standards for humanity has had an energy revolution at its heart - the advent of the industrial age with the steam engine and use of coal, the internal combustion engine and large-scale electricity generation. The energy demand, primarily from emerging economies, will double by 2050. The countervailing urgency of the threat of climate change requires a major shift in our energy sourcing, creating four new trends that will shape the current century: electrification, decarbonization, localization, and optimization. Amongst the renewable energy sources, only two are global in scale: biofuels, and solar energy. Solar Fuels is one of the "holy grails" in the 21st Century – the economical conversion of solar energy into stored chemical fuels. Research targeting efficient utilization of solar energy is inherently interdisciplinary, involving inorganic and organic synthesis, solid state chemistry and physics, electrochemistry, chemical kinetics and mechanism, and theoretical and computational chemistry. This symposium will bring together 6 of the world's foremost experts to discuss the current and future research in this area. [*Symposium Organizer*: Professor Harry B. Gray, California Institute of Technology]

Biological Role and Consequences of Intrinsic Protein Disorder. Since the determination of the first protein structure in 1959, the prevailing dogma posited that the biological function of proteins is encoded in their three-dimensional structures; in short, a stable folded protein structure was thought to be a prerequisite for protein function. It is now evident that a large proportion of eukaryotic proteins (~60% of proteins involved in cancer or cell signaling, for example) do not adopt well-defined 3D structures, but are partly or entirely disordered. Such intrinsically disordered proteins perform critical functions in cellular signaling and regulatory mechanisms and are associated with debilitating human diseases that include cancer, neurodegenerative, and amyloid diseases. Like all paradigm shifts, the generality and functional significance of intrinsically disordered proteins has taken some time to be recognized and accepted. However, the field has exploded in recent years as more and more intrinsically disordered proteins have been identified and their functional roles uncovered. There is now great interest in the physical and structural properties and biological function of intrinsically disordered proteins and the study of these is a rapidly emerging field. Despite the recent surge of activity, the prevalence of protein disorder and its association with disease remains largely underappreciated. The goals of this symposium are to promote broader awareness of protein disorder and to catalyze new interest and activity in the field. [*Symposium Organizers*: Professors Peter E. Wright and H. Jane Dyson, Scripps Research Institute]

Molecular Self-Assembly and Artificial Molecular Machines. All living systems rely on complex supramolecular structures with highly sophisticated components, which operate within cell membranes and cell compartments. Nature is remarkable in composing such complex organizations to achieve the necessary functions of life. The study of model molecular constructs in this realm provides an important window for enhancing our understanding. Moreover, the design and fabrication of artificial molecular machines is one of the great scientific challenges of our times. This symposium on molecular self-assembly and artificial molecular machines will contain lectures that reflect the current state of the art in this exciting research area. [*Symposium Organizers*: Professor Miguel A. Garcia-Garibay, University of California, Los Angeles and Dr. Bruce E. Maryanoff, The Scripps Research Institute]

Frontiers in Organic Materials for Information Processing, Energy and Sensors. The field of Functional Pi-Systems has grown tremendously in the past 15 years. Nobel Prizes have recently been awarded in this area to Heeger, MacDiarmid, and Shirakawa, and to Tsien. New technologically and biologically important developments of broad industrial and societal interest have resulted from cutting-edge research, namely in photonics, displays, and biological labeling. The main objective of the proposed Symposium is to allow a diverse audience to learn about state-of-the-art research in the area of Functional Pi-Systems. The focus will be largely, but not exclusively, on the chemistry of such materials. In doing so, the Symposium will provide a critical forum where presenters, discussion leaders, and participants can discuss not only fundamental aspects of the chemistry and physics of Functional Pi-Systems, but as well the technology drivers and biologically important applications. The latter are often neglected at more specialized Conferences on displays, organic photovoltaics, or nonlinear optics. Topics to be covered: • Organic semiconductor materials • Photovoltaic organic materials and devices • Organic electroactive materials and devices • Organic materials and devices for light-emitting diode and solid-state lighting applications and for transistor applications • Self assembly and aggregation of organic materials • Nonlinear optics and two-photon processes in organic materials. [*Symposium Organizer*: Professor Seth R. Marder, Georgia Institute of Technology]

Chemically Speaking: How Organisms Talk to Each Other. Our lives are guided chiefly by sound and sight. We react to and learn from what we hear and what we see. Although we also obtain vital information from what we taste and what we smell, our reliance on these chemical senses is generally regarded as being of lesser importance. If we consider the entire biotic world, however, we realize that this hierarchy of information-gathering senses is far from universal. From microbes to mammals, all organisms detect selected chemical cues in their environment, and all respond to a wide variety of molecular messages behaviorally or developmentally. The interplay of chemical cues and the chemical receptors that detect and transduce these cues, initiating adoptive responses to them, results in a vastly complex communicative system which is fundamental to the fabric of life. It is clear that organisms depend on chemical signals not only to lure mates, associate with symbionts, deter enemies, and fend off pathogens, but also for a myriad of other functions. Nevertheless, it is extremely difficult to establish the roles that specific secondary (and occasionally primary) metabolites play in the world of chemical communication, particularly because deciphering chemical language requires expertise in a wide range of chemical and biological disciplines. This symposium will provide accounts of some of the most recent research into how and with

what results microbes, plants, invertebrates and vertebrates speak to one another chemically. [*Symposium Organizers*: Dr. Barbara Illman, U.S. Forest Service, University of Wisconsin-Madison; and Professor Jerrold Meinwald, Cornell University]

Celebrating Marie Curie's 100th Anniversary of Her Nobel Prize in Chemistry. Marie Curie was the first person to receive two Nobel prizes, with the first in 1903 in Physics (for co-discovery of radiation) and the second in 1911 in Chemistry (for discovery of radium and polonium). Her radiochemical research led to improvements in humankind's life, almost immediately through use of portable radiography units that emanated X-rays to examine for shrapnel and broken bones in World War I. Although Curie could have patented her process of isolating radium, she said that the process belonged to the people and wanted the research to proceed unhindered. Isolation of radium was such an arduous task that Curie even traveled from her laboratory in France to the USA, in a quest for funds to purchase more radium for her research. Curie not only led a rigorous and demanding research life with her husband, Pierre Curie, at her side but also was a wife and a mother of two daughters, one of whom later received a Nobel Prize with her husband. Curie was a role model for many women in science. Despite being the first woman to receive a Nobel Prize, she faced prejudice for being a woman and she was not elected into the Academy of Sciences in her adopted country, France, versus where we are today. From the 2009 Nobel laureates, perhaps we have reached gender parity, i.e.. five women and five men chosen for Nobel prizes. The current prize is a reminder that for almost half a century no woman was included in the chemistry prize, despite many worthy achievements. [*Symposium Organizers*: Professors Penny J. Gilmer, Florida State University and Alan Rocke, Case Western Reserve University]

D. Speakers and Participants in Chemistry Symposia for the 2011 AAAS Meeting.

Powering the Planet: Generation of Clean Fuels from Sunlight and Water.

Symposium Organizer: Professor Harry B. Gray, California Institute of Technology

List of Speakers

Professor Marcetta Y. Darensbourg, Texas A&M University
"Hydrogen Evolving Catalysts: Insights from Nature"

Professor Thomas E. Mallouk, Penn State
"Progress and Problems in Visisble Light Water Splitting"

Professor Nathan Lewis, California Institute of Technology
"Sunlight-Driven Hydrogen Formation by Membrane-Supported Photochemical Water Splitting"

Professor Gerald J. Meyer, Johns Hopkins University
"Making Chemical Bonds with Visible Light"

Dr. Heinz Frei, Lawrence Berkeley National Laboratory
"All Inorganic Polynuclear Assemblies for Artificial Photosynthesis"

Biological Role and Consequences of Intrinsic Protein Disorder.

Symposium Organizers: Professors Peter E. Wright and H. Jane Dyson, Scripps Research Institute

Moderator: Professor H. Jane Dyson, Scripps Research Institute

List of Speakers

Professor Peter E. Wright Scripps Research Institute
"Intrinsically Disordered Proteins and Their Functions"
Professor Peter Tompa, Institute of Enzymology,
Hungarian Academy of Sciences, Budapest, Hungary
"Structural Disorder and Viability of Aberrant Proteins in the Cell"
Professor Ron Kopito, Stanford University
"Intrinsically Disordered Proteins and Neurodegenerative Disease"

Molecular Self-Assembly and Artificial Molecular Machines.

Symposium Organizers: Professor Miguel A. Garcia-Garibay, University of California, Los Angeles and Dr. Bruce E. Maryanoff, The Scripps Research Institute
Moderator: Dr. Bruce E. Maryanoff, The Scripps Research Institute
Discussant: Professor Miguel A. Garcia-Garibay, University of California, Los Angeles
List of Speakers

Professor J. Fraser Stoddart, Northwestern University
"Fashioning Functional Materials with Integrated Mechanostereochemical Systems"
Professor Josef Michl, Josef, University of Colorado and Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic
"Artificial Surface-Mounted Molecular Rotors"
Professor Nadrian C. Seeman, New York University
"DNA: Not Merely the Secret of Life"
Professor Stacey F. Bent, Stanford University
"Nanostructuring for Efficient Energy Conversion"
Professor M. Reza Ghadiri, The Scripps Research Institute
"Toward Synthetic Biology: Design and Study of Complex Peptide Networks"
Professor Miguel A. Garcia-Garibay, University of California-Los Angeles
"Amphiphilic Crystals and Artificial Molecular Machines"

Frontiers in Organic Materials for Information Processing, Energy and Sensors.

Symposium Organizer: Professor Seth R. Marder, Georgia Institute of Technology
Co-Organizers: Professors Jean-Luc Bredas, Georgia Institute of Technology and Tobin J. Marks, Northwestern University
Discussant: Professor Stephen Forrest, University of Michigan
List of Speakers:

Professor Richard Friend, University of Cambridge
"Current and Future Scientific and Commercial Opportunities for Organic Electronics"
Professor Alan Heeger, University of California, Santa Barbara
"Plastic Solar Cells and Photodetectors: Self-Assembly by Spontaneous Phase Separation"
Professor Zhenan Bao, Stanford University
"Organic Materials Based Flexible Electronic Sensors"
Professor Larry Dalton, University of Washington
"Electro-Optic Technology: Implications for Telecommunications, Computing, and Sensing"

Professor Joseph W. Perry, Georgia Institute of Technology
"Organic Photonic Materials for All-Optical Signal Processing"
Professor Mark E. Thompson, University of Southern California
"New Molecular Materials for Energy Based Optoelectronics: Solar Energy and Lighting"

Chemically Speaking: How Organisms Talk to Each Other.

Symposium Organizers: Dr. Barbara Illman, U.S. Forest Service, University of Wisconsin-Madison and Professor Jerrold Meinwald, Cornell University

Moderator: Dr. Barbara Illman, U.S. Forest Service, University of Wisconsin-Madison

List of Speakers:

Professor Ian T. Baldwin, Max Planck Institute for Chemical Ecology
"Asking the Ecosystem about the Function of Plant Secondary Metabolites"
Professor Deborah Hogan, Dartmouth Medical School
"Chemical signaling between bacteria and fungi"
Professor Mariana Wolfner, Cornell University
"Seminal proteins from male insects affect mated females' behavior and reproduction"
Professor Julia Kubanek, Georgia Tech
"Surface-mediated antifungal chemical defenses in marine algae"
Professor Walter S. Leal, University of California Davis
"Olfactory Molecular Targets for Reverse Chemical Ecology"
Professor Cameron R. Currie, University of Wisconsin-Madison
"In Cahoots: Fungi, Ants, and Bacteria"

Celebrating Marie Curie's 100th Anniversary of Her Nobel Prize in Chemistry.

Symposium Organizers: Professors Penny J. Gilmer, Florida State University and Alan Rocke, Case Western Reserve University

List of Speakers:

Dr. Patricia A. Baisden, Lawrence Livermore National Laboratory
"Marie Curie, the Premier Chemist, Co-discoverer of Radiation and Radioactivity"
Professor Julie Des Jardins, City University of New York
"The Marie Curie Complex: The Hidden History of Women in Science"
Dr. Pnina G. Abir-Am, Brandeis University
"Historical Perspectives on the Public Memory of Marie S. Curie. (2011, 1911)"

E. Financial Support for Chemistry Symposia for the 2011 AAAS Meeting.

The Chemistry Section of AAAS provided partial support of chemistry symposia at the 2011 AAAS Meeting. In addition, Professor Seth Marder, the organizer of the symposium "Frontiers in Organic Materials for Information Processing, Energy and Sensors" received support from Solvay SA and from Georgia Tech's Center for Organic Photonics and Electronics to cover the

cost of this symposium. Additional support for 3 symposia speakers was provided by the Biology Section of AAAS and for 1 symposium speaker by the History of Science Section of AAAS. AAAS provided free 1-day registration for symposia participants and a reduced registration fee of $110 for the whole meeting. DOE support was used to support for 13 of the organizers and speakers. About $12,300 of DOE funds were used out of the $23,000 that was granted. A separate financial report will be provided.