

The University of West Florida
Department of Chemistry

William D. Smart Seminar
Series in Chemistry



Speaker: Dr. Daniel Nocera, Henry Dreyfus Professor of Energy
Massachusetts Institute of Technology

GENERAL AUDIENCE TALK

Date: Thursday, February 18th
Location: Institute for Human and
Machine Cognition
40 South Alcaniz St,
Pensacola, FL
Time: 5:30 PM - Reception
6:00 PM – Lecture

TECHNICAL TALK

Date: Friday, February 19th
Location: UWF Main Campus,
Building 58A, Room 106
Time: 3:00 PM

Title (General) Personalized Energy for 1 (\times 6 Billion): A Solution to the Global Energy Challenge

Abstract (General): The supply of secure, clean, sustainable energy is arguably the most important scientific and technical challenge facing humanity in the 21st century. Rising living standards of a growing world population will cause global energy consumption to double by mid-century and triple by the end of the century. Even in light of unprecedented conservation, the additional energy needed is simply not attainable from long discussed sources – these include nuclear, biomass, wind, geothermal and hydroelectric. The global appetite for energy is simply too much. Petroleum-based fuel sources (i.e., coal, oil and gas) could be increased. However, deleterious consequences resulting from external drivers of economy, the environment, and global security dictate that this energy need be met by renewable and sustainable sources. The dramatic increase in global energy need is driven by 3 billion low-energy users in the non-legacy world and by 3 billion people yet to inhabit the planet over the next half century. The capture and storage of solar energy at the individual level – personalized solar energy – drives inextricably towards the heart of this energy challenge by addressing the triumvirate of secure, carbon neutral and plentiful energy. This talk will place the scale of the global energy issue in perspective and then discuss how personalized energy (especially for the non-legacy world) can provide a path to a solution to the global energy challenge.

Title (Technical): The Chemistry of Solar Energy and Its Storage for the Non-Legacy World

Abstract (Technical): The possibility of generating terawatts of carbon-free energy, and thus providing society with its most direct path to realizing a low greenhouse gas future, may be realized by making solar PE available to the 6 billion new energy users by high throughput manufacturing. Notwithstanding, current options to harness and store solar energy at the individual level are too expensive to be implemented, especially in a non-legacy world. The imperative to science is to develop new materials, reactions and processes that enable personalized solar energy to be sufficiently inexpensive to penetrate global energy markets and especially the non-legacy world.

Personalized energy at low cost presents new basic research targets. Because personalized energy will be possible only if solar energy is a 24/7 available supply, the key enabler for personalized energy is inexpensive storage. Studies in the Nocera group have led to the creation of a new catalyst that captures the functional elements of photosynthesis and in doing so provides a highly manufacturable and inexpensive method to effect a carbon-neutral and sustainable method for solar storage – solar fuels from water-splitting. By developing an inexpensive 24/7 solar energy system for the individual, a carbon-neutral energy supply for 1×6 billion becomes available.

Biography. Daniel G. Nocera is the Henry Dreyfus Professor of Energy at the Massachusetts Institute of Technology, Director of the Solar Revolutions Project and Director of the Eni Solar Frontiers Center at MIT. His group pioneered studies of the basic mechanisms of energy conversion in biology and chemistry. He has recently accomplished a solar fuels process that captures many of the elements of photosynthesis outside of the leaf. This discovery sets the stage for a storage mechanism for the large scale, distributed, deployment of solar energy. He has been awarded the Eni Prize (2005), IAPS Award (2006), Burghausen Prize (2007), Harrison Howe Award (2008), ACS Inorganic Chemistry Award (2009) and the U.N. Intergovernmental Renewable Energy Organization's Science and Technology Award (2009) for his contributions to the development of renewable energy. He is a member of the American Academy of Arts and Sciences and the National Academy of Sciences. He was named as Times Magazine 100 Most Influential People in the World.

Nocera is a frequent guest on TV (*CNN, ABC Nightline, PBS, ABS Nature's Edge, Jim Lehrer News Hour, NOVA, CBS, CNBC, Discovery Channel, The Science Channel* and *Plum* in the U.S. and *Explora* and *RAI* in Europe), radio (*NPR, Bloomberg News, CBS, BBC, All Things Considered, Here and Now, Climate Connections, Voice of America*) and is regularly featured in print (*New York Times, National Geographic, Forbes, Discover, Wall Street Journal, Time Magazine, The New Republic, U.S. News and World Report, Outside Magazine, Wired, Technology Review*). His 2006 PBS show was nominated for an Emmy Award. He worked with Robert Krulwich of ABC News to develop the pilot that was used to launch the PBS NOVA show, ScienceNow. He also worked with Mr. Krulwich and the web designer OddTodd to develop a five part series on *The Lifestyle of Carbon*, which was sponsored by the *National Geographic*. He opened the Mountain Film Festival 2007 in Telluride CO, the Aspen Forum in Aspen CO in 2008 and 2009, and the World Science Festival in NYC in

2008. He sits on several advisory boards and is currently working with several artists in the U.S and abroad, actors and producers in Los Angeles and major business leaders in the U.S. to help them develop a position that contributes positively to the energy and sustainability challenge confronting this planet. In 2008, he founded Sun Catalytix, a company committed to bringing personalized energy to the non-legacy world.