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The origin of anomalous transport in a high temperature superconductor

NIGEL HUSSEY, University of Bristol

The metallic state of high-temperature superconductors is anomalous in that the Hall coefficient is strongly temperature dependent while the resistivity varies linearly in temperature over a wide temperature range. Although this T-linear resistivity gradually weakens with doping, crucially it survives until superconductivity is destroyed. Both the superconducting pairing interaction and the origin of this anomalous transport have yet to be determined, though most theoretical approaches consider them to be intrinsically linked. Through novel analysis of polar angular magnetoresistance oscillations, we have succeeded to determine the full temperature and momentum dependence of the mean free path of the charge carriers in highly doped $Tl_2Ba_2CuO_{6+\delta}$ ($T_c = 15$K) up to 60K. From this, we have been able to identify the origin of the T-linear resistivity *and* the temperature dependence of the Hall coefficient for this particular compound. Given the correlation between the appearance of the T-linear resistivity and the onset of superconductivity, this additional scattering is also a prime candidate for the pairing mechanism for high temperature superconductivity itself.