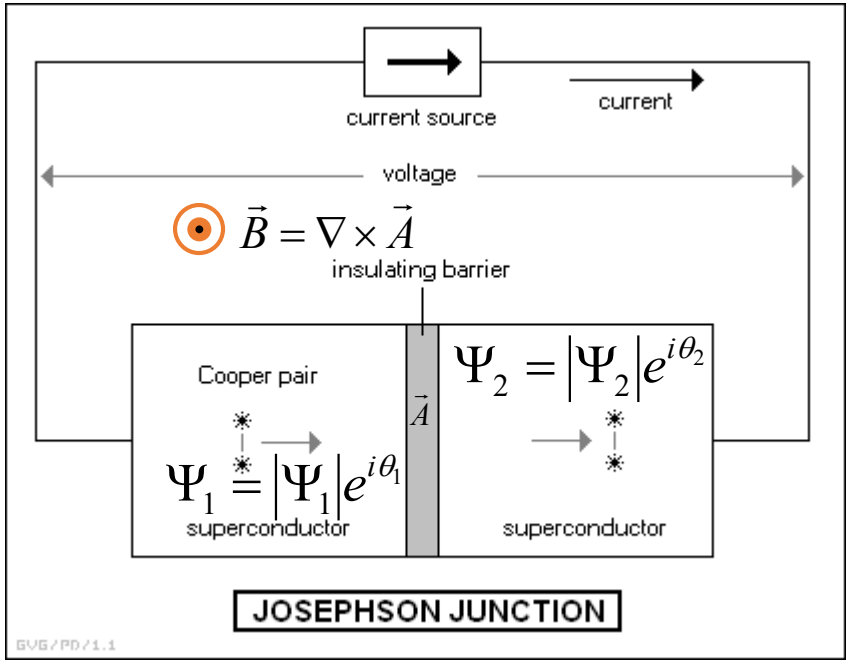
Macroscopic Quantum Effects

Continued

Josephson Effects (Tunneling of Cooper Pairs)



$$I = I_c \sin(\delta) \quad \textbf{DC}$$

$$\frac{d\delta}{dt} = \frac{2e}{\hbar} V \quad \textbf{AC}$$

$$\delta = \theta_1 - \theta_2 - \frac{2e}{\hbar} \int_1^2 \vec{A} \bullet d\vec{l}$$

Gauge-invariant phase difference

Circuit representation of a JJ

$\delta(t)$ is the solution of a nonlinear diff. Eq.

See section 21-9 of the Feynman Lecture on the Macroscopic Quantum description of superconductivity: https://www.feynmanlectures.caltech.edu/III_21.html