

Vortex Matter Research Using Electron Microscopy: Memorial to Akira Tonomura

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Abstract - Using electron holography and “coherent beam” Lorentz microscopy, Akira Tonomura studied vortex physics in metal and high-temperature superconductors for more than 20 years. The new methodology he introduced involved coherent electron waves from cold emission (field emission) sources and their quantum mechanical phase shifts. Using 300 kV and 1 MV electron microscopes Tonomura and his collaborators studied dynamic behavior of vortices in metal superconductors, Pb and Nb, and in high-temperature superconductors, $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ and $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$. In this memorial paper for Akira Tonomura the static and dynamic vortex behavior in superconductors is reviewed based on the group’s results.

Keywords - vortex, superconductivity, electron holography, Lorentz microscopy

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