Notre Dame Science
Department of Physics

SUPERCONDUCTORS IN CONFINED GEOMETRIES

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When Cooper pairs in a superconductor are squeezed into a small volume comparable to the superconducting coherence length or penetration depth, their wave functions will be strongly modified. Therefore, mesoscale superconductors are expected to exhibit properties different from bulk materials. For example, new phenomena such as vortex-antivortex pairs and fractional flux quanta have been observed in microscale superconducting dots. The critical temperature of a superconducting network oscillates with changing magnetic field.

This seminar will introduce research projects on mesoscopic superconductors in my group at Northern Illinois University and Argonne National Laboratory. We developed an electrodeposition approach to grow shaped Pb mesocrystals on graphite substrates; NbSe2 and NbN nanowires/ribbons were obtained by controlled composition adjustment of NbSe3 nanostructure precursors; we utilized nanoporous membranes as substrates to fabricate Nb films with nanoscale holes; Nb nano-strips and films containing arrays of nanoscale holes were achieved by using electron-beam lithography in combination with focused-ion-beam milling. We have been exploring the dynamics of a few-row vortex lattice, confinement-induced critical field enhancement and magnetoresistance anisotropy, commensurate pinning and Little-Parks effect and other properties in these confined superconductors.

Condensed Matter Seminar

All interested persons are cordially invited to attend.