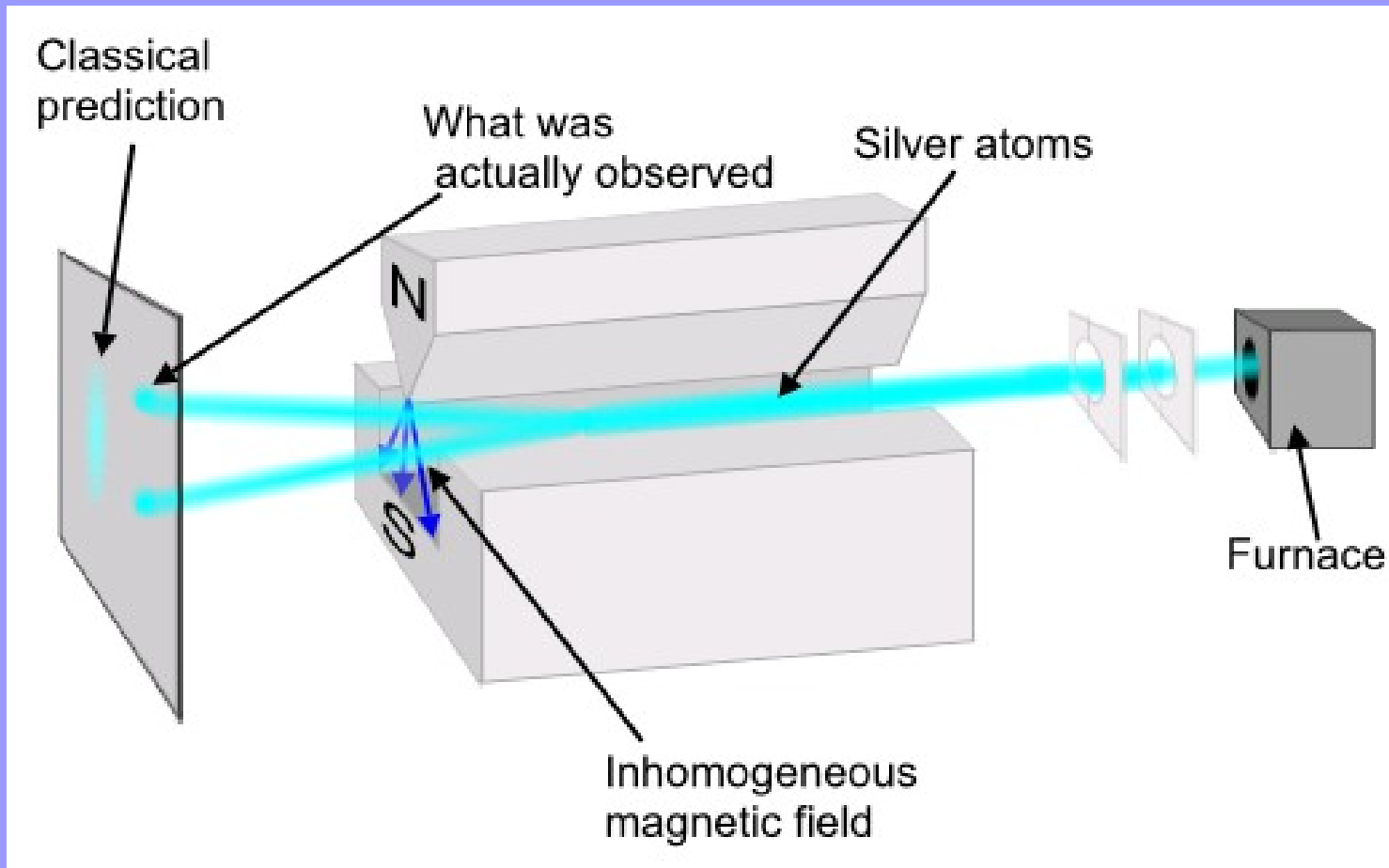


# Spintronics

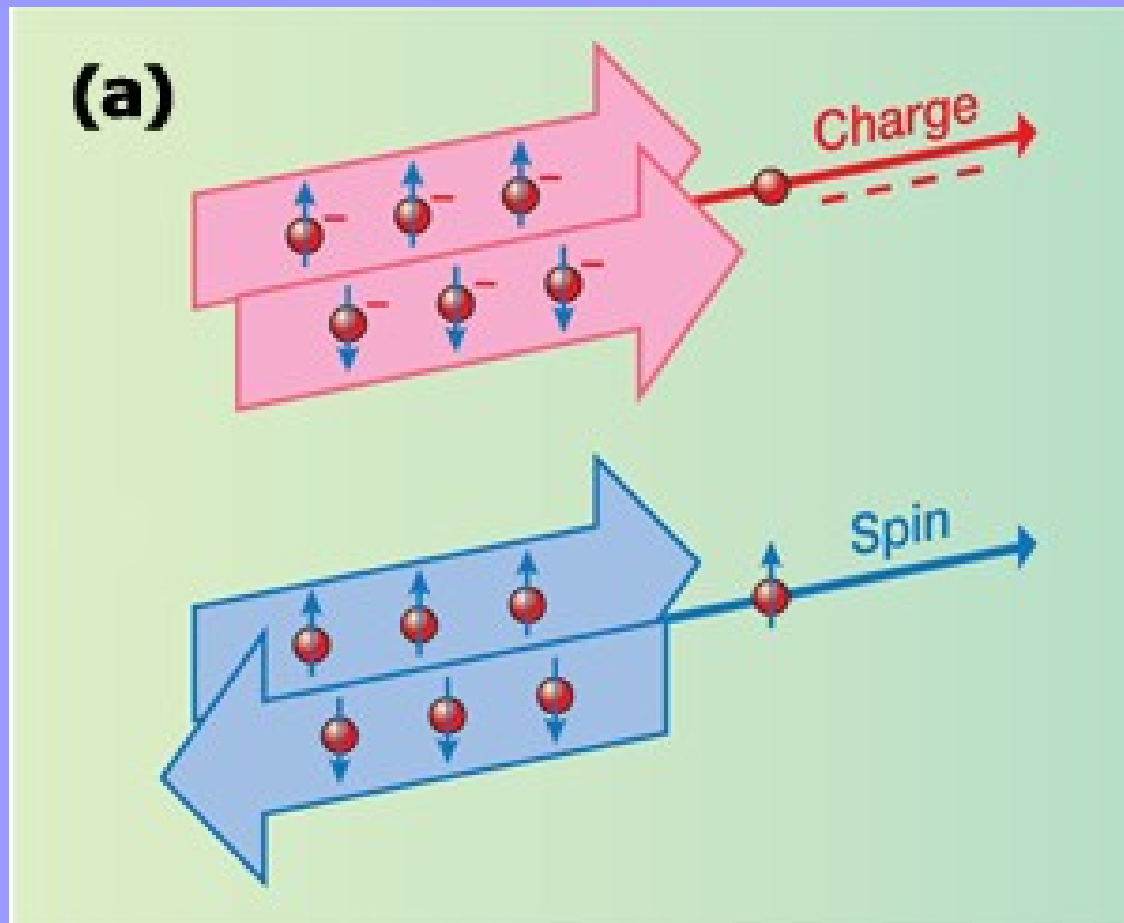
James Delles



# Stern-Gerlach Experiment (1922)



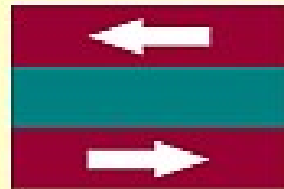
# Spin Currents vs Electrical Currents



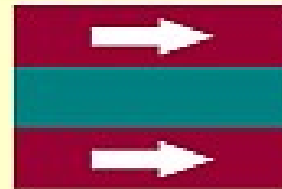
# Giant Magnetoresistance (GMR)



Antiparallel magnetizations



Parallel magnetizations

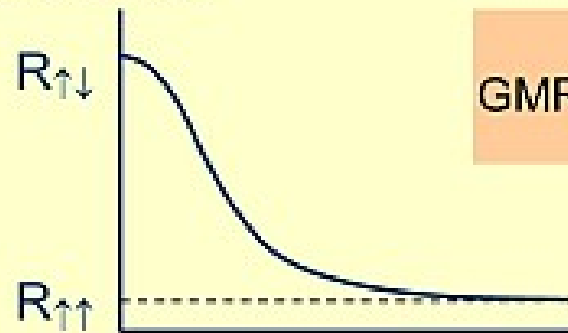


Ferromagnet (Co)

Nonmagnetic metal (Cu)

Ferromagnet (Co)

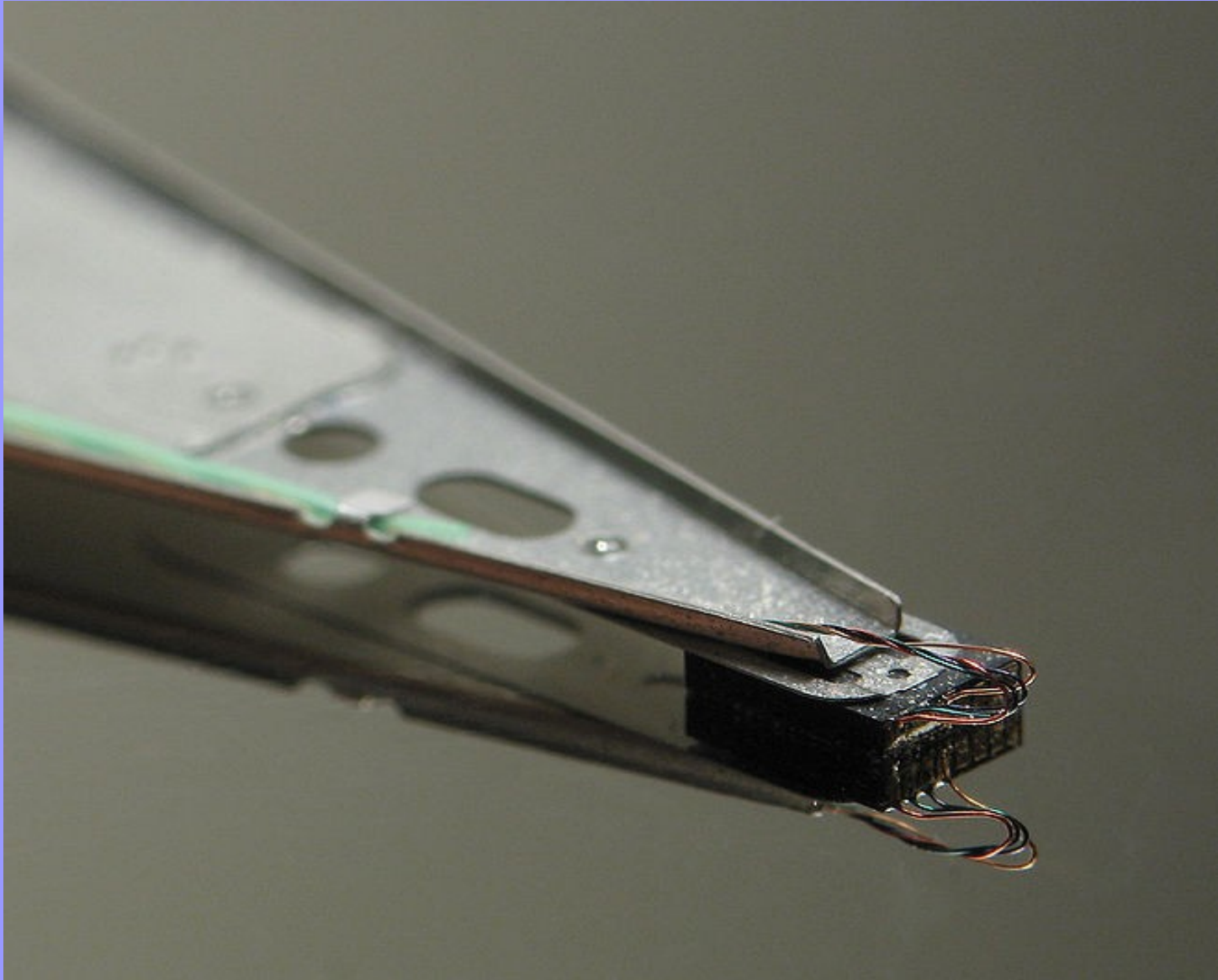
Resistance



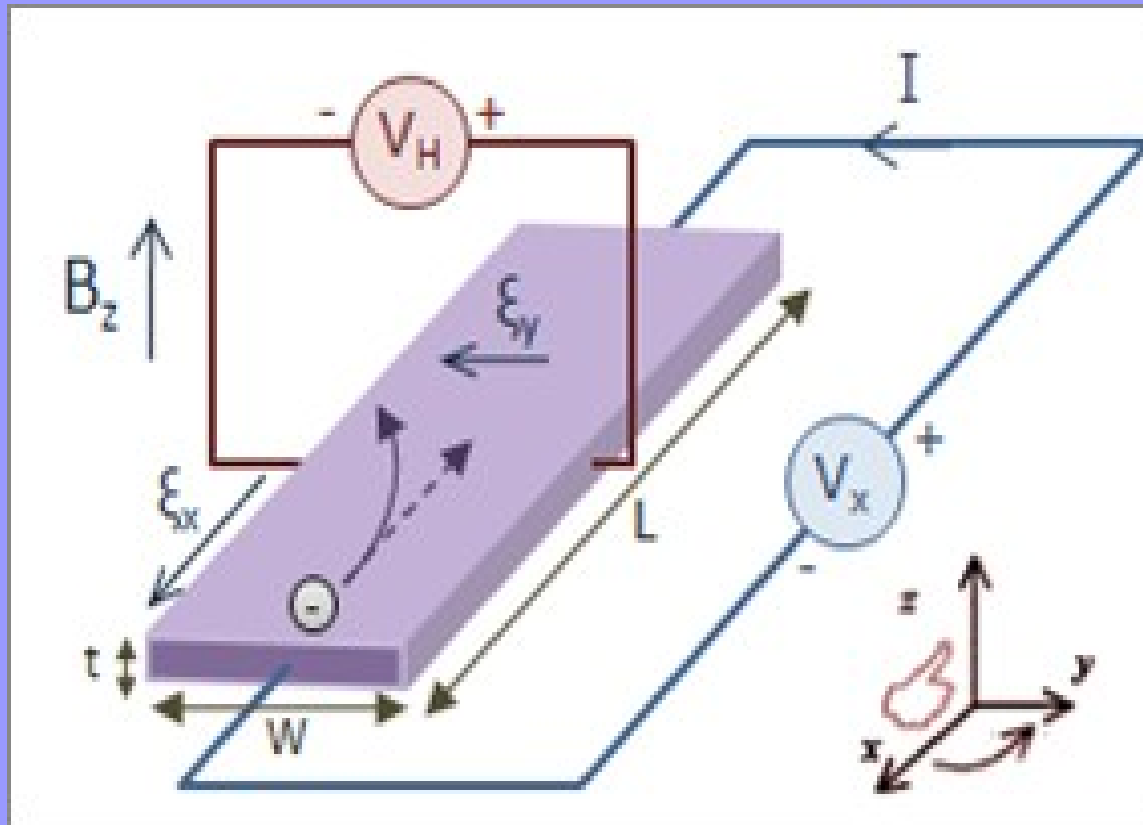
$$\text{GMR} = \frac{R_{\uparrow\downarrow} - R_{\uparrow\uparrow}}{R_{\uparrow\uparrow}}$$

Magnetic field

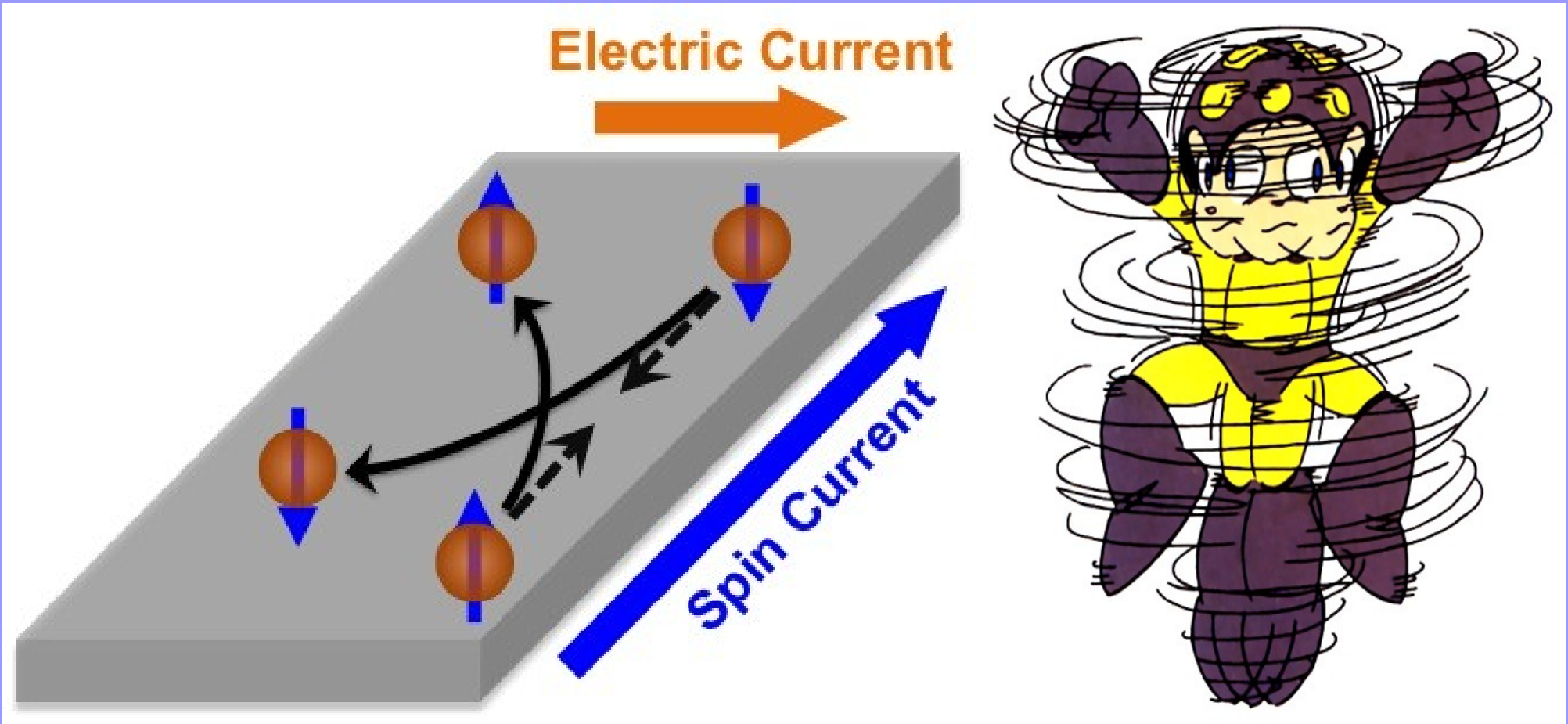
# Hard Disk Head



# Classical Hall Effect



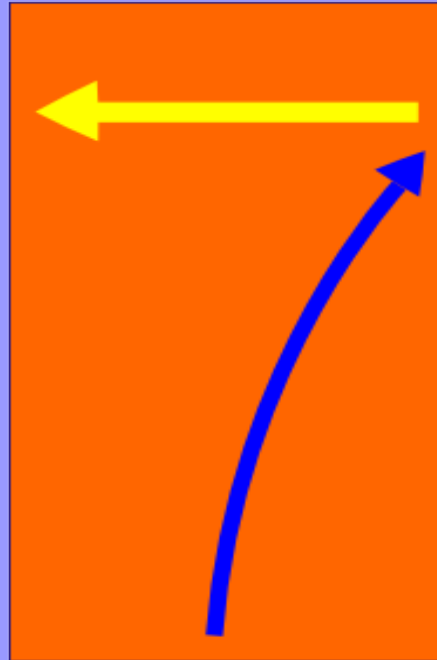
# Spin Hall Effect



# Inverse Spin Hall Effect

Electrical current created i.e.

Inverse Spin Hall Effect



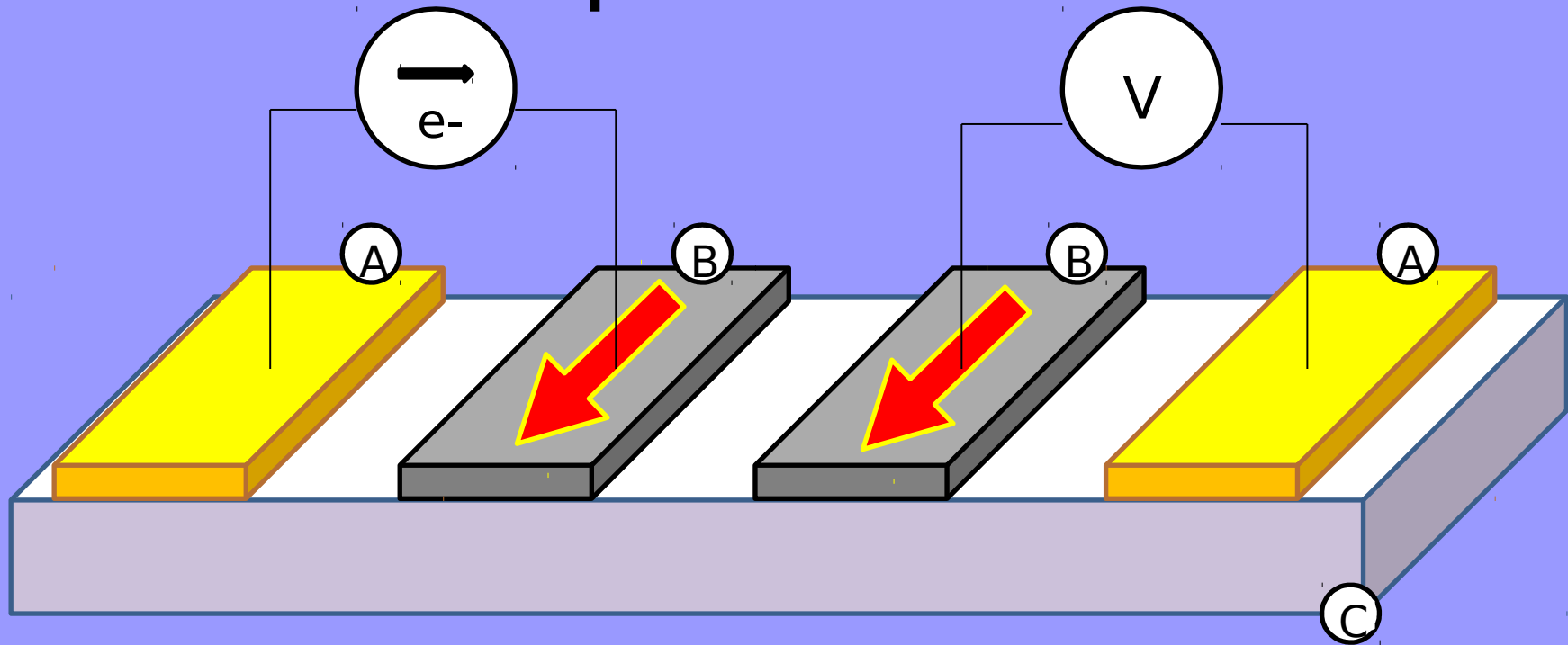
Electrons build up on this side due to Spin Hall Effect causing a voltage to be created across the conductor.



**Injected Spin Current**



# Spin Valve



- A. Electrical contacts
- B. Ferromagnets with magnetization in the shown direction
- C. Channel

# The Next Steps

- Developing spin logic gates.
- Increasing the spin diffusion length in metals.
- Other methods of interpreting spin current “1's” and “0's” i.e. Kerr Microscopy.

Thank You Very Much  
For Attending

