1093-35-326 **Michael O'Neil*** (oneil@cims.nyu.edu), 251 Mercer St, Room 1105A, New York, NY 10025.
Electromagnetics, Debye sources, and Beltrami fields: Analysis and computation via integral equations.

Beltrami (force-free) fields are those vector fields which are proportional to their own curl: curl(B) = kB, with "k" a scalar. Beltrami fields arise in several different areas of applied mathematics and physics. For example, in fluid dynamics, Beltrami flows are those flows whose velocity and vorticity are parallel. In plasma physics, magnetic Beltrami fields inside a confinement device at equlibrium arise via Lorentz force balancing. In this talk, I will show that by viewing Beltrami fields as special-case time-harmonic Maxwell fields (with wavenumber "k"), their calculation can be reduced to solving a boundary integral equation similar to those found in electromagnetics. Furthermore, using the recently introduced generalized Debye source formulation of time-harmonic electromagnetic fields, robust representations of Beltrami fields and numerically well-conditioned integral equations are immediate consequences. Lastly, the Debye source representation uniformizes a natural complex structure that is directly related to the Beltrami equation. (Received August 19, 2013)