

The BCS theory of superconductivity

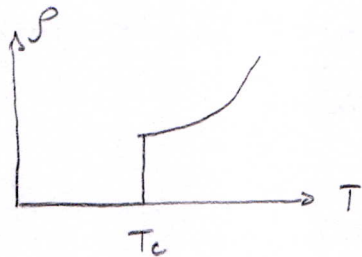
- Introduction
- The Cooper pair idea
- the BCS theory using Bogoliubov's method
- Momentum distribution and coherence length
- the gap at finite temperatures
- Electronic heat capacity

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Introduction

The electrical resistivity of certain metals as a function of temperature looks somewhat like this



Below a certain T_c it drops abruptly to a value that is identically zero. Below T_c we say the system is in a superconducting state.

This superconducting state has many other remarkable properties. But we will not be discussing them here. You don't need lecture notes for that: you can just read about it on wikipedia.

Instead, what I want to discuss here is the more subtle point concerning the microscopic mechanisms responsible for superconductivity.

One hint about such mechanisms comes from measurements of the specific heat. They look somewhat like this