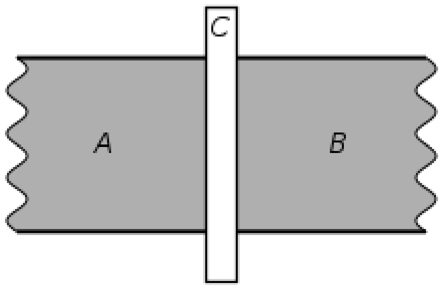
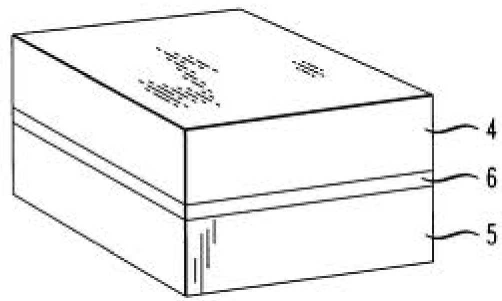
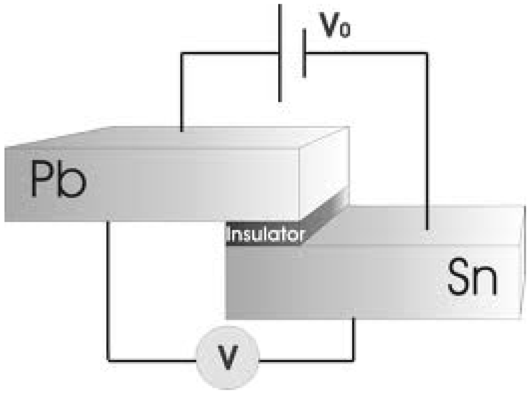
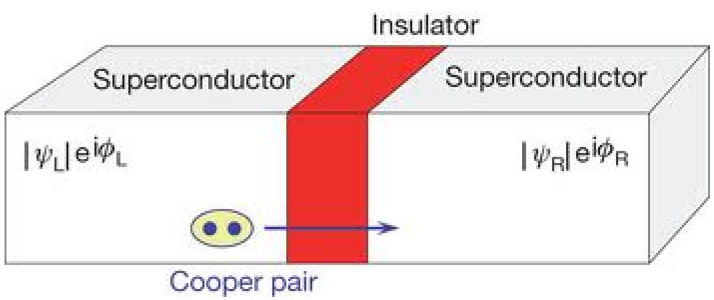
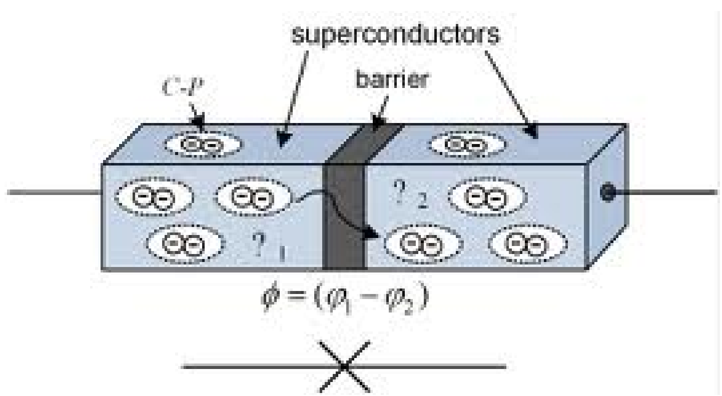
Tunnel Junctions

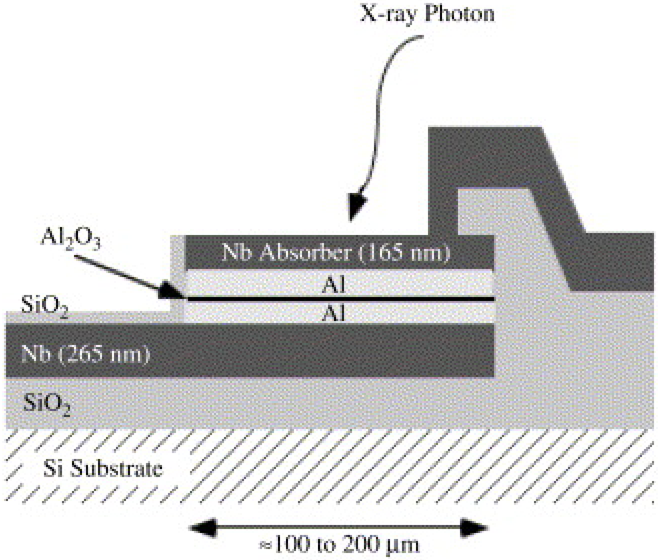






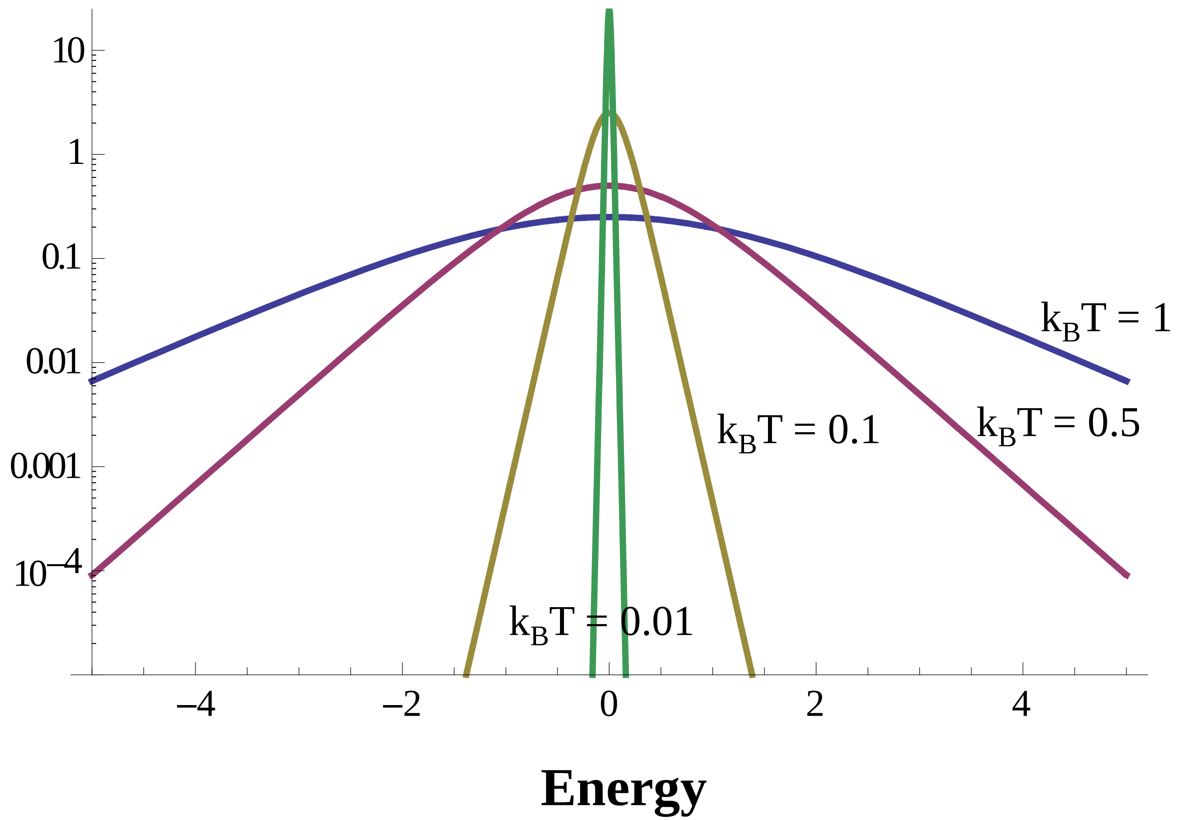






The Derivative of the Fermi Function in the Limit of Low Temperatures

$$-\left.\frac{\partial f\left(E+eV\right)}{\partial\left(eV\right)}\right|_{V=0}$$



BCS Density of States and the Fermi Function

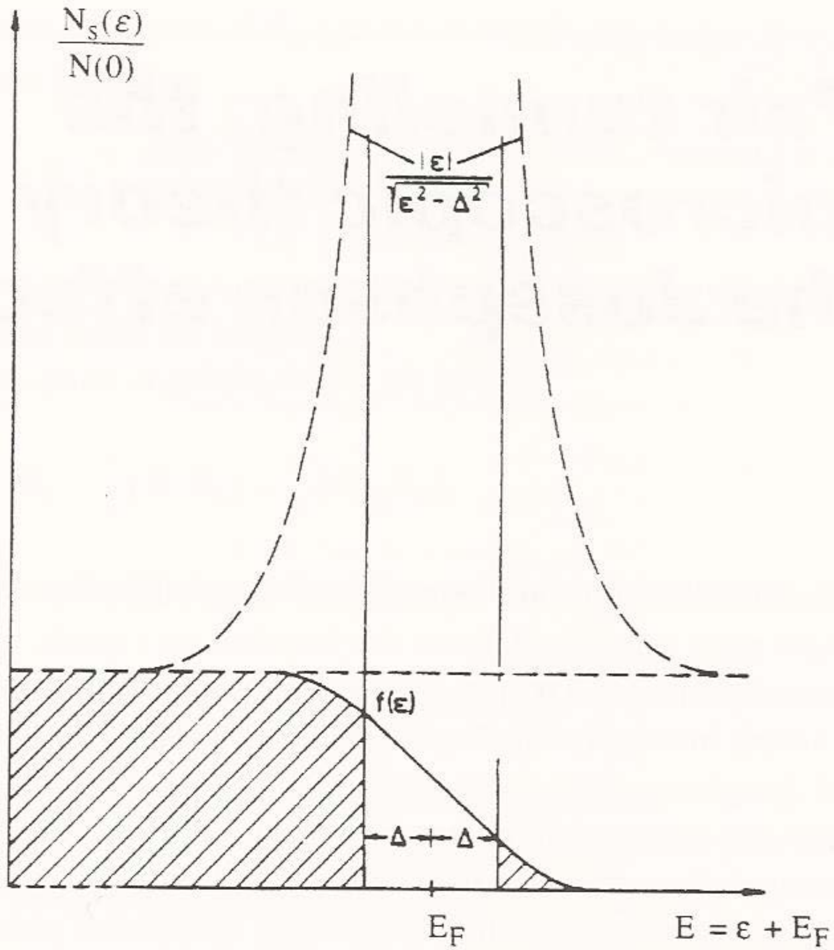


Figure 29.3 The normalized BCS quasiparticle density of states as a function of the excitation energy ε. The Fermi distribution function for a nonzero temperature is shown in the lower portion of the figure.

E. L. Wolf, Principles of Electron Tunneling Spectroscopy, Oxford Univ. Press, 1989.

SC / I / N Tunneling and the Density of States

Conductance
vs. Bias

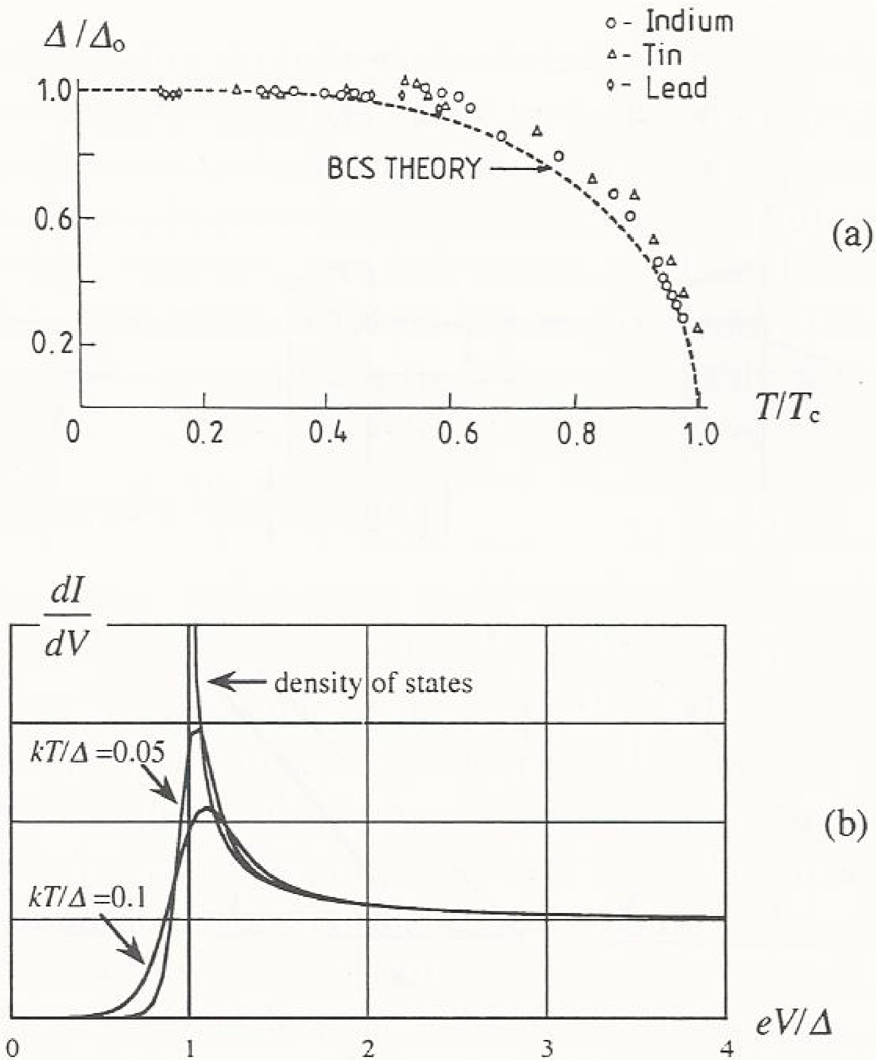


Figure 8.5. Early applications of tunnelling: (a) temperature dependence of the gap (after Giaever and Megerle [22]); (b) at low temperatures dI/dV is a good approximation to the density of states.

J. R. Waldram, *Superconductivity of Metals and Cuprates*, IOP, 1996

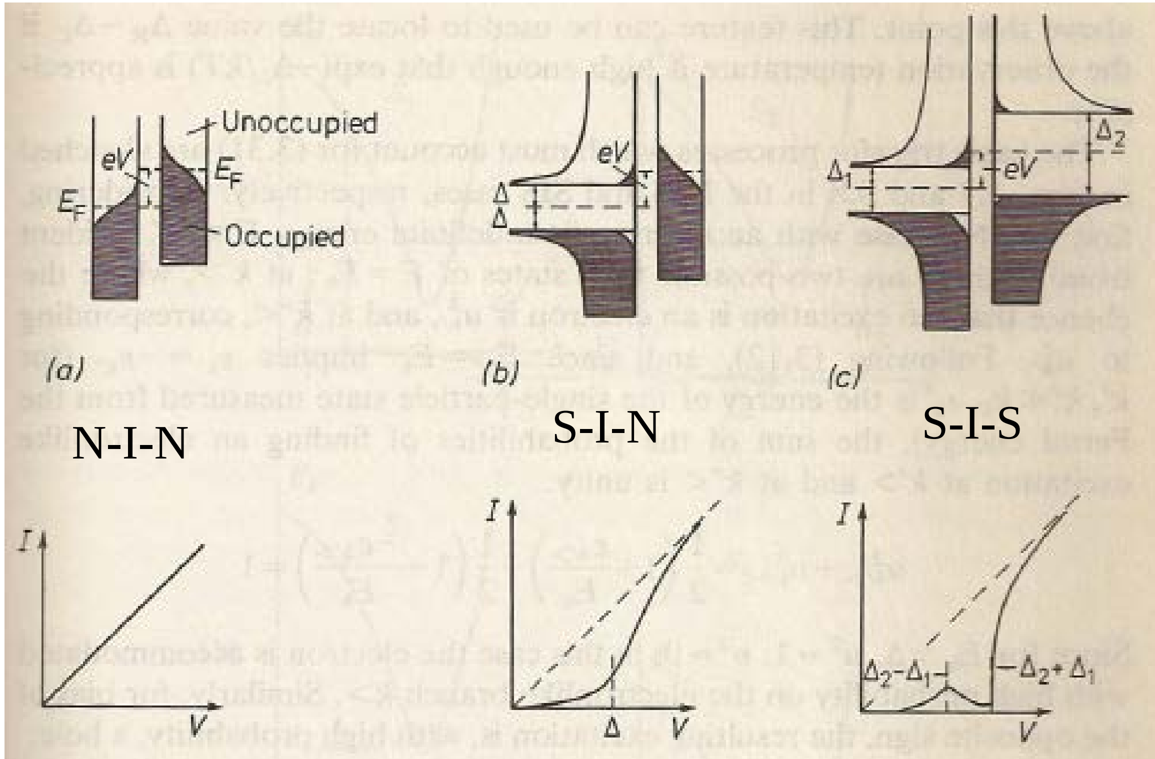


Fig. 3.6. Sketches indicate the quasiparticle current–voltage characteristics expected in the three basic cases: (a) two normal metals, (b) a normal metal and a single superconductor, and (c) two superconductors. In the latter case one may expect to determine both superconducting energy gaps from structures in $I(V)$ arising at the sum and difference of the two gap energies.

E. L. Wolf, *Principles of Electron Tunneling Spectroscopy*, (Oxford University Press, New York, 1989) page 105

Temperature dependence of the energy gap in superconducting Al–Al_2O_3–Al tunnel junctions

B. L. BLACKFORD AND R. H. MARCH

Canadian Journal of Physics, 46, 141 (1968)

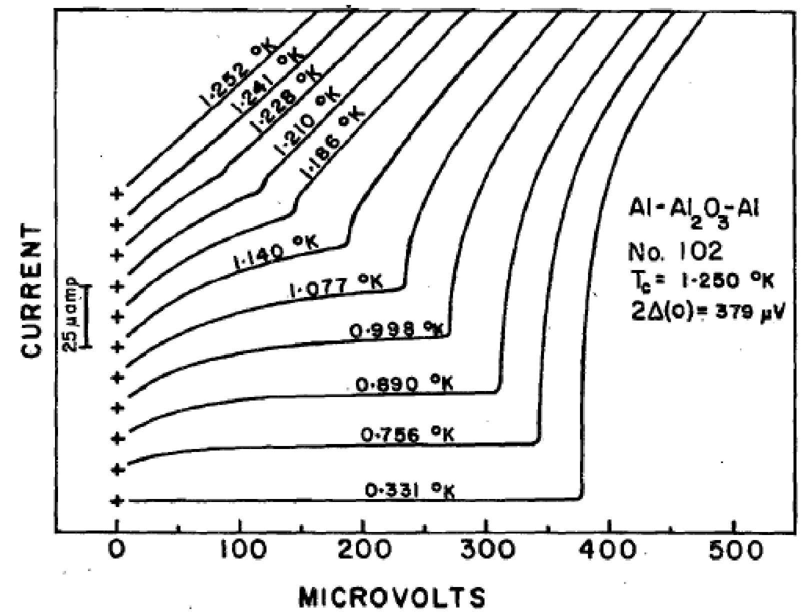


FIG. 1. Sequence of I–V curves as a function of temperature. Successive origins on the current axis are offset for clarity.

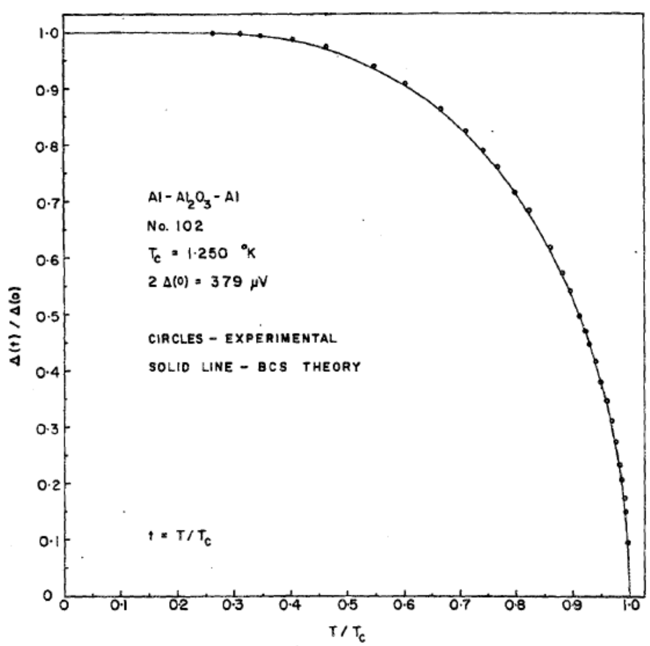


FIG. 3. Normalized energy gaps plotted versus normalized temperature and compared with the BCS theory.

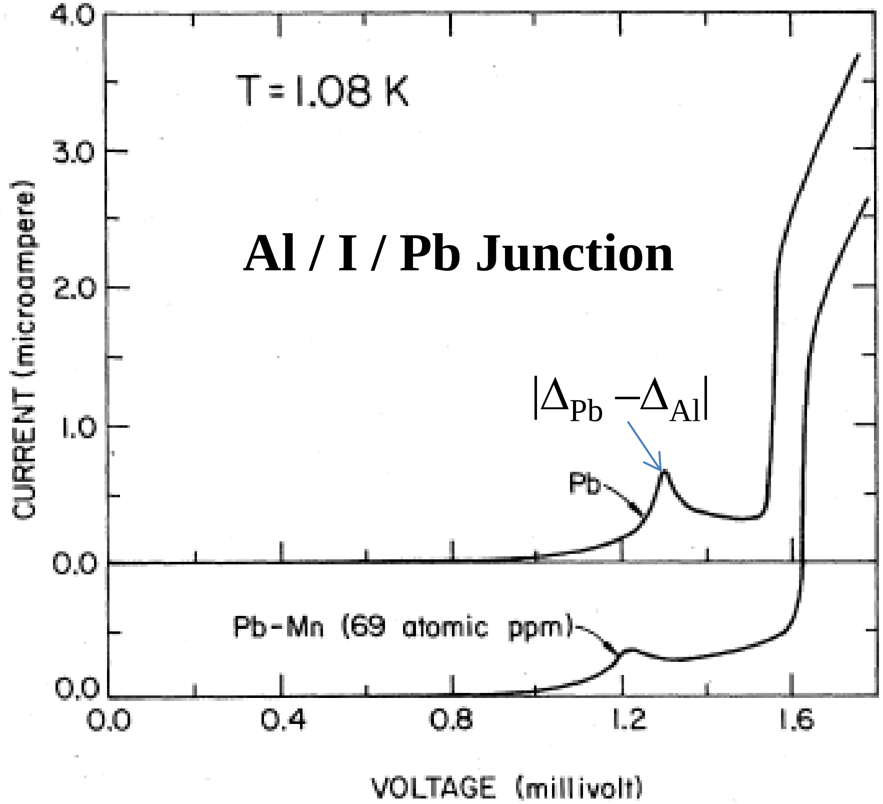


FIG. 1. Tunneling *I*-*V* characteristic curves of lead and of lead with 69 at. ppm manganese at a temperature of 1.08 K.

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Electron-tunneling observation of localized excited states in superconducting manganese-doped lead

J.-K. Tsang and D. M. Ginsberg