

# **The Catholic University of America**

*Department of Physics*

Colloquium

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## **Are Polarization and Magnetization Really Bulk Properties?**

Textbooks typically attempt microscopic definitions in terms of the dipole moment per cell: this is only correct for the spin contribution to magnetization  $M$ , but is incorrect for both polarization  $P$  and for the orbital contribution to  $M$ . The microscopic quantities well defined inside a polarized material are the microscopic charge and current densities: these trivially determine the dipole (electric and magnetic) of a finite sample, but the sample boundary yields an extensive contribution to such dipoles. Contrary to what textbooks pretend, the microscopic charge and current densities in the bulk of a sample do not determine the values of  $P$  and  $M$ . The problem has been solved in 1993 for  $P$  and in 2005-6 for  $M$ . In the latter case, there have been recent developments at the fundamental level [1].

In this talk I will outline the state of the art about  $P$  and  $M$ .

**Wednesday, February 3, 2016**

**4:00pm**

**106 Hannan Hall**

**Refreshments will be served at 3:45**

Sponsored in part by the Graduate Student Association For more information, please contact: Dr. Nick Mercholsky (202) 319-5586

If you would like to request disability accommodations, please contact Patrick Burke at (202)-319-5315 to make arrangements.