#flo #inclass

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1 | Current! and magnetism!

flux: analogy, total number of field lines poking out of a surface

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area A and it is perpendicular to B, the flux is
$$\phi = BA \cos(\theta)$$
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if the area is tilted, we have lower flux. this makes sense, as really we are just taking the dot product from the normal to the surface.

change in flux is what induces current.

EMF :: eletromotive force. it is the rate of change of the flux w.r.t. time

$$EMF = \frac{d\phi}{dt}$$

flux can be changed by :: - mag field strength - total area of loop - area of the loop that is crossed by the field - angle of the loop w.r.t. the field - or, ofc, combos. the pictures! they match! like this:

A-B C-D B-A D-C

1.1 | the experiment notes, for after break.

moving magnet across coil of wire.

figure out the induced current over time

tenth of an amp.

moving the graph gives us,

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welp, it's after 'break.' ### inductors!

- inductance :
  - backwards MEF / rate of change of current
    - units of volts / Amps/sec or (V * S)/A, called a henry
- inductance can be increased with a material inside just like a capacitor

tch – inductor {close} called an **inductor-capacitor**

  - big surge of current,

L is used for inductance

the energy alternates between the magnetic and the capacity? called a resonant circuit fundemental way of oscilating anything LC circuit

resonant is defined as

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

- magnetic field builds up in the coil as the capacitor discharges, then since the capacitor is discharged the magnetic field shrinks, which is changing flux, which charges the capacitor
  - thus, it oscilates,
    - but the charging is changing flux as well… with no resistance tho, this isnt lossy
- transformers use inductance to change the voltage
  - can be done by changing the number of 'wraps'
  - ration is defined by $\frac{v_P}{v_S} = \frac{N_P}{N_S}$ where v_P vs v_S is the primary vs. secondary current, and N_P vs N_S is the primary vs. secondary turns

1. solids!
   - diamagnetic
     - most materials
       - however, all materials have this characteristic
       - but in other materials, other props overwhelm it
     - no polarized particles, becomes aligned in the presence of magnetic field
   - paramagnetic
     - polarized particles, magnetic field aligns them
   - and ferromagnetic

1.2 | **the experiment.**

1. ex2.pt1
   - took three resistors in parrelel to make it work
   - taped down the magnetic field sensor right ontop of the wire
   - had a large wire loop far away from the sensor, w/ battery, resistors in parrelel, current sensor.
   - had a current probe and a magnetic field probe going into logger pro
   - we changed
     - the resistence, from 2 resistors to 3.
2. ex2.pt2
   - same thing as earlier, but we removed resistors
     - this is because we don't care about being able to measure the current as long as it is consistent
   - then we changed
     - the distance of the magnetic field sensor.
     - we did this by stacking microphones of the same radius to our sensor under our magnetic field sensor
       - the r = 1/4 in
3. ex3
   - loop the coil, tape it down

  - 3 loops
  - diameter 3 1/8 inch
- current is too high to be measured
  - maintain current, change distance

something missing here!!

changed current with resistor, kept distance the same z distance was equal to height of end of sensor - roughly one centimeter

diameter 8 coils, 3/2 cm 8 coils, 10 cm