

**NEW OPPORTUNITIES FOR PLASMA SCIENCE IN NONEQUILIBRIUM,  
LOW TEMPERATURE PLASMAS CONFINED TO MICROCAVITIES:  
THERE'S PLENTY OF ROOM AT THE BOTTOM**

**Wednesday, October 11, 2006  
Babbio Bldg, Room 104, Time 11am**

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Nonequilibrium, low temperature plasmas have, in just the past few years, been confined to microcavities with characteristic dimensions ( $d$ ) as small as  $10\ \mu\text{m}$ . Plasma science has thus entered a new region of parameter space in which  $d$  is on the order of tens of Debye lengths and the plasma frequency  $\omega_p/2\pi \sim 1\ \text{THz}$ . In this previously unexplored realm, plasmas display intriguing properties, including the loss of quasineutrality and the ability to operate continuously at atmospheric pressure and beyond. Of equal importance is the interaction of the plasma with its material boundaries and, in particular, the demonstrated ability to interface a plasma in the gas or vapor phase with the electron-hole plasma in a semiconductor. This presentation will briefly describe the salient characteristics of these cold, dense plasmas and the opportunities for plasma science of driving  $d$  to  $1\ \mu\text{m}$  and into the nanometer domain. Several recent applications of microplasmas, including the demonstration of large ( $500 \times 500$ ) arrays of microcavity plasma devices in Si, and the observation of photodetection in the visible and near-infrared by a microplasma, will also be discussed.

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**J. G. Eden** received the B.S. degree in electrical engineering (high honors) from the University of Maryland, College Park, in 1972 and the M.S. and Ph.D. degrees from the University of Illinois at Urbana-Champaign in 1973 and 1976, respectively. In 1976, he joined the Optical Sciences Division of the U.S. Naval Research Laboratory as a National Research Council postdoctoral associate, and from 1976 to 1979 was a research physicist in the Laser Physics Branch. He was appointed to the faculty of the University of Illinois, Urbana, in 1979 and is currently Professor of Electrical and Computer Engineering and Director of the Laboratory for Optical Physics and Engineering. At the University of Illinois, he has served as Associate Vice-Chancellor for Research, Associate Dean of the Graduate College, and Assistant Dean of Engineering. He has authored more than 200 journal publications and two books, and holds 22 patents. Dr. Eden is a Fellow of the Optical Society of America and the American Physical Society. He received the IEEE Lasers and Electro-Optics Society (LEOS) Distinguished Service Award in 1996, the IEEE Third Millennium medal in 2000, and was appointed a LEOS Distinguished Lecturer for 2003-2005. He is the recipient of the 2005 IEEE LEOS Aron Kressel Award. From 1996 to 2002, he served as Editor-in-Chief of the IEEE JOURNAL OF QUANTUM ELECTRONICS and, in 1998, as President of LEOS.

**Light refreshments will be served prior to seminar**