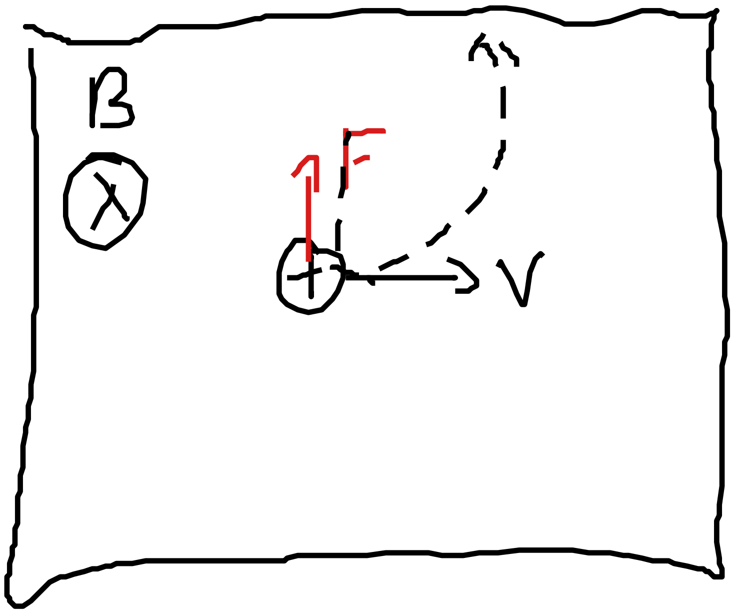


$$r = \frac{mv}{qB}$$

e.g a bunch of charged particles with mass $m = 0.1kg$

$q$ ?

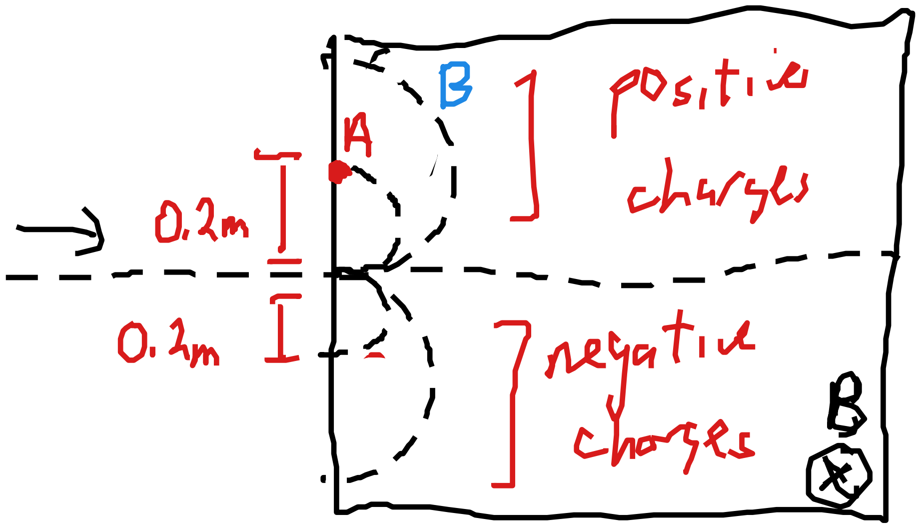
fire them at a $0.3T$ field at $300 \, m/s$

$q_A$ is positive

F ↑

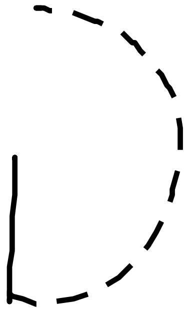
V →

B ⊗



$$r = \frac{mv}{qB}$$

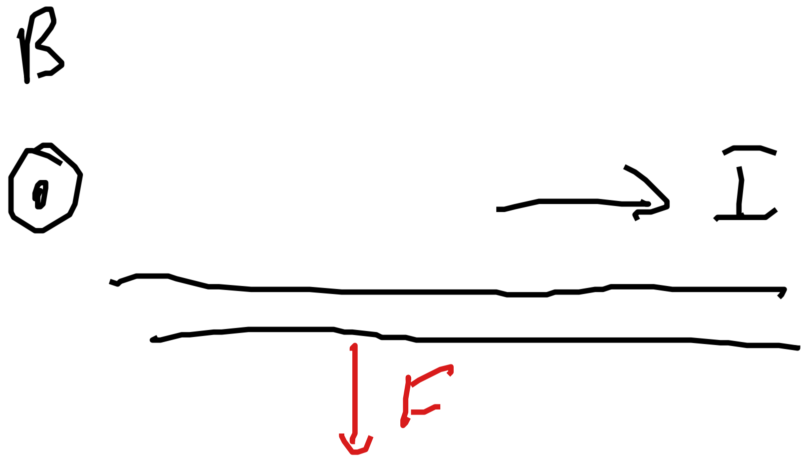
$$0.1\,m = \frac{(0.1)(300\,m/s)}{q\,(0.3T)}$$



$$q = \frac{(\cancel{0.1}\,kg)(300)}{(\cancel{0.1}\,m)(0.3T)}$$

$$q = 1000\ C$$

# Magnetic fields also affect currents

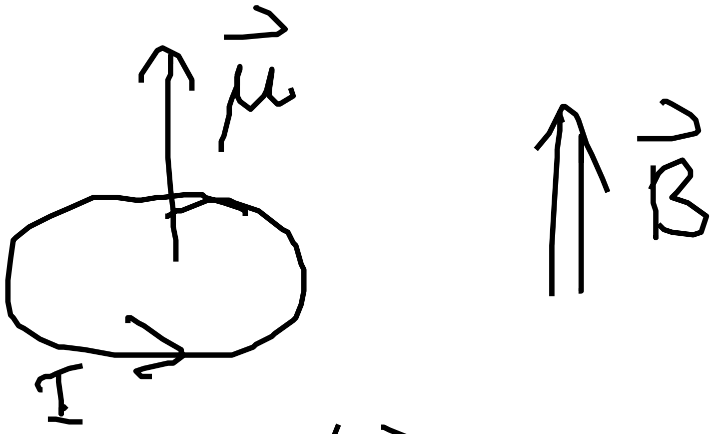


- fingers: I
- palm: B
- thumb: F

$$F = I L B \sin\theta$$

↑ length of wire

Current loops react just like magnets - orient themselves to the local $\vec{B}$ field



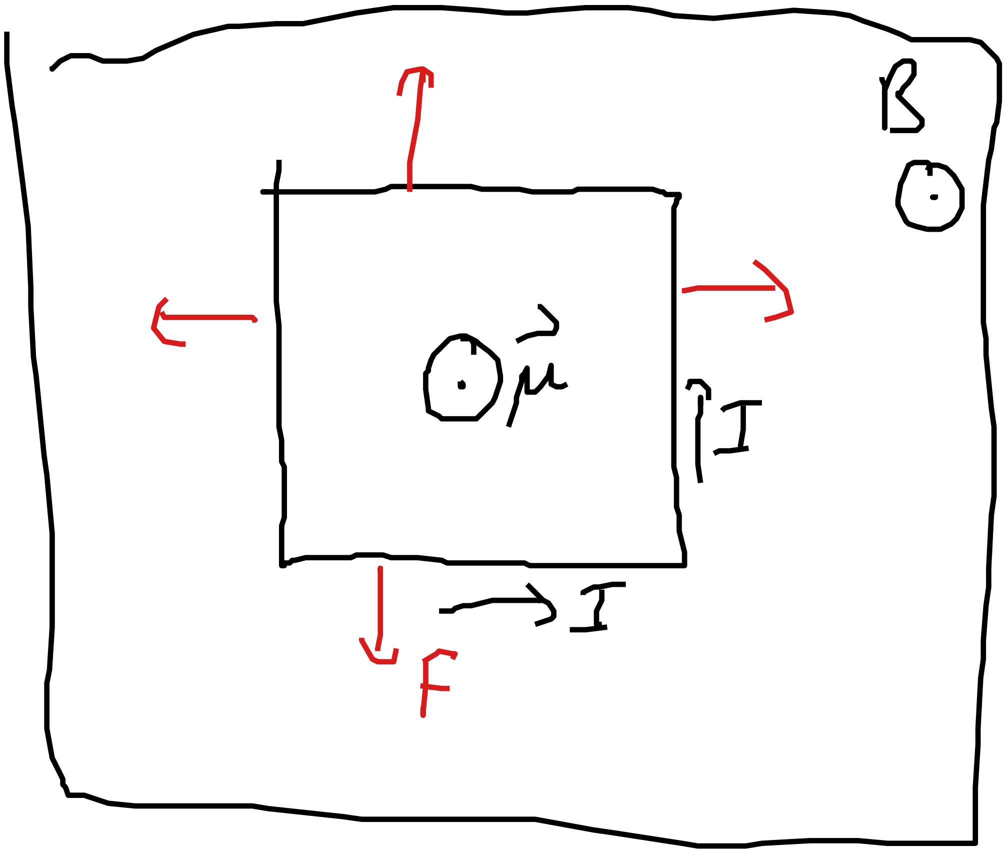
($\vec{\mu}$ wants to point in $\vec{B}$ direction)

Force on wire: RHR

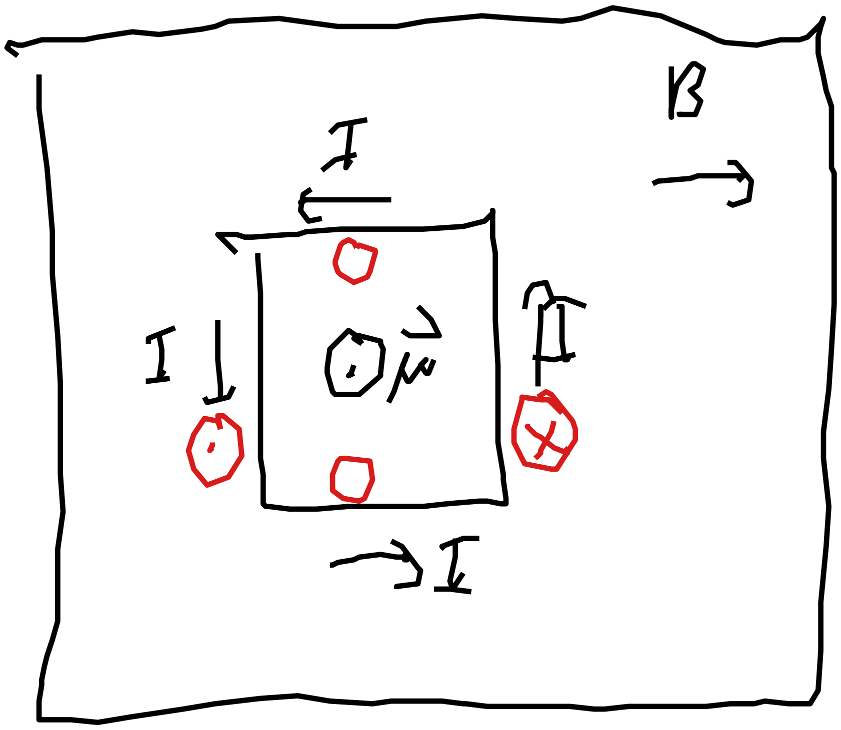
fingers: I

palm: B

thumb: F (⊥ to I & B)

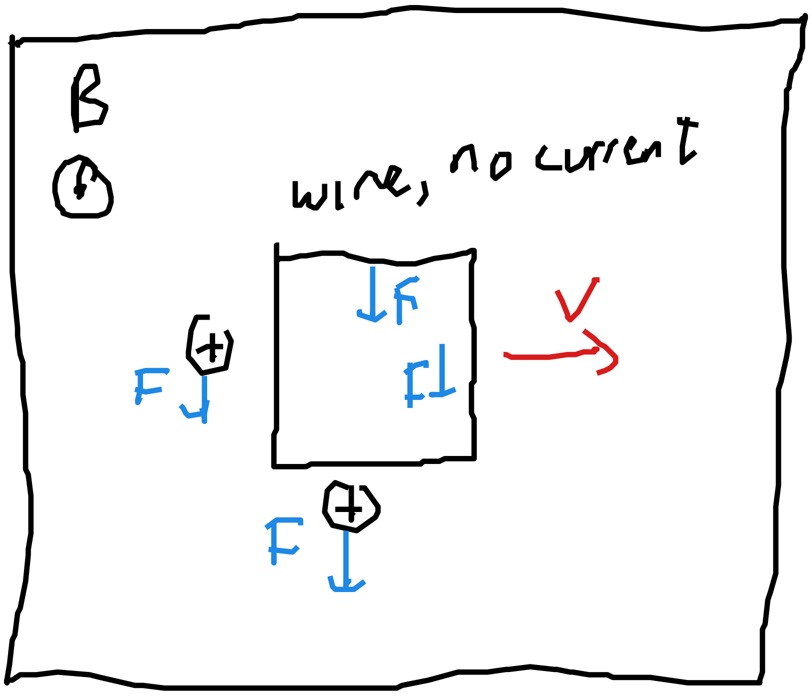


loop might be stretched but not rotated



loop turns until $\vec{\mu}$ points in same direction as $\vec{B}$

if $\underrightarrow{I}$ & $\underleftrightarrow{B}$, then $F = 0$

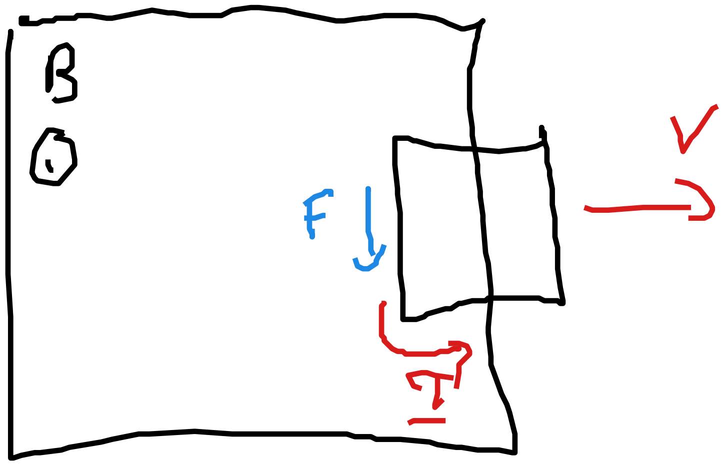


Wire contains charge carriers

moving loop = moving charges

∴ charges feel a force downward

but nothing really happens... yet



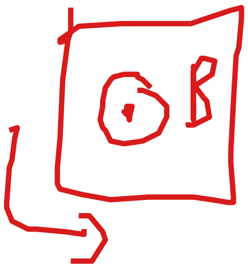
As loop leaves field, the force on left isn't balanced by force on right, and a <u>current</u> starts

Induced current

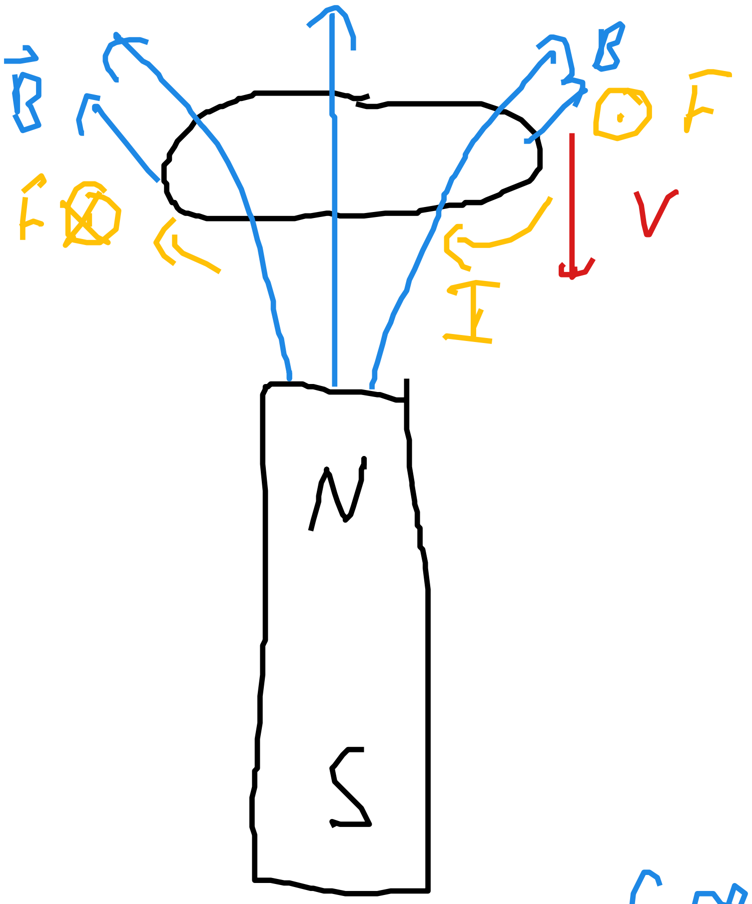
Occurs when amount of magnetism ("magnetic flux") through loop changes.

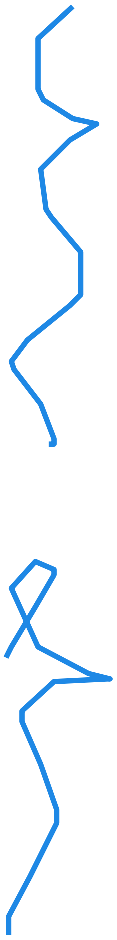
This current creates its own magnetic field

In this case, it points in same direction as original field, to replace what was lost.



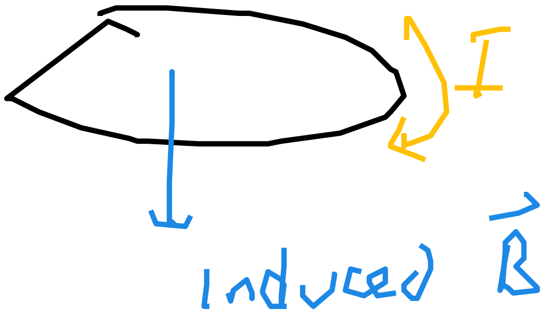
Electromagnetic Induction slows down change



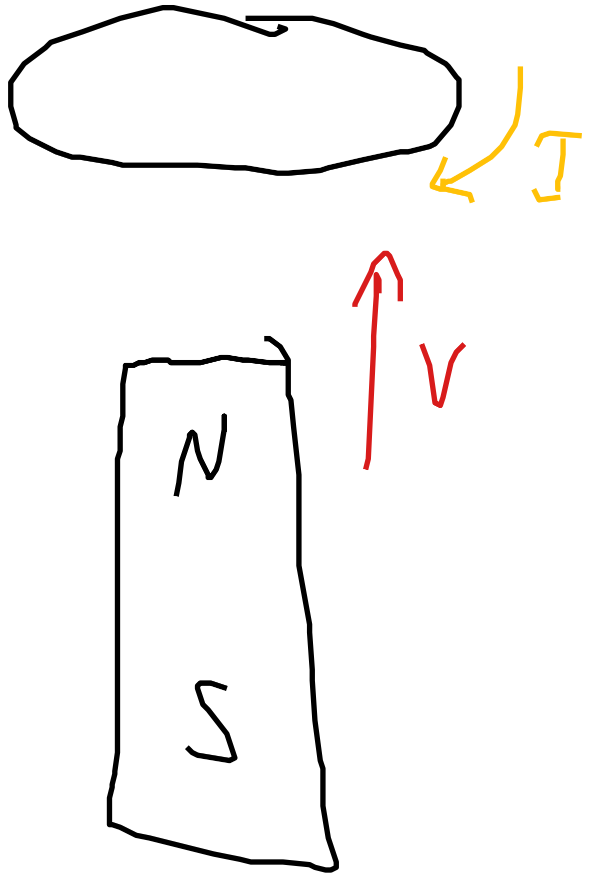


loop gets more magnetic flux which it doesn't like

creates ~~its own~~ flux to fight ~~the increase~~



In opposite direction of magnet's



You still get a current but b/c $\vec{B}$ field is changing which creates an induced $\vec{E}$ field in loop

But same result.