



USC University of
Southern California

USC Viterbi

Ming Hsieh Department
of Electrical Engineering

Munushian Visiting Seminar Series

Demetrios Christodoulides

CREOL - The College of Optics & Photonics, University of Central Florida

Optical Thermodynamics of Nonlinear Highly Multimode Systems

Friday, October 12, 2018

2:00 - 3:30 pm, EEB 132

Refreshments will be served

Abstract: The past few years have witnessed a resurgence of interest in multimode waveguide structures, predominantly driven by the ever-increasing demand for higher information capacities. This renaissance, in turn, incited a flurry of activities in the general area of nonlinear multimode fiber optics. The sheer complexity associated with the presence of hundreds or thousands of nonlinearly interacting modes that collectively act as a many-body system, has led to new opportunities in observing a multitude of novel optical effects that would have been otherwise impossible in single-mode settings. In this talk, a thermodynamic theory capable of describing complex, highly multimoded, nonlinear optical systems is presented. It is shown that the mode occupancies in such nonlinear multimode arrangements follow a universal behavior that always tends to maximize the system's entropy at steady-state. This thermodynamic response takes place irrespective of the type of nonlinearities involved and can be utilized to either heat or cool an optical multimode system. Aspects associated with adiabatic compressions and expansions will be discussed along with the possibility for all-optical Carnot cycles.



Biography: Demetrios Christodoulides is the Cobb Family Endowed Chair and Pegasus Professor of Optics at CREOL-the College of Optics and Photonics of the University of Central Florida. He received his Ph.D. degree from Johns Hopkins University in 1986 and he subsequently joined Bellcore as a post-doctoral fellow. Between 1988 and 2002 he was with the faculty of the Department of Electrical Engineering at Lehigh University. His research interests include linear and nonlinear optical beam interactions, synthetic optical materials, optical solitons, and quantum electronics. He has authored and co-authored more than 350 papers. He is a Fellow of the Optical Society of America and the American Physical Society. He is the recipient of the 2011 Wood Prize and 2018 Max Born Award of OSA.