The Electron-Phonon Interaction

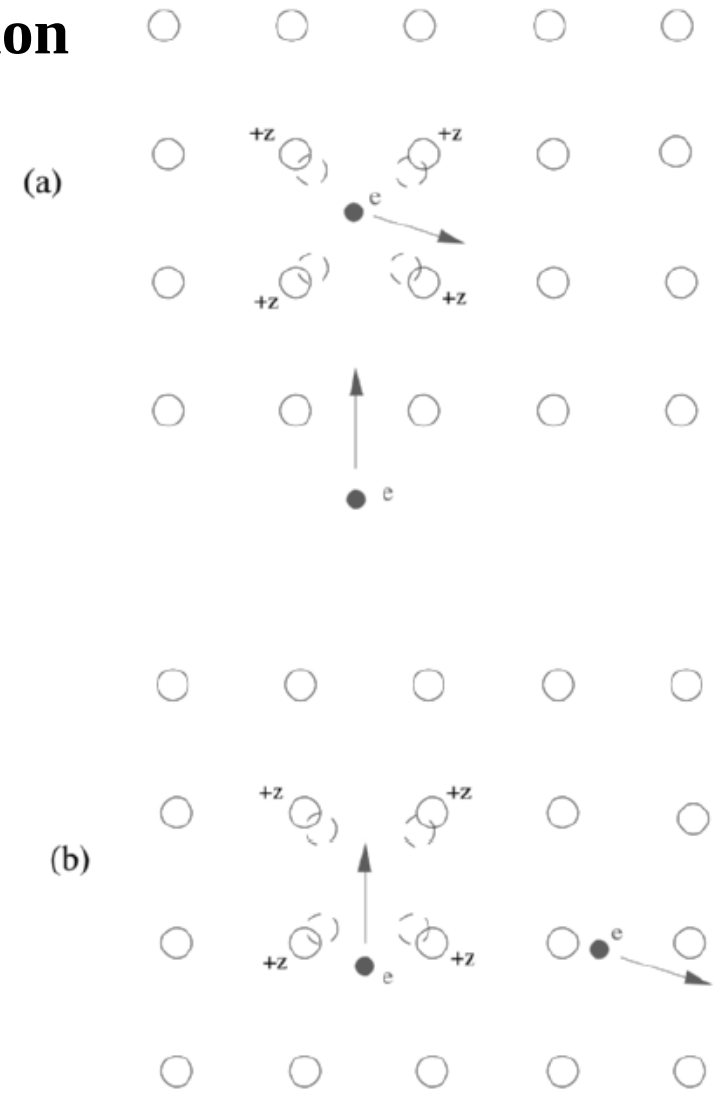

Fig. 3.1. In (a) one electron polarizes the lattice (indicated by *dashed circles* displaced towards uppermost electron); in (b) that electron has moved away. In the meantime a second electron (seen below in (a)) is attracted to the polarized region, *which has remained polarized long after the first electron has left the region*. The figure is schematic only, and does not, for example, properly convey the opposite momenta such a pair should possess

Superconductivity
Conventional and Unconventional Superconductors
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3 Electron–Phonon Superconductivity*

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Table 51.1 Thermodynamic properties of typical superconductors

	T_c, °K	$\theta = \hbar\omega_D/k_B$, °K	N(0) V	$\frac{\Delta_0}{k_B T_c}$	$H_c(0)$, Oe	$\frac{T_c C_n(T_c)}{H_c(0)^2 V}$	$\left.\frac{C_s - C_n}{C_n}\right\|_{T_c}$
BCS				1.76		0.168	1.43
Cd	0.56	164	0.18	1.6	29	0.177	1.32–1.40
Al	1.2	375	0.18	1.3–2.1	106	0.171	1.45
Sn	3.75	195	0.25	1.6	305	0.161–0.164	1.60
Pb	7.22	96	0.39	2.2	805	0.134	2.71

N(0) V

is calculated from Eq. (51.43). $k_B T_c \approx 1.13\hbar\omega_D e^{-1/N(0)V}$

Source: R. Meservey and B. B. Schwartz, Equilibrium Properties: Comparison of Experimental Results with Predictions of the BCS Theory, in R. D. Parks (ed.), "Superconductivity," vol. I, pp. 122, 141, 165, Marcel Dekker, Inc., New York, 1969; D. Shoenberg, "Superconductivity," 2d ed., p. 226, Cambridge University Press, Cambridge, 1952.

Note the difference between T_c and the pairing interaction temperature scale ($\hbar\omega_D/k_B$)

A. L. Fetter and J. D. Walecka, Quantum Theory of Many Particle Systems, p. 448