



**Wednesday**  
**November 7, 2012**  
**4:00 pm**  
**Room 1311**  
**EECS Building**

**Prof. Howard Milchberg**  
**University of Maryland**

## **The Extreme Nonlinear Optics of Air and Femto- second Optical Filamentation**

Under certain conditions, powerful ultrashort laser pulses can form greatly extended filaments of concentrated high intensity in gases, leaving behind a very long trail of plasma. Applications range from laser-guided electrical discharges to remote sensing. Air is a medium of particular interest for applications, and as a mostly molecular gas it is interesting from a physics perspective as well. The experimental program at Maryland has two tracks. One is to conduct fundamental measurements of the nonlinear response of gas phase atoms and molecules with unprecedented precision in space and time. The other is to use this understanding in filamentation experiments. I will discuss recent efforts in measuring filament electron density, addressing a recent controversy about the response of atoms and molecules to intense fields, and quantum-coherent boosting of filamentation.

**About the Speaker:** Howard Milchberg received his undergraduate degree in Engineering Physics from McMaster University, in Hamilton, Ontario. He held a National Science and Engineering Research Council of Canada Fellowship at Princeton University, where he completed his Ph.D. in Astrophysical Sciences in 1985, in the plasma physics program. His dissertation was on one of the first two soft x-ray lasers experimentally demonstrated. Milchberg then joined AT&T Bell Laboratories as a postdoc, where he performed among the first experiments in high intensity femtosecond laser-plasma interactions. In 1988 Milchberg joined the University of Maryland, where he received a NSF Presidential Young Investigator Award. He is a Professor in the Department of Electrical and Computer Engineering, and the Department of Physics. Milchberg is a Distinguished Scholar-Teacher at Maryland and a Fellow of the American Physical Society (APS). In 2005, he was awarded the APS Division of Plasma Physics (DPP) Award for Excellence in Plasma Physics Research. Three of his graduate students, most recently in 2012, have won the APS-DPP Marshall Rosenbluth Award for their dissertation research.