FUNDAMENTALS OF NANOELECTRONICS

Basic Concepts

1. The New Perspective
2. Energy Band Model

3. What & Where is the "Voltage"?

4. Heat & Electricity:

Second Law & Information

3.1. Introduction

3.2. A New Boundary Condition

3.3. Quasi-Fermi Levels (QFL's)

3.4. Current from QFL's

3.5. Landauer Formulas

3.6. What a Probe Measures

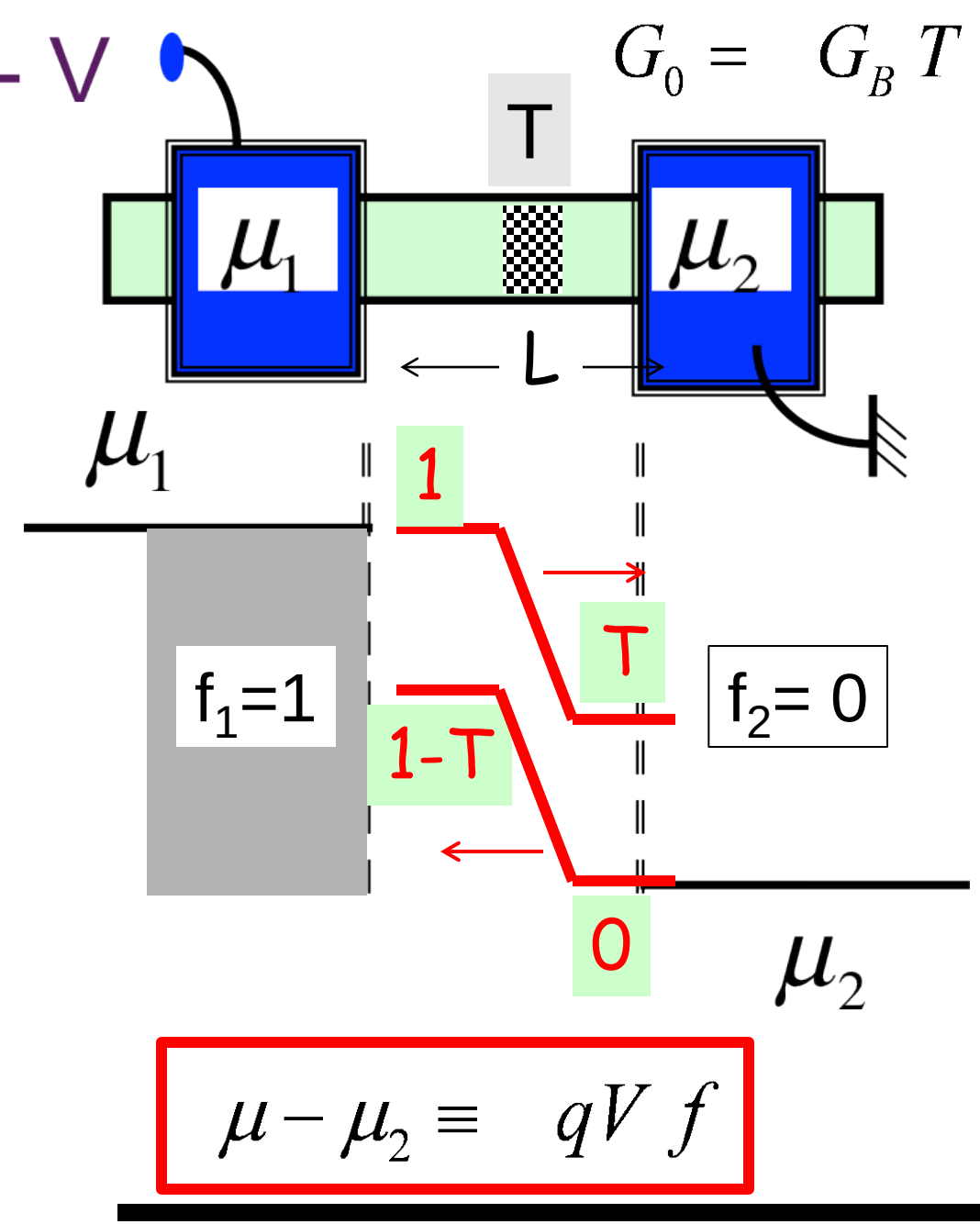
3.7. Electrostatic Potential

3.8. Boltzmann Equation

3.9. Spin voltages

3.10. Summing up ..

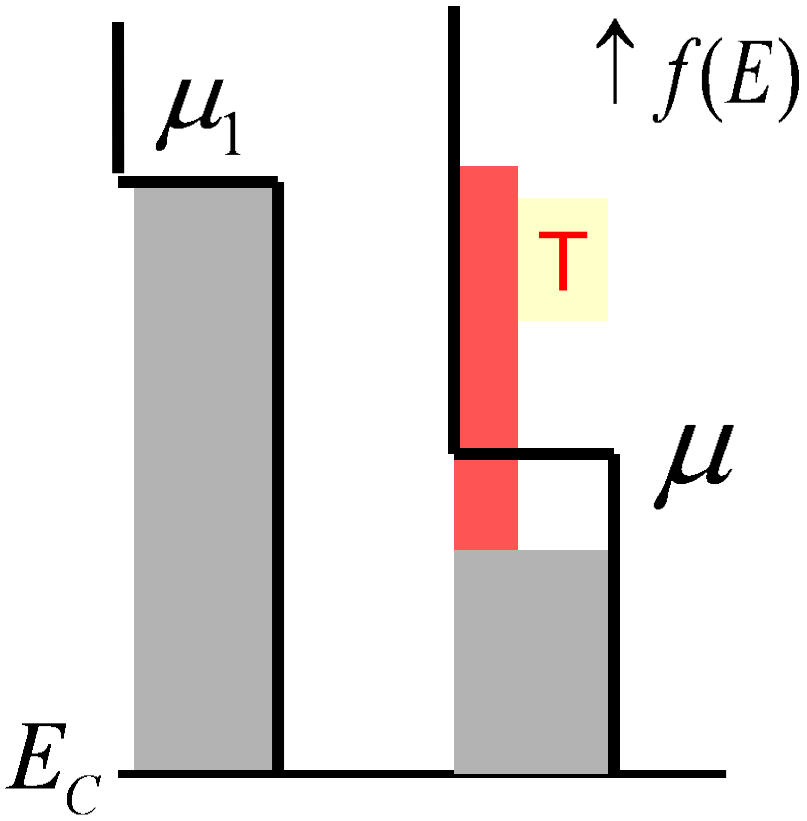
3.5a Landauer Formulas



$$G_0 = G_B\, T$$

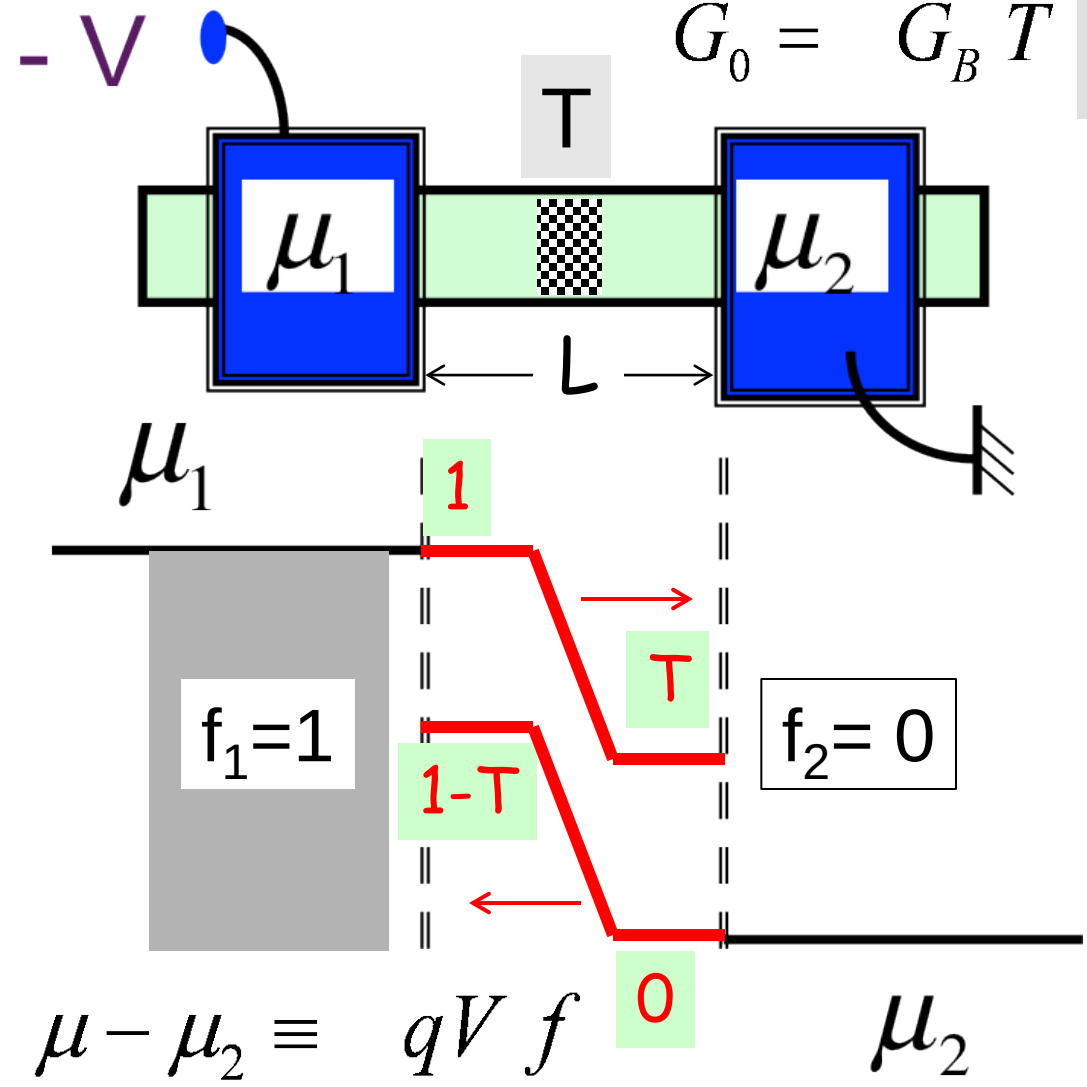
$$G_0 = G_B \frac{\lambda}{L+\lambda}$$

T



$$\mu - \mu_2 \equiv qV\, f$$

3.5b Landauer Formulas



$$G_0 = G_B\,T$$

$$I = \frac{G_B}{q}\underbrace{\left(\mu^+ - \mu^-\right)}_{qV\,T}$$

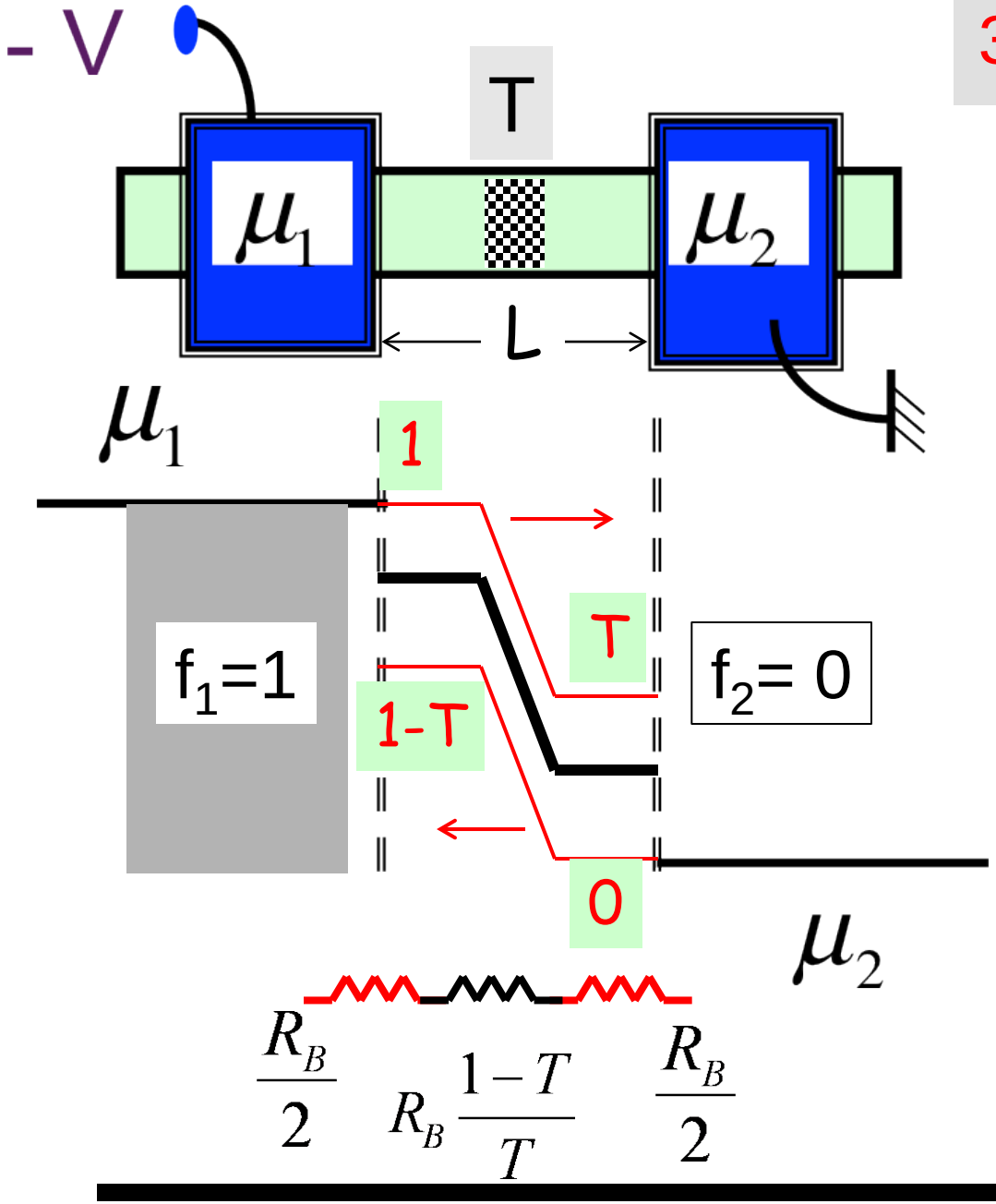
$$\frac{I}{V} = G_B\,T \rightarrow R = R_B\,\frac{1}{T}$$

$$R_S = R_B\,\frac{1-T}{T}$$

$$\frac{I}{\delta V} = G_B\,\frac{T}{1-T}$$

$$\delta V = V\,(1-T)$$

3.5c Landauer Formulas



$$\mu - \mu_2 \equiv qV\,f$$

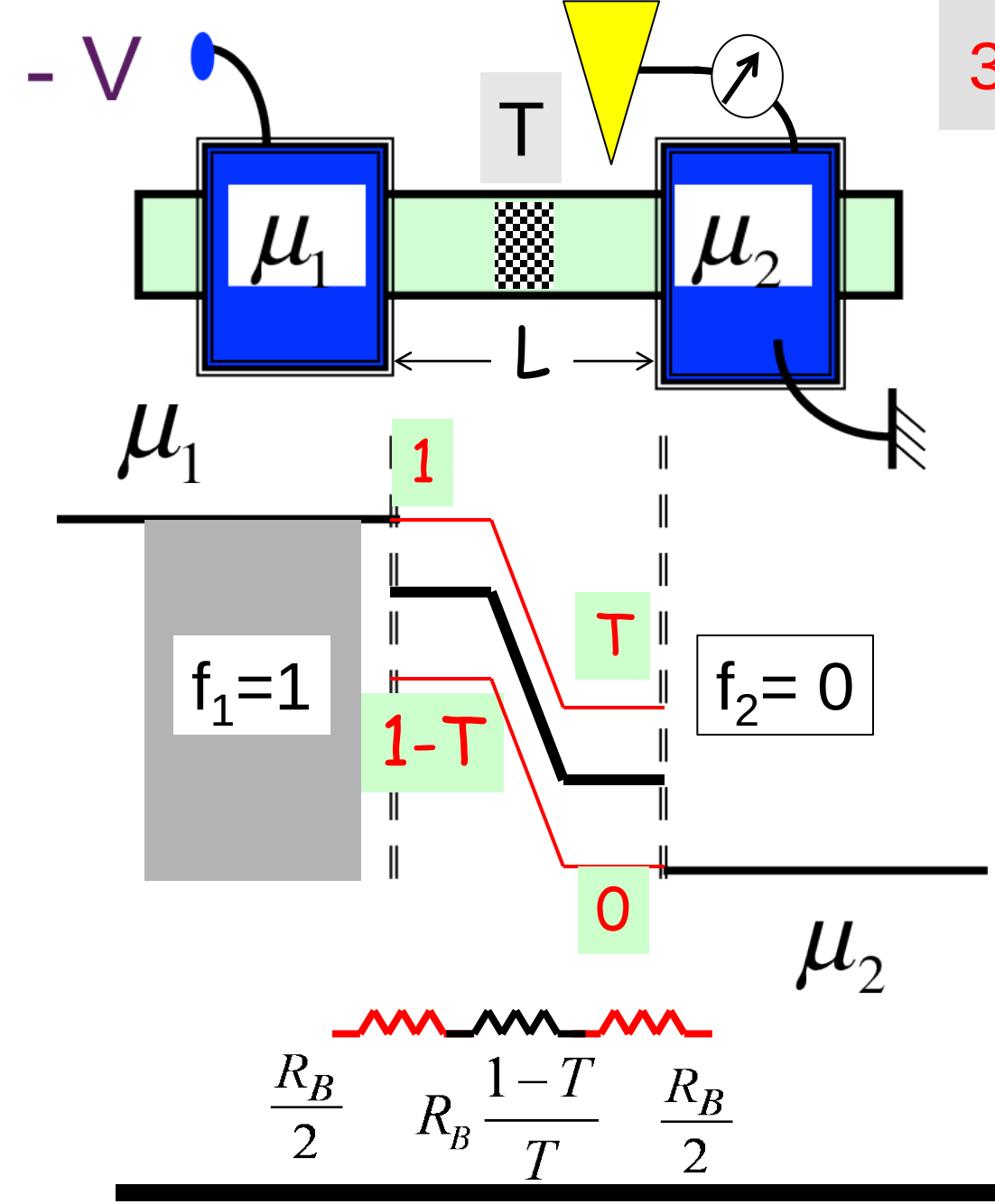
$$\delta V = V(1-T)$$

$$R = R_B\frac{1}{T}$$

$$R_S = R_B\frac{1-T}{T}$$

$$R - R_S = R_B$$

3.5d Landauer Formulas

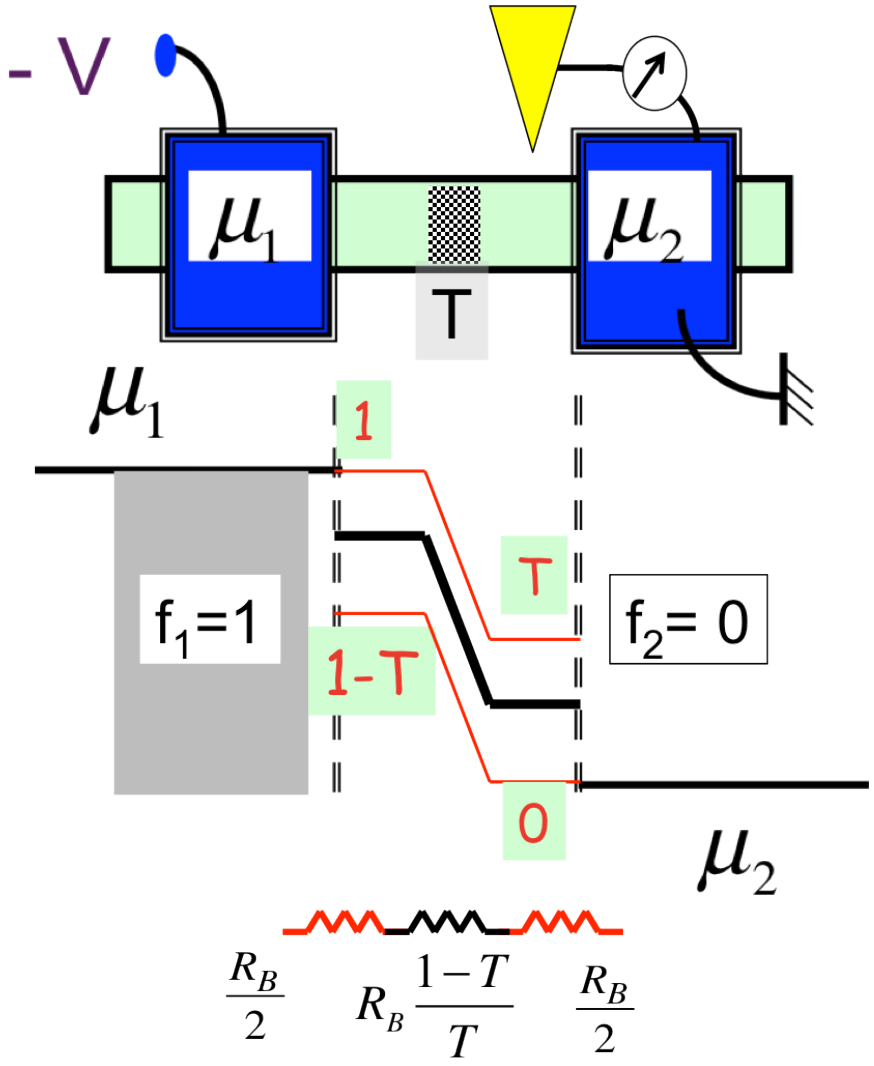


Two approaches to making it "concrete"

4.6. Measure with a probe

4.7. Electrostatic potential

Coming up next ..



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