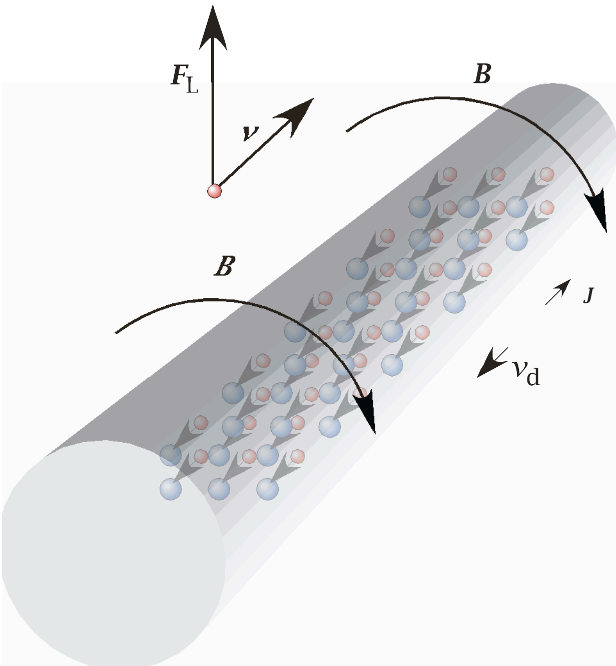

A. Classical Approach

1. Consider a wire with one conduction electron (red) per atom (blue), carrying an electric current density ***J***. The actual drift velocity of the electrons, $\boldsymbol{v}_d$, is opposed to ***J***.

2. The electric current generates a magnetic field ***B***.

3. Now consider an electron moving wi velocity v along wire axis. The left hanc for electrons yields a Lorentz force $\boldsymbol{F}_L$ points *away* from the wire axis.

B. Relativistic Explanation

1. Imagine you sit on the electron. You velocity relative to the resting, positive charged metal ions (blue) is v. Your vel relative to the moving, negatively charg electrons in the wire (red), in contrast, $v+v_d$.

2 According to the "Special Theory of Relativity," you see objects that you approach with a velocity v "Lorentz-contracted" by a factor $(1-(v/c)^2)^{-1}$, whe is the velocity of light in vacuum.

3. Since you approach the electrons in wire with a higher velocity than the me ions, the Lorentz contraction causes yc see a net negative charge. This negativ charge repels the electron away from t wire. In conclusion, magnetic fields car explained as relativistic effects of elect fields.