UC San Diego
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Virtual SEMINAR SERIES

Wednesday, April 14, 2021
Seminar Presentation: 11:00am – 12:00pm PDT
Zoom Seminar

"Battery Systems Engineering Enabling Mobility and Grid Independence"

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Abstract: Batteries enable mobile and un-plugged electronics with applications ranging from cell phones to solar homes. Batteries are being widely adopted to increase the efficiency and effectiveness of hybrid and electric vehicles, including electric aircraft. Cost and life of the energy storage system, however, are concerns that limit the desirability of battery powered devices. This seminar introduces the electrochemistry, dynamic modeling, controls, and multifunctionality associated with the emerging field of battery systems engineering. The governing partial differential equations are derived, simplified, discretized, and reduced in order to develop efficient and accurate models that include important aging and thermal effects. Model-based state of charge and state of health algorithms are derived that predict the remaining charge and capacity evolution of a battery pack, respectively. Dynamic current limiters and thermal management algorithms are shown to maximize power and minimize degradation. The multifunctional capabilities of battery systems are explored, including energy storage, actuation, sensing, and mechanical structure.

Just as engineers and scientists have come to the rescue in the COVID crisis, we can save planet from the devasting effects of climate change. Through our technical innovations, we can make renewable energy less expensive than fossil fuels so that market forces will drive energy consumption in the right direction. We need the best and brightest minds working on this problem. Now is the time for students and faculty at all levels to join the growing ranks of energy researchers. Together, we can solve this most important problem of our time.

Biosketch: **Christopher D. Rahn** graduated from the University of Michigan with a B.S. in mechanical engineering in 1985 and an M.S. from the University of California, Berkeley in 1986. After three years as a Research and Development Engineer at Ford Aerospace, he returned to Berkeley to pursue a Ph.D. After graduating from Berkeley in 1992, Dr. Rahn joined the Department of Mechanical Engineering at Clemson University. In 2000, he moved to the Pennsylvania State University where he is now the J. 'Lee' Everett Professor of Mechanical Engineering, Associate Dean for Innovation in the College of Engineering, Director of the Mechatronics Research Laboratory, and Co-Director of the Battery and Energy Storage Technology Center. Dr. Rahn's research work on the modeling, analysis, design, and control of mechatronic systems has resulted in three books (including *Battery Systems Engineering*), almost three hundred peer reviewed publications, and several patents. An ASME Fellow, Dr. Rahn is the Technical Editor of an ASME journal and chaired an ASME technical committee and the executive committee of the ASME Design Engineering Division.

Register to receive a zoom link the day of the seminar:
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