FUNDAMENTALS OF NANOELECTRONICS

Basic Concepts

1. The New Perspective

Energy Band Model →

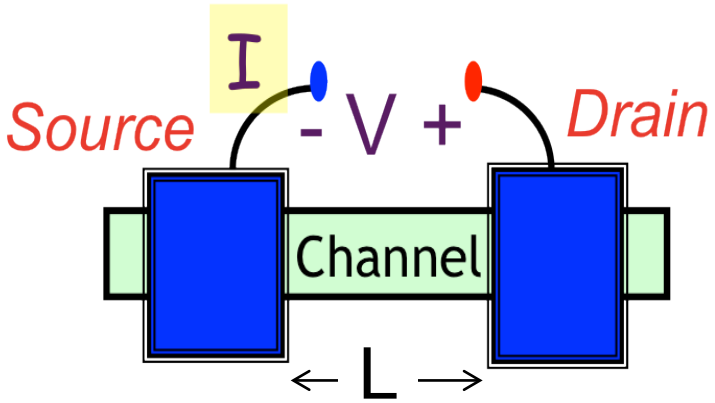
3. What and Where

   is the Voltage?

4. Heat & Electricity:

Second Law & Information

- 2.1. Introduction
- 2.2. E(p) or E(k) relation
- 2.3. Counting States
- 2.4. Density of states
- 2.5. Number of modes
- 2.6. Electron density (n)
- 2.7. Conductivity vs n
- 2.8. Quantum Capacitance
- 2.9. The Nanotransistor
- 2.10. Summing up ..



$$\text{Ballistic conductance} \qquad G_B = q^2 \frac{D}{2L} = \frac{q^2}{h} M$$

New perspective

$$\sigma = \frac{G_B}{A} \lambda$$

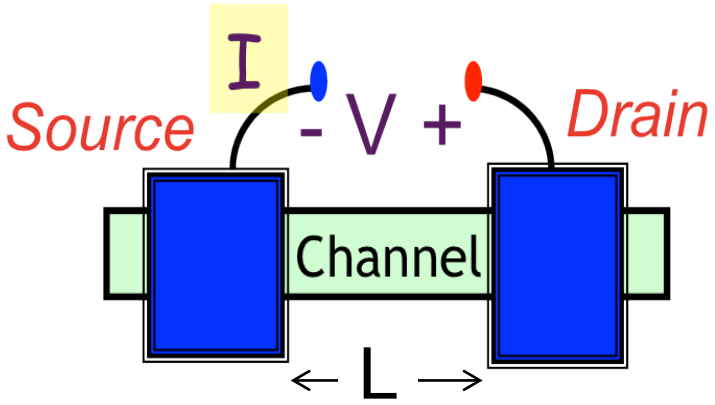
Drude formula

$$\sigma = q^2 \frac{n}{m} \tau$$

$$G = \frac{q^2 D}{2t} = \frac{G_B \lambda}{L+\lambda} = \frac{\sigma A}{L+\lambda}$$

$$I/V \equiv G_0 = \int_{-\infty}^{+\infty} dE \left(-\frac{\partial f_0}{\partial E}\right) G(E)$$

$$I = \frac{1}{q} \int_{-\infty}^{+\infty} dE\, G(E) \left(f_1(E) - f_2(E) \right)$$



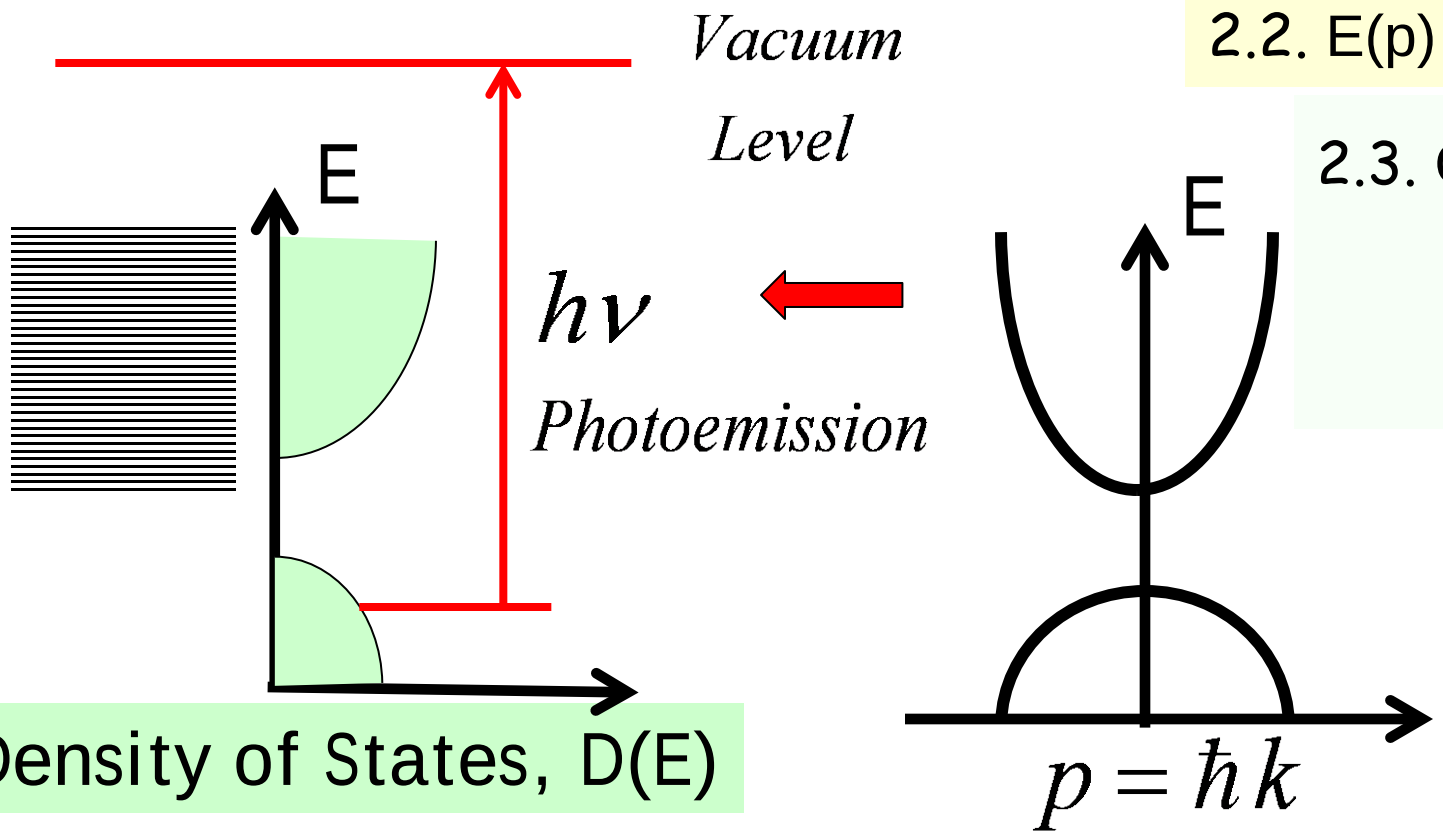
$$G_B = q^2 \frac{D\bar{\nu}}{2L} = \frac{q^2}{h} M$$

2.2. E(p) or E(k) relation

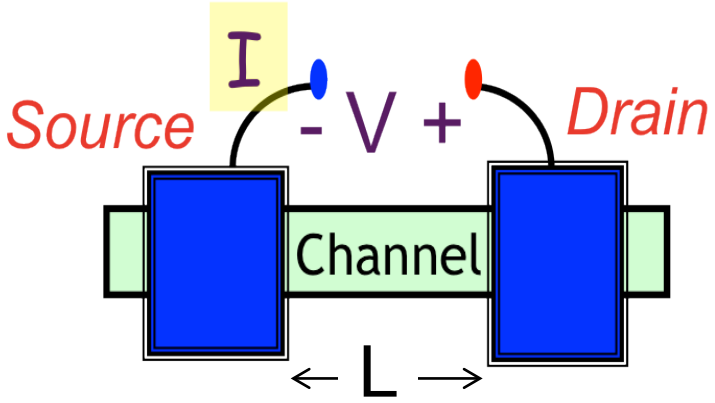
2.3. Counting states

2.4. D(E)

2.5. M(E)



Density of States, D(E)



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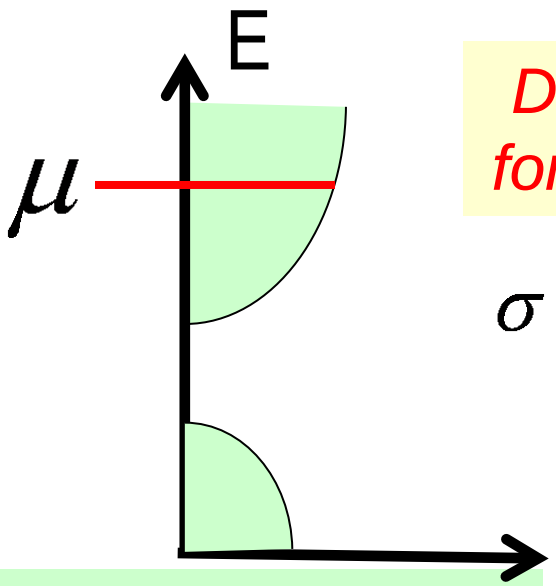
2.2. E(p) or E(k) relation



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Drude formula

$$\sigma = q^2 \frac{n}{m} \tau$$

2.3. Counting states

2.4. D(E)

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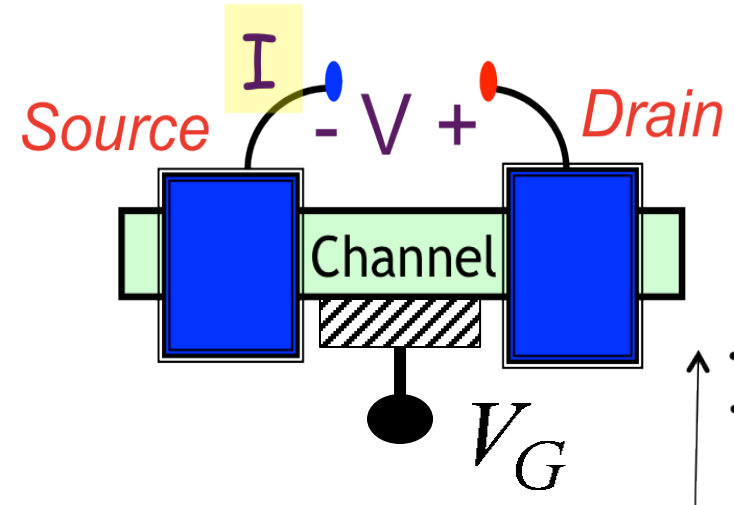
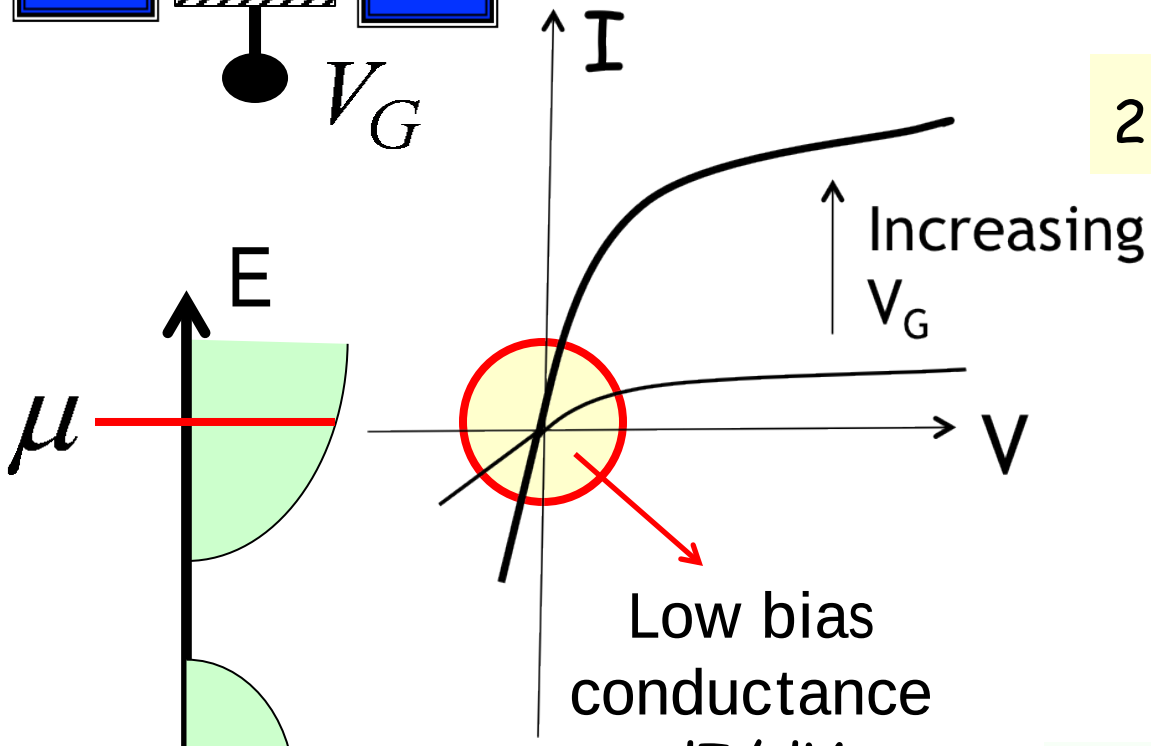
2.6. N(E)

2.7. Conductivity vs n





Coming up next ..