Charging and Thermal Hall Effect in Superconductors

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We present a talk about recent theoretical progress of our understanding on the charging and thermal Hall effect in superconductors, which has been brought about based on the augmented quasiclassical equations of superconductivity. The two phenomena are both outside the description of the standard Ginzburg-Landau and quasiclassical Eilenberger equations, for which we need to incorporate the next-to-the-leading order corrections. The resulting augmented quasiclassical equations have proved to be quite powerful in elucidating presence of new and/or unexpected phenomena in superconductors. They include inhomogeneous charging in the Abrikosov lattice that is superimposed on the magnetic-field distribution, intrinsic charging near the surface of d-wave superconductors, and a drastic enhancement of thermal Hall angle in d-wave superconductors at low temperatures. They will be discussed in detail together with the theoretical formalism for calculating them.

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