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

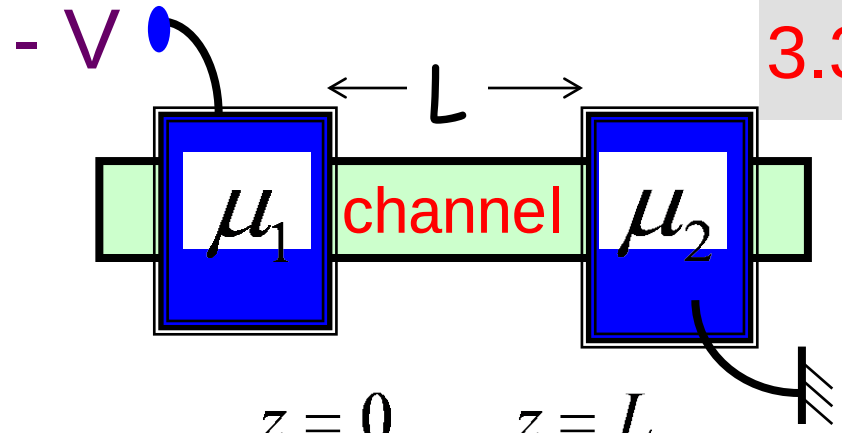
3.7. Electrostatic Potential

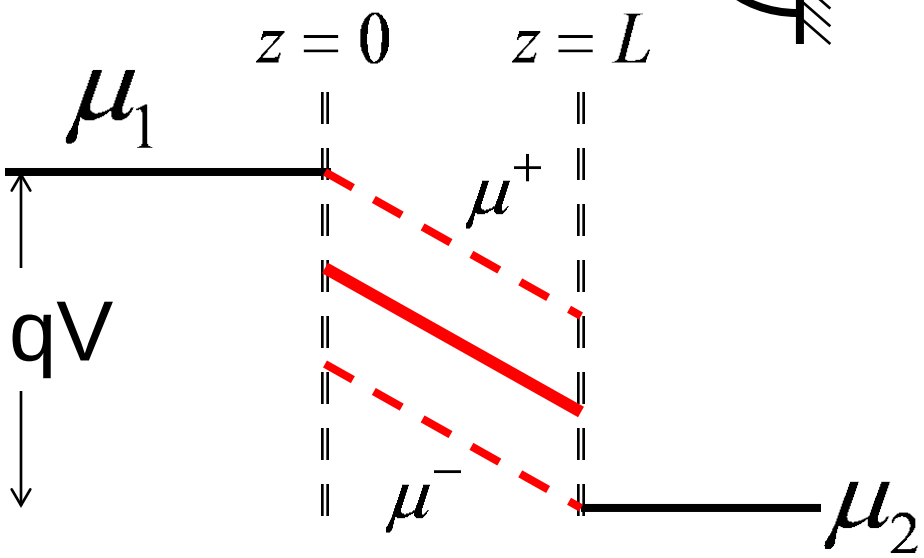
3.8. Boltzmann Equation

3.9. Spin voltages

3.10. Summing up ..

3.3a Quasi-Fermi Levels (QFL's)





$$\mu^+(z=0) = \mu_1$$
$$\mu^-(z=L) = \mu_2$$

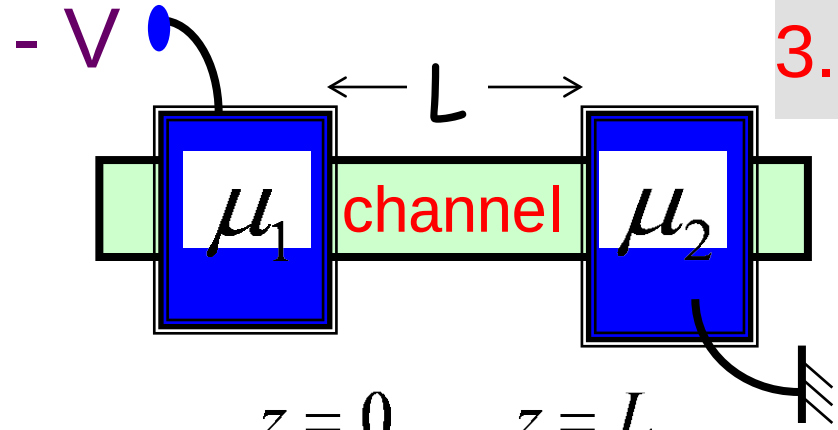
Lecture 4.4

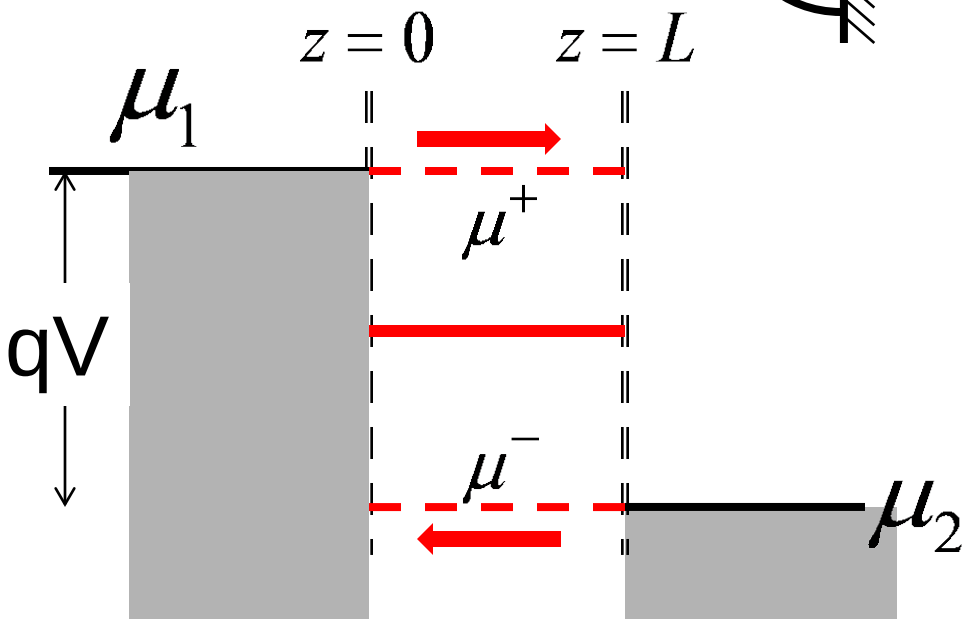
$$\mu(z=0) = \mu_1 - \frac{qIR_B}{2}$$
$$\mu(z=L) = \mu_2 + \frac{qIR_B}{2}$$

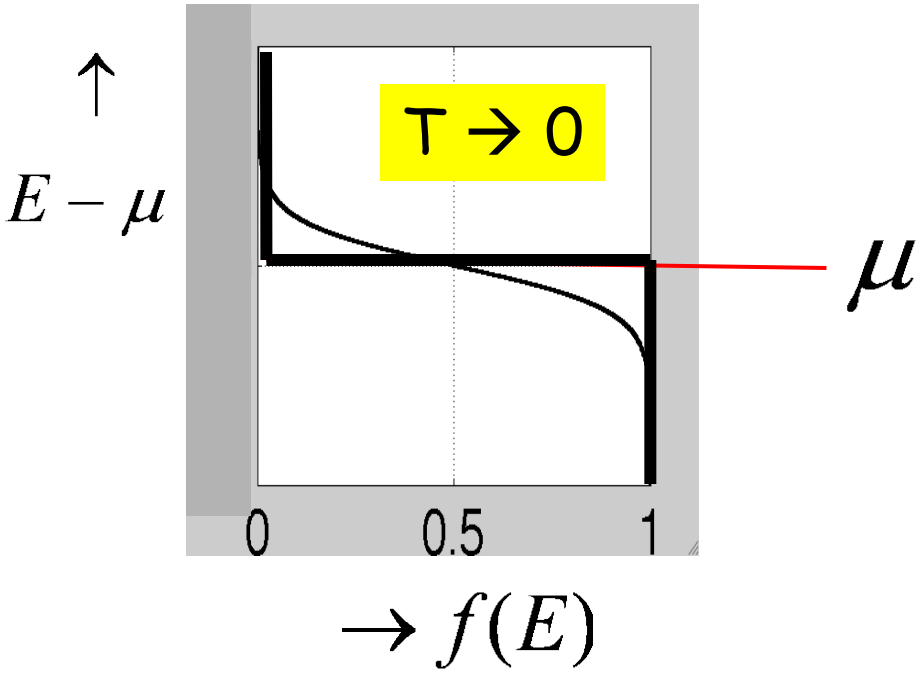
$L << \lambda$

$$\frac{R_B}{2} \quad R_B\frac{L}{\lambda} \quad \frac{R_B}{2}$$

3.3b Quasi-Fermi Levels (QFL's)



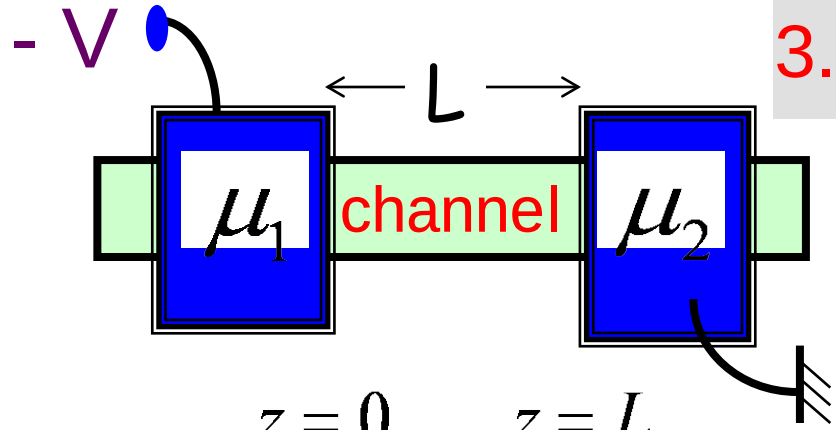


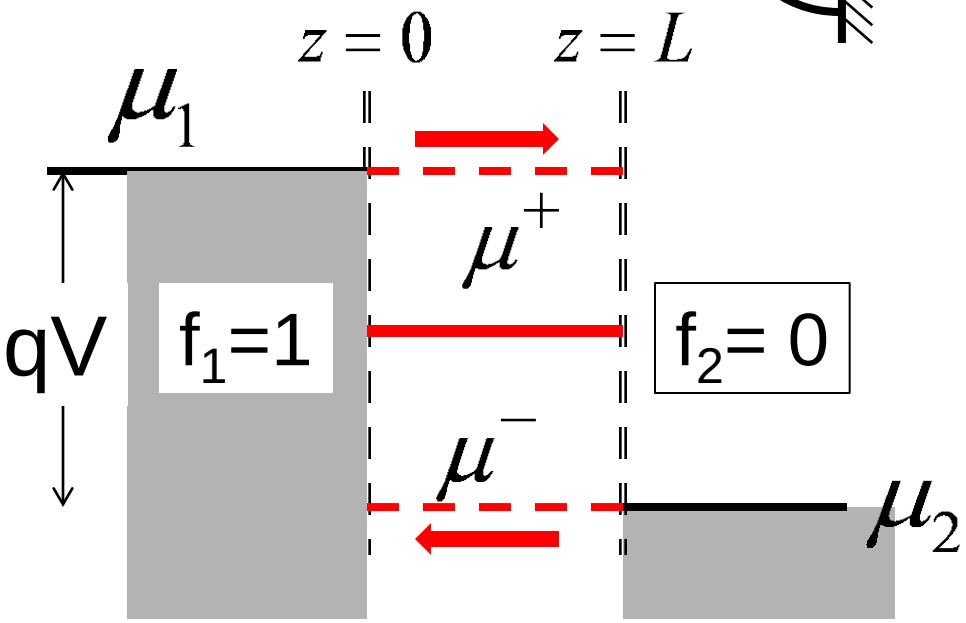


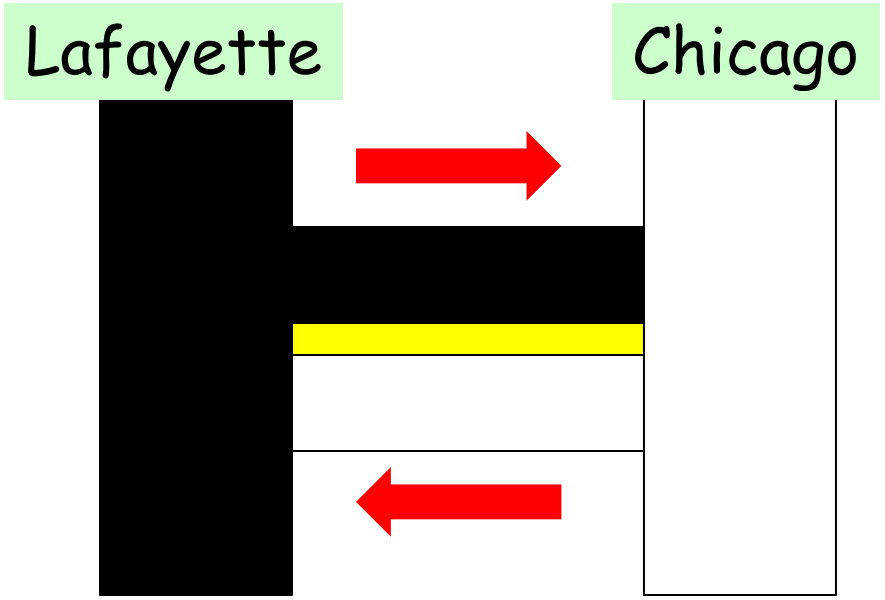
$L << \lambda$

$\frac{R_B}{2}$ $R_B \frac{L}{\lambda}$ $\frac{R_B}{2}$

3.3c Quasi-Fermi Levels (QFL's)



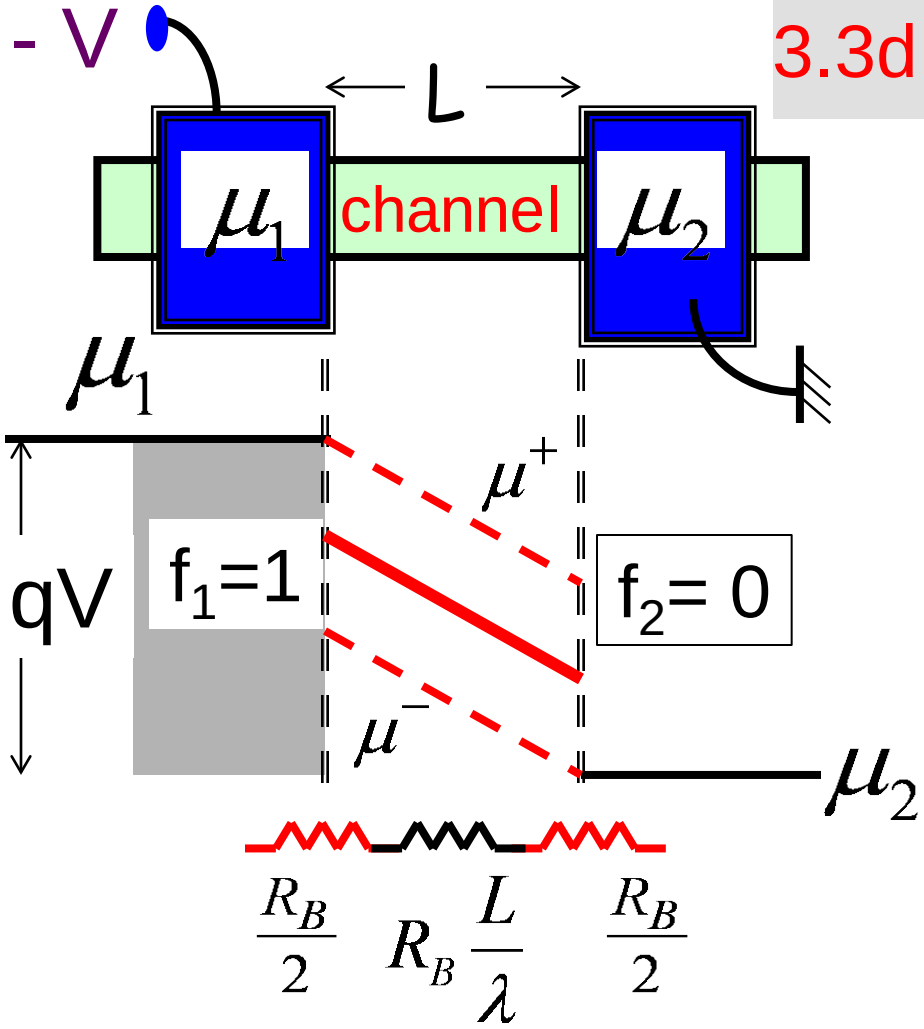




$$L << \lambda$$

$$\frac{R_B}{2} \qquad R_B \frac{L}{\lambda} \qquad \frac{R_B}{2}$$

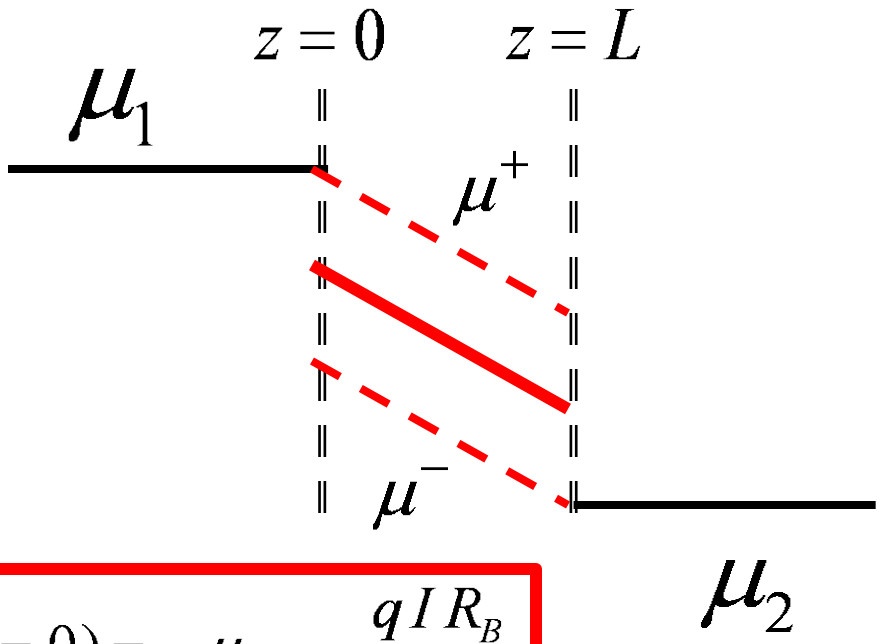
3.3d Quasi-Fermi Levels (QFL's)



$$\mu^+(z=0) = \mu_1$$

$$\mu^-(z=L) = \mu_2$$

Coming up next ..



$$\mu(z=0) = \mu_1 - \frac{qIR_B}{2}$$

$$\mu(z=L) = \mu_2 + \frac{qIR_B}{2}$$

$$\mu^+(z=0) = \mu_1$$

$$\mu^-(z=L) = \mu_2$$

QFL Boundary Conditions