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Nancy Ryan Gray, Ph.D.

Director

2007 Renewable Energy: Solar Fuels Gordon Research Conference - January 21-26

FINAL PROGRESS REPORT

DOE

DE-FG02-07ER15845

The 2007 Renewable Energy: Solar Fuels Gordon Research Conference was held at Ventura Beach Marriott from January 21-26, 2007. The Conference was well-attended with 153 participants (attendees list attached). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. Time for formal presentations was limited in the interest of group discussions. In order that more scientists could communicate their most recent results, poster presentation time was scheduled. Attached is a copy of the formal schedule and speaker program and the poster program. In addition to these formal interactions, "free time" was scheduled to allow informal discussions. Such discussions are fostering new collaborations and joint efforts in the field.

I want to personally thank you for your support of this Conference. As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings. If you wish any further details, please feel free to contact me. Thank you.

Dr. Daniel G. Nocera
Conference Chair

Renewable Energy: Solar Fuels

Gordon Research Conferences

Participant List

Ventura Beach Marriott
Jan 21-26, 2007

Name	Organization	Participation	Status
MASATO AIZAWA	NATIONAL INSTITUTE FOR NANOTECHNOLOGY	Poster Presenter	Registered
PAUL ALIVISATOS	UNIVERSITY OF CALIFORNIA, BERKELEY	Speaker	Registered
MAGNUS F ANDERLUND	UPPSALA UNIVERSITY	Poster Presenter	Registered
ALEXANDRA ANGHIEL	SHELL HYDROGEN	Attendee	Registered
MARTIN APPLE	COUNCIL SCIENTIFIC SOCIETY PRESIDENTS	Attendee	Registered
SHAMINDRI M ARACHCHIGE	VIRGINIA TECH	Poster Presenter	Registered
FRASER A ARMSTRONG	OXFORD UNIVERSITY	Speaker	Registered
KATHERINE E AYERS	DISTRIBUTED ENERGY SYSTEMS	Attendee	Registered
R. TOM BAKER	LOS ALAMOS NATIONAL LABORATORY	Speaker	Registered
JAMES BARBER	IMPERIAL COLLEGE LONDON	Speaker	Registered
ALLEN J BARD	UNIVERSITY OF TEXAS AT AUSTIN	Discussion Leader	Registered
BRETT M BARNEY	UTAH STATE UNIVERSITY	Attendee	Registered
BART M BARTLETT	UNIVERSITY OF CALIFORNIA, BERKELEY	Poster Presenter	Registered
JOHN E BERCAW	CALIFORNIA INSTITUTE OF TECHNOLOGY	Discussion Leader	Registered
CURTIS P BERLINGUETTE	UNIVERSITY OF CALGARY	Attendee	Registered
STEFAN BERNHARD	PRINCETON UNIVERSITY	Poster Presenter	Registered
ANDREW B BOCARSLY	PRINCETON UNIVERSITY	Poster Presenter	Registered
SHANNON W BOETTCHER	UNIVERSITY OF CALIFORNIA, SANTA BARBARA	Attendee	Registered
THOMAS R BOUSSIE	SYMYX TECHNOLOGIES	Attendee	Registered
BRUCE S BRUNSCHWIG	CALIFORNIA INSTITUTE OF TECHNOLOGY	Attendee	Registered
FELIX N CASTELLANO	BOWLING GREEN STATE UNIVERSITY	Attendee	Registered
CHRISTOPHER J CHANG	UC BERKELEY	Poster Presenter	Registered
SAYANDEV CHATTERJEE	UNIVERSITY OF CINCINNATI	Poster Presenter	Registered
STEVEN CHU	LAWRENCE BERKELEY NATIONAL LABORATORY	Speaker	Registered
MARIE-NOELLE COLLOMB	UNIVERSITE JOSEPH FOURIER	Poster Presenter	Registered
MARK CONROY	GE POWER	Speaker	Registered
GLENN A CROSBY	WASHINGTON STATE UNIVERSITY/CONCORDIA UNIVERSITY	Attendee	Registered
CHRISTOPHER C CUMMINS	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Discussion Leader	Registered
NIELS H DAMRAUER	UNIVERSITY OF COLORADO AT BOULDER	Poster Presenter	Registered
DANA M DATTELBAUM	LOS ALAMOS NATIONAL LABORATORY	Attendee	Registered
JILLIAN L DEMPSEY	CALTECH	Poster Presenter	Registered
TODD G DEUTSCH	NATIONAL RENEWABLE ENERGY LABORATORY	Poster Presenter	Registered
MIRCEA DINCA	UNIVERSITY OF CALIFORNIA, BERKELEY	Poster Presenter	Registered
DANIEL L DUBOIS	PACIFIC NORTHWEST NATIONAL LABORATORY	Speaker	Registered
GORDANA DUKOVIC	UC BERKELEY	Attendee	Registered
P. LESLIE DUTTON	UNIVERSITY OF PENNSYLVANIA	Discussion Leader	Registered
RICHARD EISENBERG	UNIVERSITY OF ROCHESTER	Discussion Leader	Registered
RANDY J ELLINGSON	NREL	Poster Presenter	Registered
ARTHUR J ESSWEIN	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
WILLIAM J EVANS	UNIVERSITY OF CALIFORNIA, IRVINE	Attendee	Registered
REZA A FALLAHOUPUR	UNIVERSITY OF ZURICH	Poster Presenter	Registered
TAMMER FARID	UNIVERSITY OF PENNSYLVANIA SCHOOL OF	Poster Presenter	Registered

MEDICINE			
SHELAGH M FERGUSON-MILLER	MICHIGAN STATE UNIVERSITY	Speaker	Registered
MARK J FINK	TULANE UNIVERSITY	Poster Presenter	Registered
RICHARD G FINKE	COLORADO STATE UNIVERSITY	Attendee	Registered
JUAN C FONTECILLA	INSTITUT DE BIOLOGIE STRUCTURALE	Speaker	Registered
PETER C FORD	UNIVERSITY OF CALIFORNIA, SANTA BARBARA	Attendee	Registered
STEPHEN R FORREST	UNIVERSITY OF MICHIGAN	Speaker	Registered
CASSANDRA FRASER	UNIVERSITY OF VIRGINIA	Speaker	Registered
ETSUKO FUJITA	BROOKHAVEN NATIONAL LABORATORY	Poster Presenter	Registered
MASAOKI FURUE	KOCHI UNIVERSITY OF TECHNOLOGY	Poster Presenter	Registered
MARIA L GHIRARDI	NATIONAL RENEWABLE ENERGY LABORATORY	Speaker	Registered
WAYNE L GLADFELTER	UNIVERSITY OF MINNESOTA	Poster Presenter	Registered
KAREN I GOLDBERG	UNIVERSITY OF WASHINGTON	Speaker	Registered
HARRY B GRAY	CALIFORNIA INSTITUTE OF TECHNOLOGY	Discussion Leader	Registered
LORI E GREENE	UC BERKELEY	Poster Presenter	Registered
MICHIEL J GROENEVELD	SHELL INTERNATIONAL EP BV	Attendee	Registered
MICHAEL S HAMBOURGER	ARIZONA STATE UNIVERSITY	Poster Presenter	Registered
LEIF HAMMARSTROM	UPPSALA UNIVERSITY	Speaker	Registered
HIRO HARA	AEROGEL COMPOSITE INC.	Attendee	Registered
FRANTISEK HARTL	UNIVERSITY OF AMSTERDAM	Poster Presenter	Registered
TING HE	HONDA RESEARCH INSTITUTE USA	Attendee	Registered
DANIEL A HIGGINS	KANSAS STATE UNIVERSITY	Poster Presenter	Registered
IAN G HILL	DALHOUSIE UNIVERSITY	Attendee	Registered
KURT F HIRSEKORN	DOW CHEMICAL COMPANY	Attendee	Registered
JAMES D HOEFELMEYER	UNIVERSITY OF SOUTH DAKOTA	Attendee	Registered
MORTON Z HOFFMAN	BOSTON UNIVERSITY	Attendee	Registered
JONG-DAL HONG	UNIVERSITY OF INCHEON	Poster Presenter	Registered
MICHAEL D HOPKINS	THE UNIVERSITY OF CHICAGO	Attendee	Registered
JOSEPH T HUPP	NORTHWESTERN UNIVERSITY	Speaker	Registered
TANIA IREBO	UPPSALA UNIVERSITY	Poster Presenter	Registered
STEVEN KAYE	UNIVERSITY OF CALIFORNIA, BERKELEY	Poster Presenter	Registered
RICHARD A KEMP	SANDIA NATIONAL LABORATORIES	Attendee	Registered
GUNTHER KNOR	JOHANNES KEPLER UNIVERSITY LINZ	Attendee	Registered
KELLY P KNUITSEN	NATIONAL RENEWABLE ENERGY LAB	Poster Presenter	Registered
CARL A KOVAL	UNIVERSITY OF COLORADO AT BOULDER	Poster Presenter	Registered
HAROLD W KROTO	FLORIDA STATE UNIVERSITY	Speaker	Registered
GREGORY J KUBAS	LOS ALAMOS NATIONAL LAB	Poster Presenter	Registered
CLIFFORD P KUBIAK	UNIVERSITY OF CALIFORNIA, SAN DIEGO	Poster Presenter	Registered
PHILIPP G.E. KURZ	UPPSALA UNIVERSITY	Poster Presenter	Registered
MATT LAW	NATIONAL RENEWABLE ENERGY LABORATORY	Poster Presenter	Registered
NATHAN S LEWIS	CALIFORNIA INSTITUTE OF TECHNOLOGY	Vice Chair	Registered
DENNIS L LICHTENBERGER	UNIVERSITY OF ARIZONA	Poster Presenter	Registered
KARL LITTAU	PALO ALTO RESEARCH CENTER	Attendee	Registered
JEFFREY R LONG	UNIVERSITY OF CALIFORNIA, BERKELEY	Discussion Leader	Registered
STEPHEN MALDONADO	CALIFORNIA INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
ALEX B F MARTINSON	NORTHWESTERN UNIVERSITY	Poster Presenter	Registered
JOCHEN MARWEDE	SHELL GAMECHANGER	Attendee	Registered
PHILIPPE PH MAURON	EMPA	Attendee	Registered
JAMES K MCCUSKER	MICHIGAN STATE UNIVERSITY	Poster Presenter	Registered
MICHAEL D MCGEHEE	STANFORD UNIVERSITY	Speaker	Registered
ELISE G MEGEHEE	ST. JOHN'S UNIVERSITY	Poster Presenter	Registered
THOMAS J MEYER	UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL	Speaker	Registered
DAVID MILSTEIN	WEIZMANN INSTITUTE OF SCIENCE	Speaker	Registered
THOMAS A MOORE	ARIZONA STATE UNIVERSITY	Speaker	Registered
ANA L MOORE	ARIZONA STATE UNIVERSITY	Attendee	Registered
GARY F MOORE	ARIZONA STATE UNIVERSITY	Poster Presenter	Registered

JAMES T MUCKERMAN	BROOKHAVEN NATIONAL LABORATORY	Poster Presenter	Registered
OMKARAM NALAMASU	APPLIED MATERIALS	Attendee	Registered
DANIEL G NOCERA	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Chair	Registered
ARTHUR J NOZIK	NATIONAL RENEWABLE ENERGY LABORATORY	Discussion Leader	Registered
JONATHAN S OWEN	UNIVERSITY OF CALIFORNIA, BERKELEY	Poster Presenter	Registered
BRUCE A PARKINSON	COLORADO STATE UNIVERSITY	Poster Presenter	Registered
HRVOJE PETEK	UNIVERSITY OF PITTSBURGH	Speaker	Registered
JONAS C PETERS	MIT	Speaker	Registered
POUL B PETERSEN	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Attendee	Registered
DMITRY E POLYANSKY	BROOKHAVEN NATIONAL LABORATORY	Poster Presenter	Registered
DOROTHY L READ	UNIVERSITY OF MASSACHUSETTS	Evaluator	Registered
PETER L REDMOND	COLUMBIA UNIVERSITY	Poster Presenter	Registered
STEVEN Y REECE	MIT	Poster Presenter	Registered
THOMAS G RICHMOND	UNIVERSITY OF UTAH	Poster Presenter	Registered
JOEL ROSENTHAL	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
BORIS RYBTCHINSKI	WEIZMANN INSTITUTE OF SCIENCE	Poster Presenter	Registered
JOSEPH P SADIGHI	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Speaker	Registered
MARTIN SCHIERHORN	UCSB	Attendee	Registered
CODY W SCHLENKER	UNIVERSITY OF SOUTHERN CALIFORNIA	Poster Presenter	Registered
SUSAN J SCHOFFER	SYMYX TECHNOLOGIES	Attendee	Registered
PAMELA J SHAPIRO	UNIVERSITY OF IDAHO	Poster Presenter	Registered
PRADYUMNA S SINGH	UPPSALA UNIVERSITY	Attendee	Registered
JOZEF JT SMITS	SHELL GLOBAL SOLUTIONS	Attendee	Registered
REBECCA C. SOMERS	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Attendee	Registered
RICHARD SOMERVILLE	SCRIPPS INSTITUTION OF OCEANOGRAPHY	Speaker	Registered
MARK T SPITLER	U.S. DEPARTMENT OF ENERGY	Poster Presenter	Registered
SHANNON STAHL	UNIVERSITY OF WISCONSIN-MADISON	Speaker	Registered
FRANCES STEPHENS	LOS ALAMOS NATIONAL LABORATORY	Attendee	Registered
CARLYLE B STORM	GORDON RESEARCH CONFERENCES	Monitor	Registered
NICHOLAS C STRANDWITZ	UNIVERSITY OF CALIFORNIA, SANTA BARBARA	Poster Presenter	Registered
STENBJORN STYRING	UPPSALA UNIVERSITY	Poster Presenter	Registered
JESSICA M SWANSON	UNIVERSITY OF UTAH	Poster Presenter	Registered
PHILLIP D SZUROMI	SCIENCE MAGAZINE	Attendee	Registered
MARK E THOMPSON	UNIVERSITY OF SOUTHERN CALIFORNIA	Attendee	Registered
BOZHI TIAN	HARVARD UNIVERSITY	Poster Presenter	Registered
T. DON TILLEY	UNIVERSITY OF CALIFORNIA, BERKELEY	Speaker	Registered
MATTHEW TRAUB	CALIFORNIA INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
ANTHONY M TROZZOLO	UNIVERSITY OF NOTRE DAME	Evaluator	Registered
THOMAS VAID	WASHINGTON UNIVERSITY	Poster Presenter	Registered
RIENK VAN GRONDELLE	FREE UNIVERSITY AMSTERDAM	Poster Presenter	Registered
MINGFENG WANG	UNIVERSITY OF TORONTO	Poster Presenter	Registered
MICHAEL R WASIELEWSKI	NORTHWESTERN UNIVERSITY	Poster Presenter	Registered
BRADFORD B WAYLAND	UNIVERSITY OF PENNSYLVANIA	Attendee	Registered
WALTER W WEARE	LAWRENCE BERKELEY NATIONAL LABORATORY	Attendee	Registered
ERIN S WHITNEY	NATIONAL RENEWABLE ENERGY LABORATORY	Poster Presenter	Registered
JAY R WINKLER	CALTECH	Attendee	Registered
PETER T WOLCZANSKI	CORNELL UNIVERSITY	Attendee	Registered
WILLIAM H WOODRUFF	CHEMISTRY DIVISION	Attendee	Registered
YIYING WU	OHIO STATE UNIVERSITY	Poster Presenter	Registered
OMAR M YAGHI	UNIVERSITY OF CALIFORNIA, LOS ANGELES	Speaker	Registered
JENNY Y YANG	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Attendee	Registered
ELIZABETH R YOUNG	MIT	Attendee	Registered
THOMAS A ZAWODZINSKI	CASE WESTERN RESERVE UNIVERSITY	Attendee	Registered
NANFENG ZHENG	UC-SANTA BARBARA	Attendee	Registered
DE-LING ZHOU	HONEYWELL	Attendee	Registered
HANNO ZUR LOYE	UNIVERSITY OF SOUTH CAROLINA	Poster Presenter	Registered

RENEWABLE ENERGY: SOLAR FUELS

Gordon Research Conferences

Conference Program

January 21-26, 2007
Ventura Beach Marriott
Ventura, CA

Chair: **Daniel G. Nocera**

Vice Chair **Nathan S. Lewis**

This Gordon Research Conference seeks to bring together chemists, physicists, materials scientists and biologists to address perhaps the outstanding technical problem of the 21st Century - the efficient, and ultimately economical, storage of energy from carbon-neutral sources. Such an advance would deliver a renewable, environmentally benign energy source for the future.

A great technological challenge facing our global future is energy. The generation of energy, the security of its supply, and the environmental consequences of its use are among the world's foremost geopolitical concerns. Fossil fuels - coal, natural gas, and petroleum - supply approximately 90% of the energy consumed today by industrialized nations. An increase in energy supply is vitally needed to bring electric power to the 25% of the world's population that lacks it, to support the industrialization of developing nations, and to sustain economic growth in developed countries. On the geopolitical front, insuring an adequate energy supply is a major security issue for the world, and its importance will grow in proportion to the singular dependence on oil as a primary energy source. Yet, the current approach to energy supply, that of increased fossil fuel exploration coupled with energy conservation, is not scalable to meet future demands. Rising living standards of a growing world population will cause global energy consumption to increase significantly. Estimates indicate that energy consumption will increase at least two-fold, from our current burn rate of 12.8 TW to 28 - 35 TW by 2050. - U.N. projections indicate that meeting global energy demand in a sustainable fashion by the year 2050 will require a significant fraction of the energy supply to come from carbon free sources to stabilize atmospheric carbon dioxide levels at twice the pre-anthropogenic levels. External factors of economy, environment, and security dictate that this global energy need be met by renewable and sustainable sources from a carbon-neutral source.

Sunlight is by far the most abundant global carbon-neutral energy resource. More solar energy strikes the surface of the earth in one hour than is obtained from all of the fossil fuels consumed globally in a year. Sunlight may be used to power the planet. However, it is intermittent, and therefore it must be converted to electricity or stored chemical fuel to be used on a large scale. The "grand challenge" of using the sun as a future energy source faces daunting challenges - large expanses of fundamental science and technology await discovery. A viable solar energy conversion scheme must result in a 10-50 fold decrease in the cost-to-efficiency ratio for the production of stored fuels, and must be stable and

robust for a 20-30 year period. To reduce the cost of installed solar energy conversion systems to \$0.20/peak watt of solar radiation, a cost level that would make them economically attractive in today's energy market, will require revolutionary technologies. This GRC seeks to present a forum for the underlying science needed to permit future generations to use the sun as a renewable and sustainable primary energy source.

SUNDAY

- 4:00 pm - 9:00 pm Arrival and Check-in
- 6:00 pm Dinner
- 7:30 pm - 7:35 pm Opening comments: **Daniel G. Nocera** (Massachusetts Institute of Technology, Department of Chemistry) / Introductory Comments by GRC Site Staff
- 7:35 pm - 9:30 pm **Global Energy Perspective**
Session Chair: **Harry B. Gray** (California Institute of Technology, Department of Chemistry)
- 7:35 pm - 8:05 pm **Richard C.J. Somerville** (Scripps Institution of Oceanography, UCSD)
"Predicting Climate Change: What to Expect and Why"
- 8:05 pm - 8:15 pm Discussion
- 8:15 pm - 8:40 pm **Steven Chu** (Director, Lawrence Berkeley National Lab)
"The Energy Problem and Lawrence Berkeley National Lab's Plans to Help Solve It"
- 8:40 pm - 8:50 pm Discussion
- 8:50 pm - 9:20 pm **Harold Kroto** (Florida State University, Department of Chemistry & Biochemistry)
"Science for Society and Survival - the Only Way to Avoid Global Suicide?"
- 9:20 pm - 9:30 pm Discussion

MONDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **Bioenergy Conversion: Systems**
Session Chair: **P. Leslie Dutton** (University of Pennsylvania, Department of Biochemistry and Biophysics)
- 9:00 am - 9:30 am **Jim Barber** (Imperial College, Division of Molecular Biosciences)
"Towards Understanding How Nature Uses Solar Energy to Split Water"
- 9:30 am - 9:45 am Discussion
- 9:45 am - 10:15 am **Shelagh Ferguson-Miller** (Michigan State University, Department of Biochemistry & Molecular Biology)
"Cytochrome c Oxidase: A Clean Oxygen-Reducing Machine and Reversible Proton Pump"

- 10:15 am - 10:30 am Discussion
- 10:30 am - 11:00 am **Juan Fontecilla-Camps** (Institut de Biologie Structurale "Jean-Pierre Ebel")
- 11:00 am - 11:15 am Discussion
- 11:15 am - 11:45 am Group Photo / Coffee Break
- 11:45 am - 12:15 pm **Maria Ghirardi** (National Renewable Energy Laboratory)
"[FeFe]-Hydrogenases as Catalysts in Photobiological and Photobiomimetic Hydrogen Production Systems"
- 12:15 pm - 12:30 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm Poster Session 1
- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **Bioenergy Conversion: Mechanisms**

Session Chair: **Richard S. Eisenberg** (University of Rochester, Department of Chemistry)

- 7:30 pm - 8:00 pm **Leif Hammarström** (Uppsala Universitet, Department of Photochemistry & Molecular Science)
"Coupled Electron Transfer in Artificial Photosynthesis"
- 8:00 pm - 8:10 pm Discussion
- 8:10 pm - 8:40 pm **Thomas Moore** (Arizona State University, Department of Chemistry & Biochemistry)
"Artificial Photosynthesis: Combining Technology with Biology for Efficient Solar Energy Conversion"
- 8:40 pm - 8:50 pm Discussion
- 8:50 pm - 9:20 pm **Fraser A. Armstrong** (University of Oxford, Department of Chemistry)
"Rapid Electrocatalysis by the Organometallic Active Sites of Hydrogenases: Mechanism, Exploitation and Inspiration"
- 9:20 pm - 9:30 pm Discussion

TUESDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **Small Molecule Activation: Oxygen, Hydrogen and Water**
- Session Chair: **Christopher C. Cummins** (Massachusetts Institute of Technology, Department of Chemistry)
- 9:00 am - 9:30 am **David Milstein** (Weizmann Institute of Science, Department of Chemistry)
"Activation of O-H Bonds by Late Transition Metal Complexes"
- 9:30 am - 9:45 am Discussion
- 9:45 am - 10:15 am **Jonas C. Peters** (California Institute of Technology, Department of Chemistry)

"Electrocatalysts for Hydrogen Evolution at Positive Potentials"

- 10:15 am - 10:30 am Discussion
- 10:30 am - 11:00 am Coffee Break
- 11:00 am - 11:30 am **Daniel L. Dubois** (Pacific Northwest National Laboratory)
"The Role of First and Second Coordination Spheres in Hydrogen Production and Oxidation Catalysts"
- 11:30 am - 11:45 am Discussion
- 11:45 am - 12:15 pm **Thomas J. Meyer** (University of North Carolina, Department of Chemistry)
"Photochemical Oxygen Formation"
- 12:15 pm - 12:30 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm Poster Session 1
- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **Other Small Molecule Activation Reactions of Energy Consequence**
- Session Chair: **John E. Bercaw** (California Institute of Technology, Department of Chemistry)
- 7:30 pm - 8:00 pm **Joseph P. Sadighi** (Massachusetts Institute of Technology, Department of Chemistry)
"Catalytic Reactions of Carbon Dioxide: A Complement to the Renewable Energy Challenge"
- 8:00 pm - 8:10 pm Discussion
- 8:10 pm - 8:40 pm **Shannon S. Stahl** (University of Wisconsin-Madison, Department of Chemistry)
"Palladium-Dioxygen Reactivity: Implications for Catalytic Oxygen Evolution"
- 8:40 pm - 8:50 pm Discussion
- 8:50 pm - 9:20 pm **Karen I. Goldberg** (University of Washington, Department of Chemistry)
"Organometallic Reactions Relevant to Selective Hydrocarbon Oxidation"
- 9:20 pm - 9:30 pm Discussion

WEDNESDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **Hydrogen Storage**
- Session Chair: **Jeffrey R. Long** (University of California, Berkeley, Department of Chemistry)
- 9:00 am - 9:30 am **Andreas Züttel** (Universität Fribourg, Department of Physics)
"The Potential and Limitations of Hydrogen as an Energy Carrier"
- 9:30 am - 9:45 am Discussion

- 9:45 am - 10:15 am **Omar M. Yaghi** (University of California, Los Angeles, Department of Chemistry & Biochemistry)
"Hydrogen Storage and Carbon Dioxide Capture in Molecular Organic Frameworks"
- 10:15 am - 10:30 am Discussion
- 10:30 am - 11:00 am Coffee Break
- 11:00 am - 11:30 am **Tom Baker** (Los Alamos National Laboratory)
"Towards a Sustainable Transportation Fuel: Catalyzed Hydrogen Release from Ammonia-Borane"
- 11:30 am - 11:45 am Discussion
- 11:45 am - 12:00 pm Poster talk 1
- 12:00 pm - 12:05 pm Discussion
- 12:05 pm - 12:20 pm Poster talk 2
- 12:20 pm - 12:25 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm Poster Session 2
- 6:00 pm Dinner
- 7:00 pm - 7:30 pm Business Meeting
(Nominations for the next Vice Chair; Fill out Conference Evaluation Forms; Discuss future Site & Scheduling preferences; Election of the next Vice Chair)
- 7:30 pm - 9:30 pm **Reaction Chemistry at Surfaces**
Session Chair: **Allen J. Bard** (University of Texas at Austin, Department of Chemistry & Biochemistry)
- 7:30 pm - 8:00 pm **T. Don Tilley** (University of California, Berkeley, Department of Chemistry)
"Electrocatalytic Water Splitting: Immobilization of the Catalytic Centers"
- 8:00 pm - 8:10 pm Discussion
- 8:10 pm - 8:40 pm **Joseph T. Hupp** (Northwestern University, Department of Chemistry)
"Dye-Sensitized Solar Cells: New Molecular and Electrode Designs"
- 8:40 pm - 8:50 pm Discussion
- 8:50 pm - 9:20 pm **Hrvoje Petek** (University of Pittsburgh, Department of Physics & Astronomy)
"Ultrafast Electron Solvation and Interfacial Charge Transfer at Metal Oxide/Protic Solvent Interfaces"
- 9:20 pm - 9:30 pm Discussion

THURSDAY

- 7:30 am - 8:30 am Breakfast

- 9:00 am - 12:30 pm **Photovoltaics**
 Session Chair: **Arthur Nozik** (National Renewable Energy Laboratory)
- 9:00 am - 9:30 am **Paul Alivisatos** (University of California, Berkeley, Department of Materials Science & Engineering)
 "Nanocrystal Solar Cells"
- 9:30 am - 9:45 am Discussion
- 9:45 am - 10:15 am **Michael D. McGehee** (Stanford University, Department of Materials Science & Engineering)
 "Advances in Organic-Inorganic Hybrid Solar Cells"
- 10:15 am - 10:30 am Discussion
- 10:30 am - 11:00 am Coffee Break
- 11:00 am - 11:30 am **Stephen R. Forrest** (University of Michigan, Department of Electrical Engineering)
 "Thin Film Organic Solar Cells: Control of Morphology and Device Architecture to Achieve High Efficiency"
- 11:30 am - 11:45 am Discussion
- 11:45 am - 12:00 pm Poster talk 3
- 12:00 pm - 12:05 pm Discussion
- 12:05 pm - 12:20 pm Poster talk 4
- 12:20 pm - 12:25 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm Poster Session 2
- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **Challenges to the Implementation of a Solar Agenda**
 Session Chair: **Karen J. Brewer** (Virginia Polytechnic Institute and State University, Department of Chemistry)
- 7:30 pm - 8:00 pm **Mark E. Conroy** (General Manager, GE Energy)
 "Ecomagination & Meeting the Demand for Renewables"
- 8:00 pm - 8:15 pm Discussion
- 8:15 pm - 8:45 pm **Nathan S. Lewis** (California Institute of Technology, Department of Chemistry)
 "Progress and Challenges in Solar Energy Conversion Using Semiconductor/Liquid Junctions"
- 8:45 pm - 9:00 pm Discussion

FRIDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am Depart
-