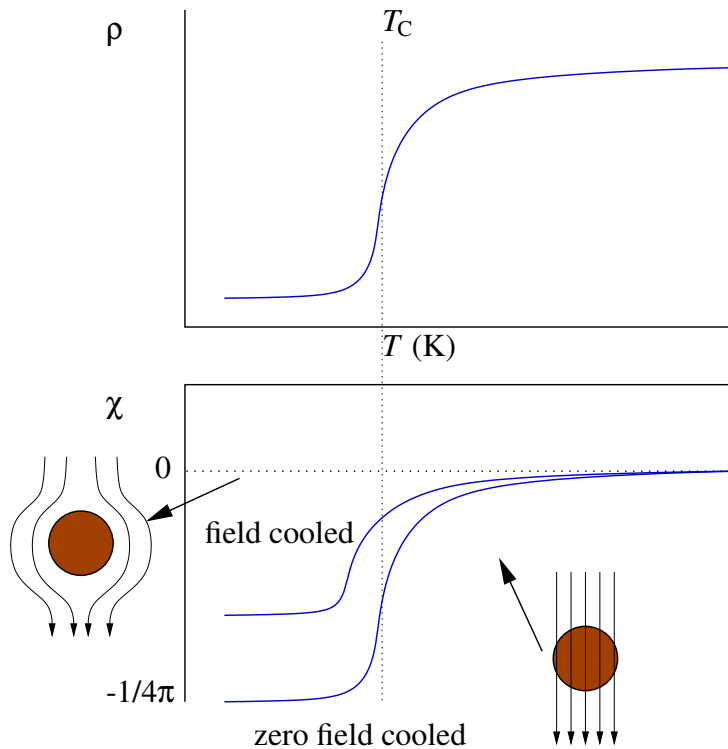


Superconductivity

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- In 1908, Kamerlingh Onnes liquefied He for the first time, and in 1911 he used it to cool mercury to about 1.5 K. At 4.2 K, the resistance of his Hg specimen dropped suddenly from about 0.1Ω to $10^{-5} \Omega$, and by 3 K had dropped to $1/10^6$ its value at room T . This marked the discovery of superconductivity. Typical temperature dependence of the electrical resistivity and the magnetic susceptibility of a superconductor are shown below:



- Not only does the electrical resistivity go to zero, but because of the *Meissner effect* any magnetic lines of force are thrown out by the superconductor, making superconductors strong diamagnets (perfect, even, when the magnetic susceptibility becomes $\chi = -\frac{1}{4\pi}$).
- Uses of superconductors:
 - Used in electromagnetic coils in high field magnets in NMR, MRI *etc.*
 - Power transmission (high currents through thin wires)
 - Magnetic levitation

