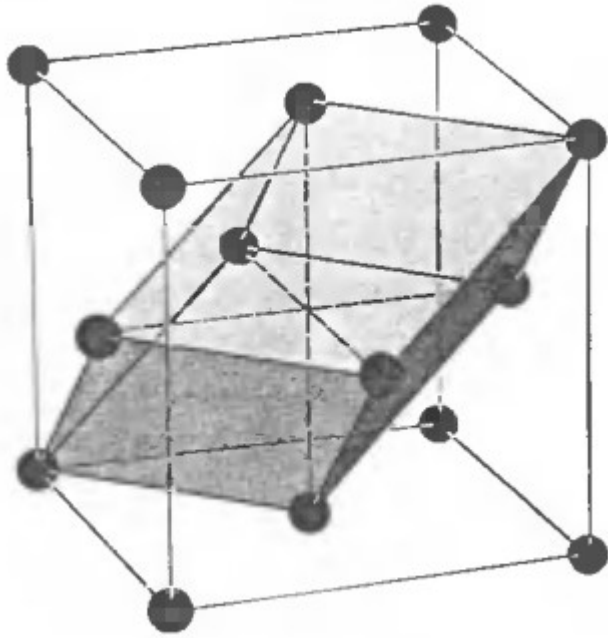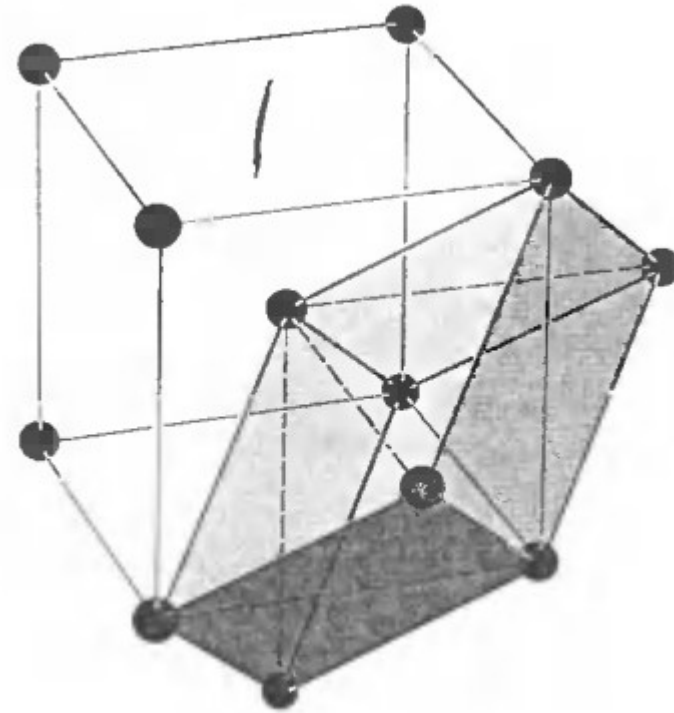# Condensed Matter Physics

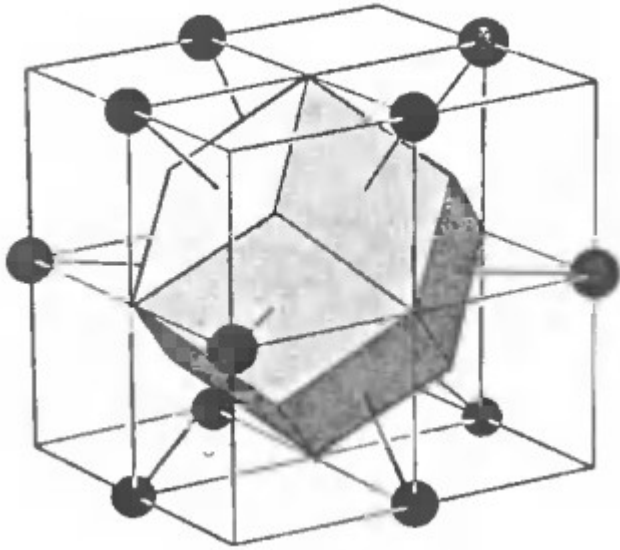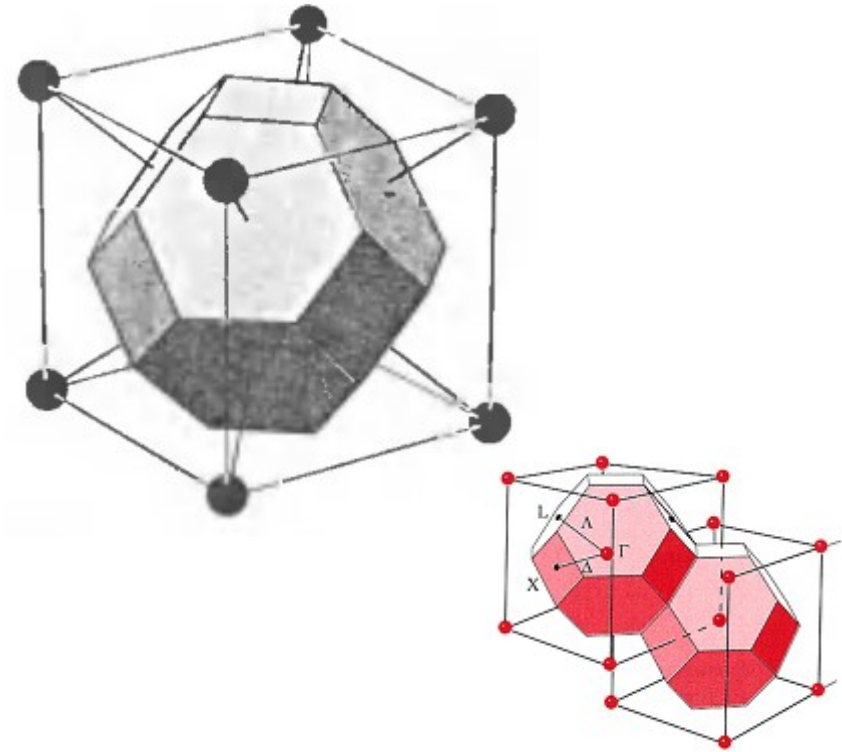# Conventional and primitive unit cells

face centered cubic (fcc)
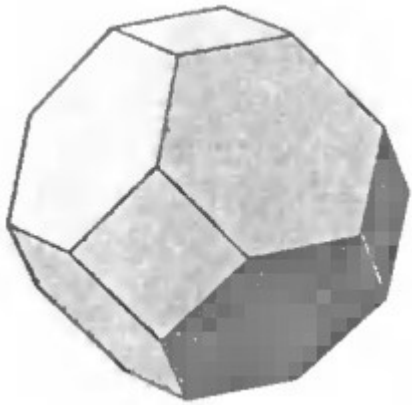
body centered cubic (bcc)
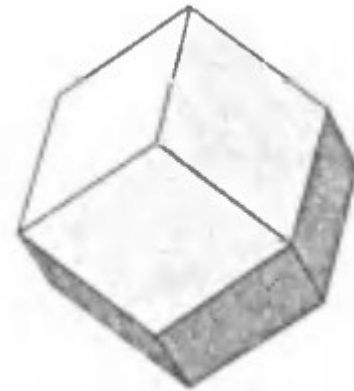
Wigner-Seitz cell

face centered cubic (fcc)

body centered cubic (bcc)

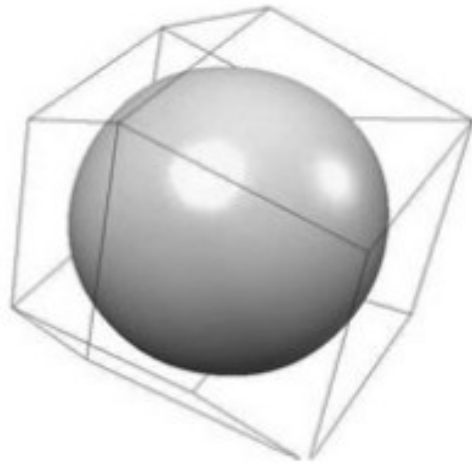# The first Brillouin zone

face centered cubic (fcc)

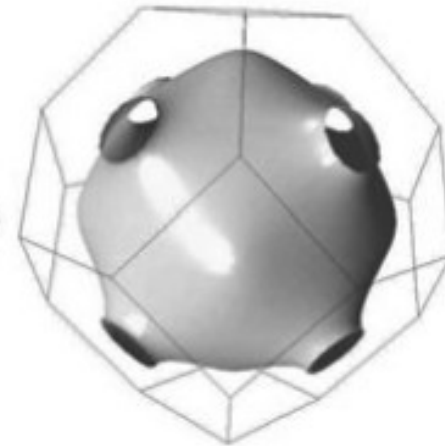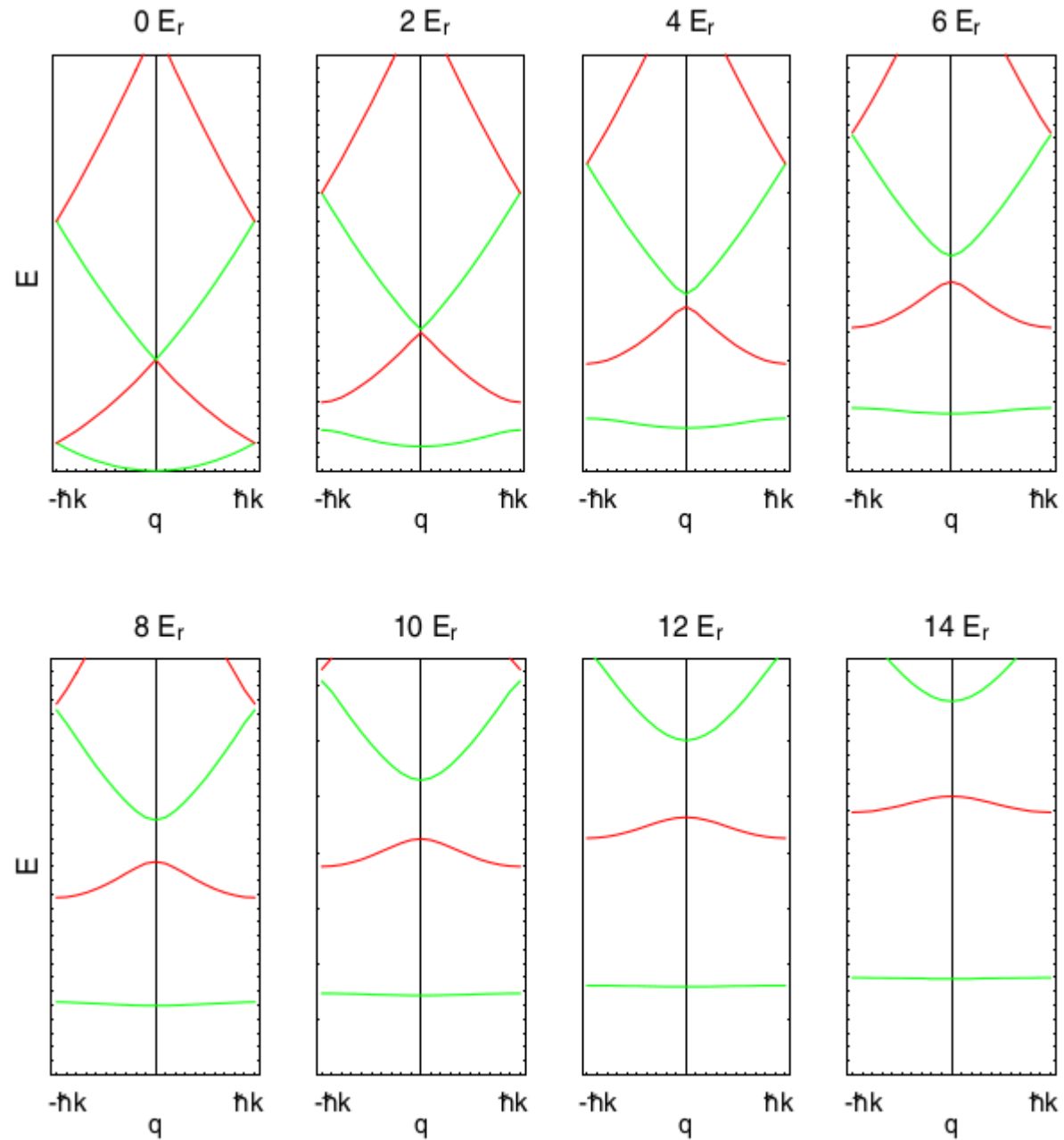body centered cubic (bcc)
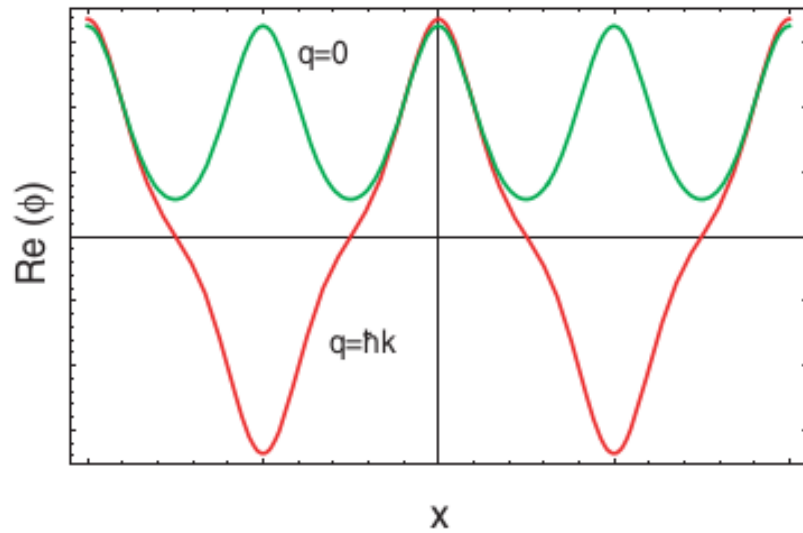
The Fermi surface

Potassium   Lithium   Copper

Energy Bands
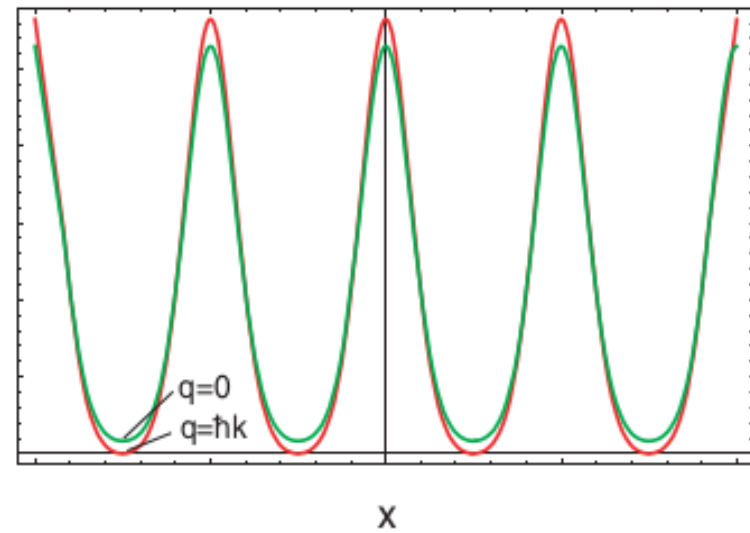
Bloch Wavefunctions

(a) Bloch wavefunction $\phi_q^{(1)}(x)$, $V_{lat} = 8\,E_r$

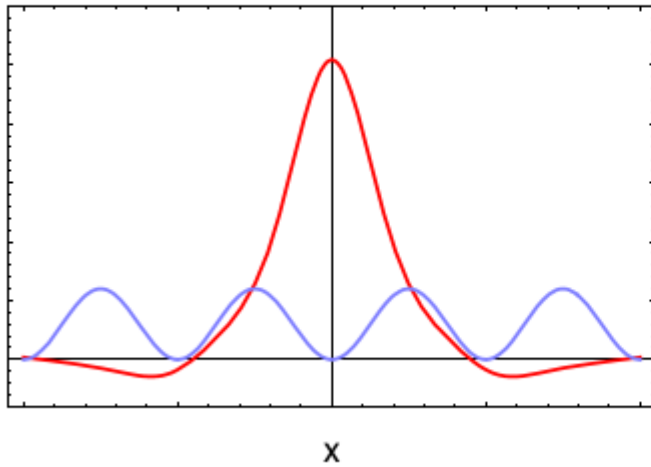Re (ϕ)

q=0

q=$\hbar$k

x

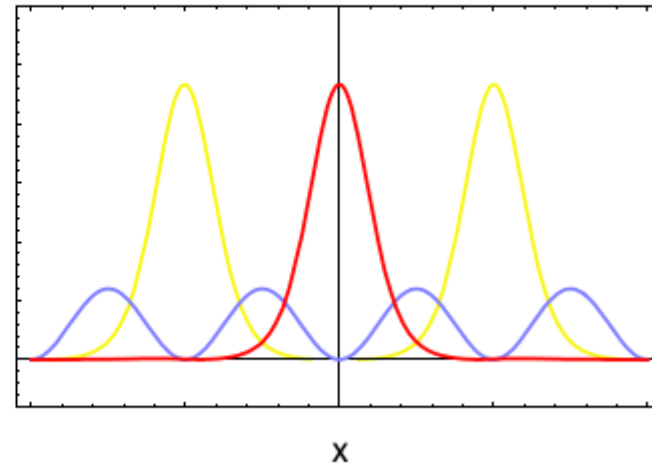(b) Density $|\phi_q^{(1)}(x)|^2$, $V_{lat} = 8\,E_r$

q=0
q=$\hbar$k

x
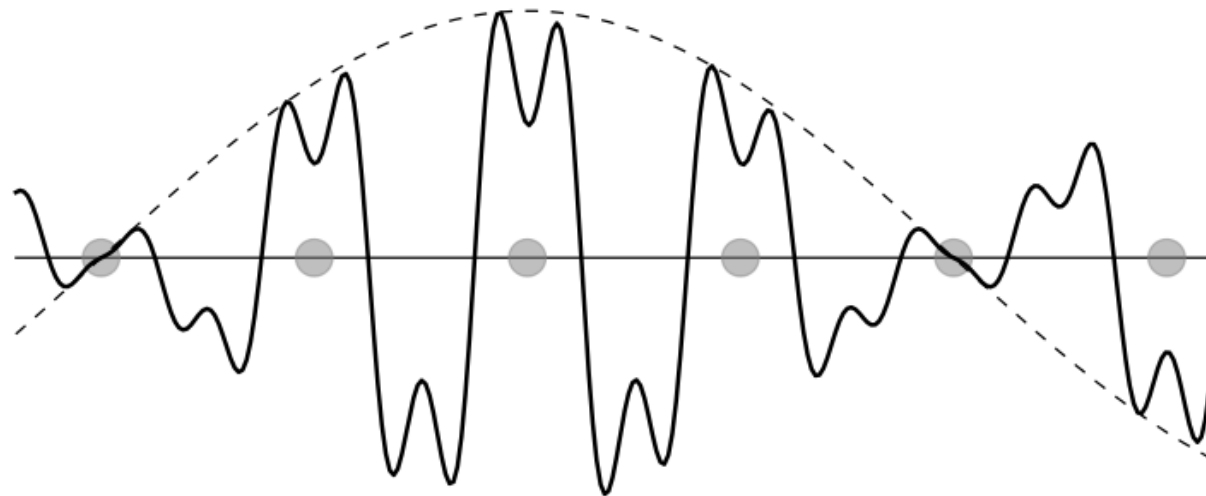
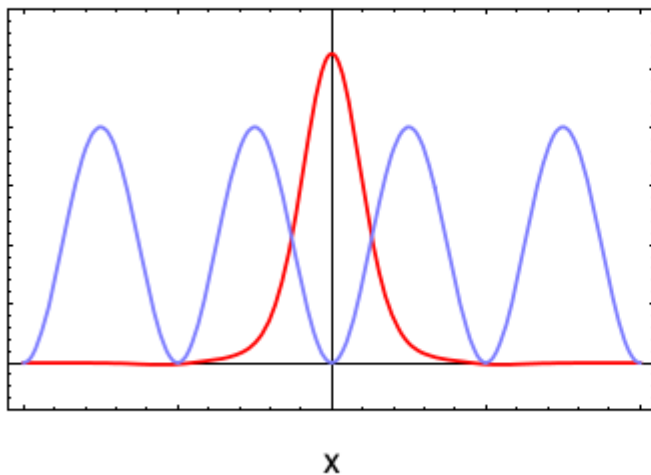# Wannier Functions

(a)

Wannier function w(x), $V_{lat} = 3\,E_r$

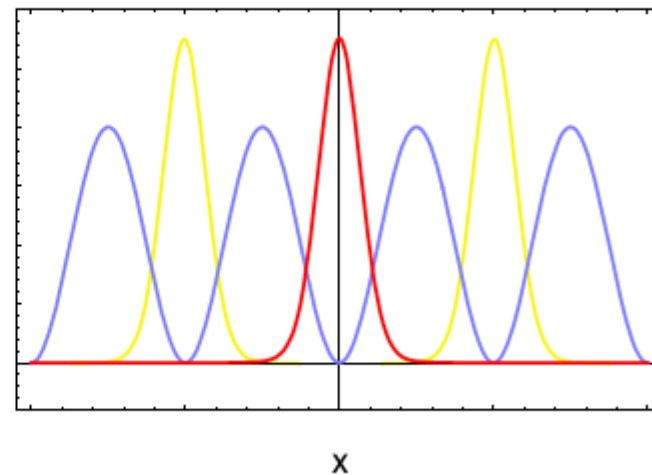Density $|w(x)|^2$, $V_{lat} = 3\,E_r$

x

x

(b)

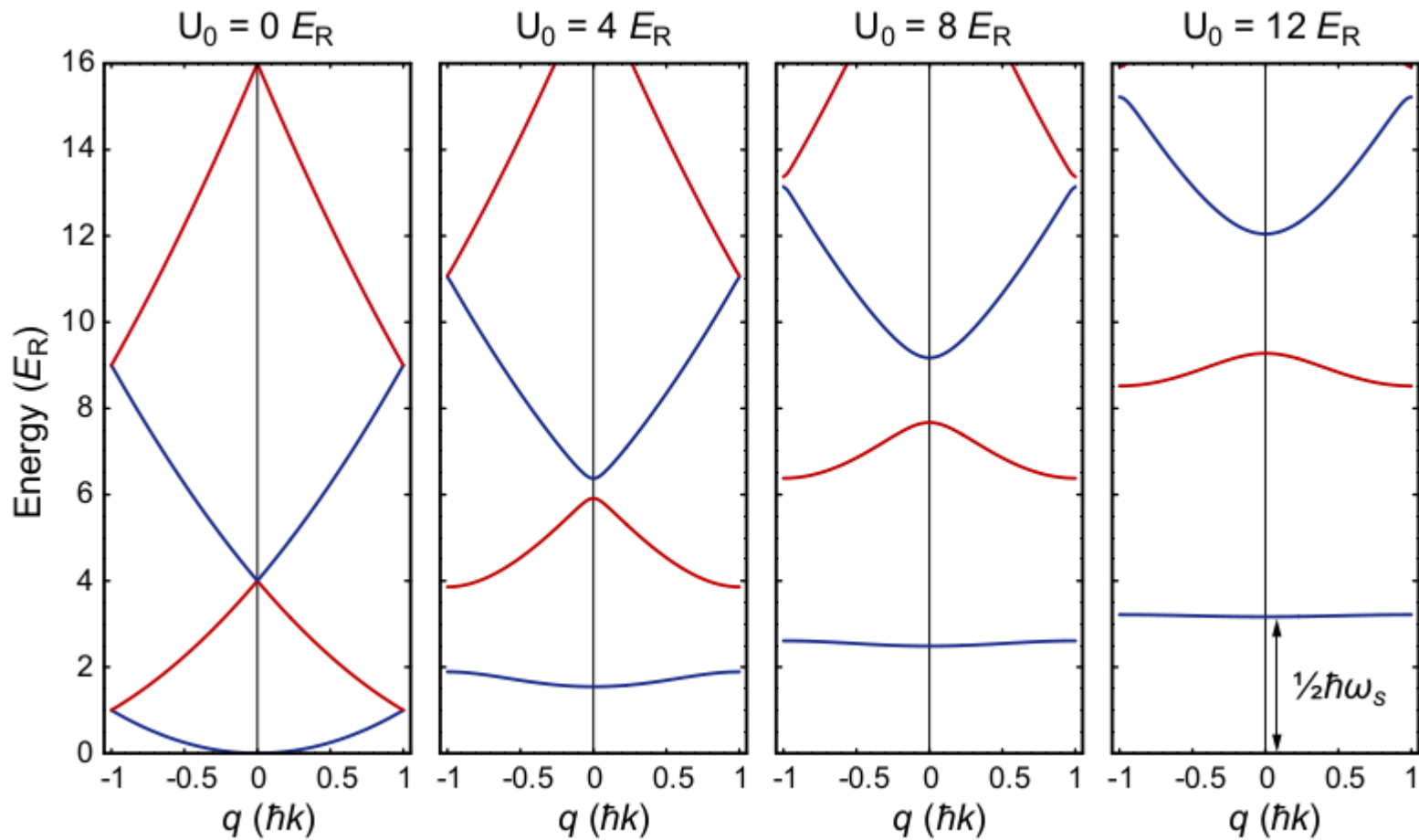Wannier function w(x), $V_{lat} = 10\,E_r$

Density $|w(x)|^2$, $V_{lat} = 10\,E_r$

x

x

Energy Bands

Wannier Functions