SUPERCONDUCTIVITY

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Superconductivity is a phenomenon occurring in certain materials generally at very low temperatures, characterized by exactly zero electrical resistance and the exclusion of the interior magnetic field (the Meissner effect). Like ferromagnetism and atomic spectral lines, superconductivity is a quantum mechanical phenomenon. It cannot be understood simply as the idealization of "perfect conductivity" in classical physics.

The electrical resistivity of a metallic conductor decreases gradually as the temperature is lowered. However, in ordinary conductors such as copper and silver, impurities and other defects impose a lower limit. Even near absolute zero a real sample of copper shows a non-zero resistance. The resistance of a superconductor, despite these imperfections, drops abruptly to zero when the material is cooled below its "critical temperature". An electric current flowing in a loop of superconducting wire can persist indefinitely with no power source.