Wimshurst and Coulomb

Some of History's Shocking Men

Hollywood Example

- Christmas Vacation

Cover questions

- Electrostatics Study Sheet
- Questions from previous material.

James Wimshurst

- British Engineer and Inventor
- Developed improved version of the electrostatic generator. (1883)
- 1823-1903
- Built largest Wimshurst machine (Chicago Museum of Science/Industry)
- Machine can get up to 75,000 Volts

Path of Least Resistance

- Charge will always follow path of least resistance to get to ground or opposite terminal.

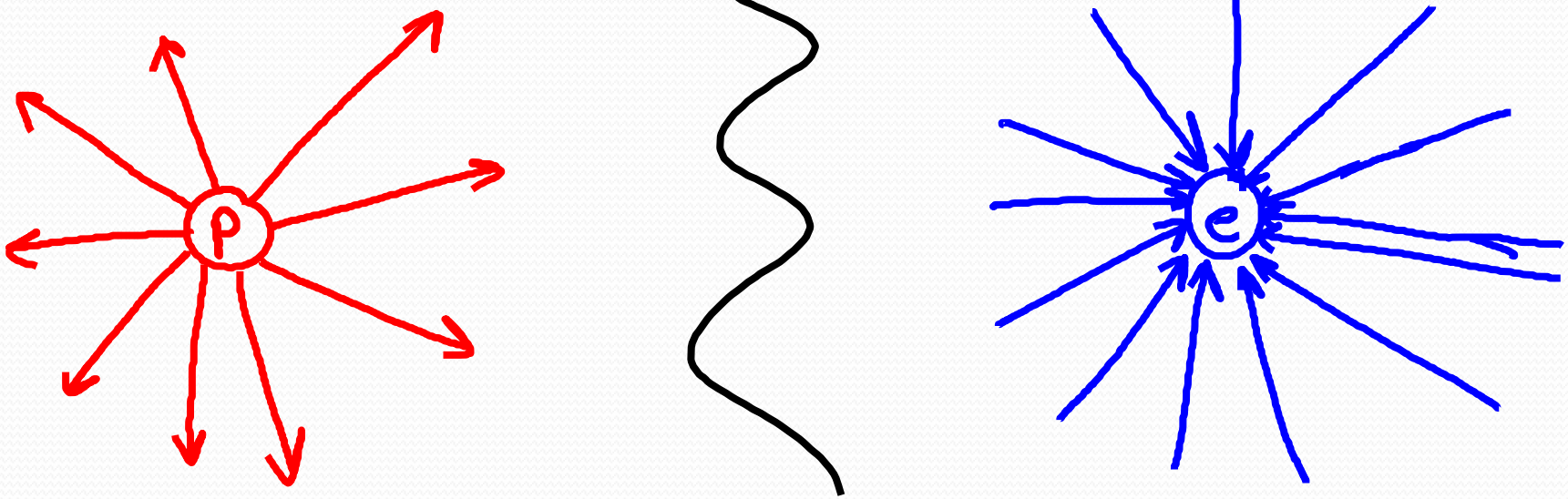
Electrostatic motor.

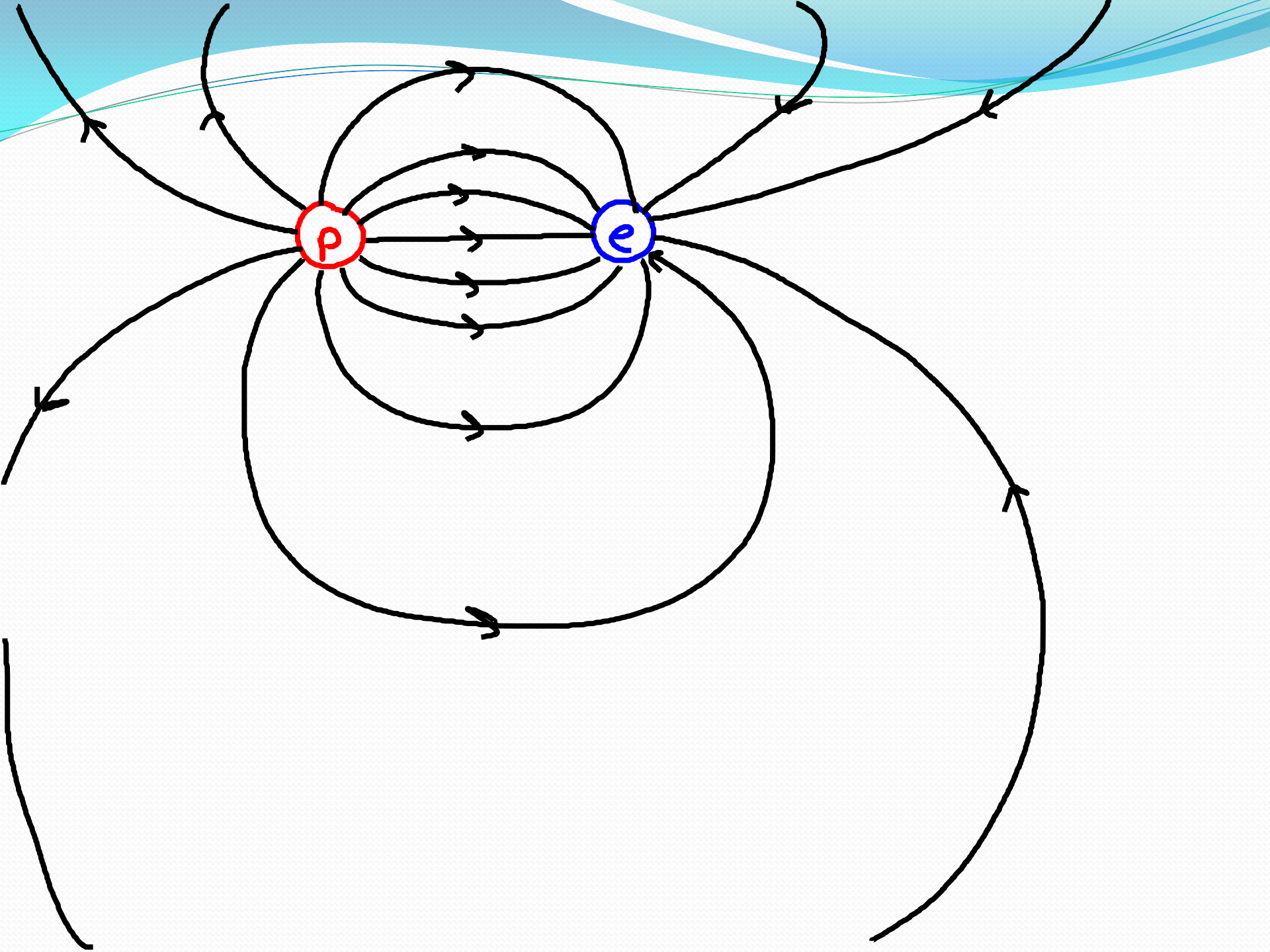
Charge stays on the outside

- On a conductor the charge always stays on the outside surface.
- This is because the charges are repelling and trying to get as far away as possible.

Electric Fields

- Like magnetic field lines but now it is because of charge.

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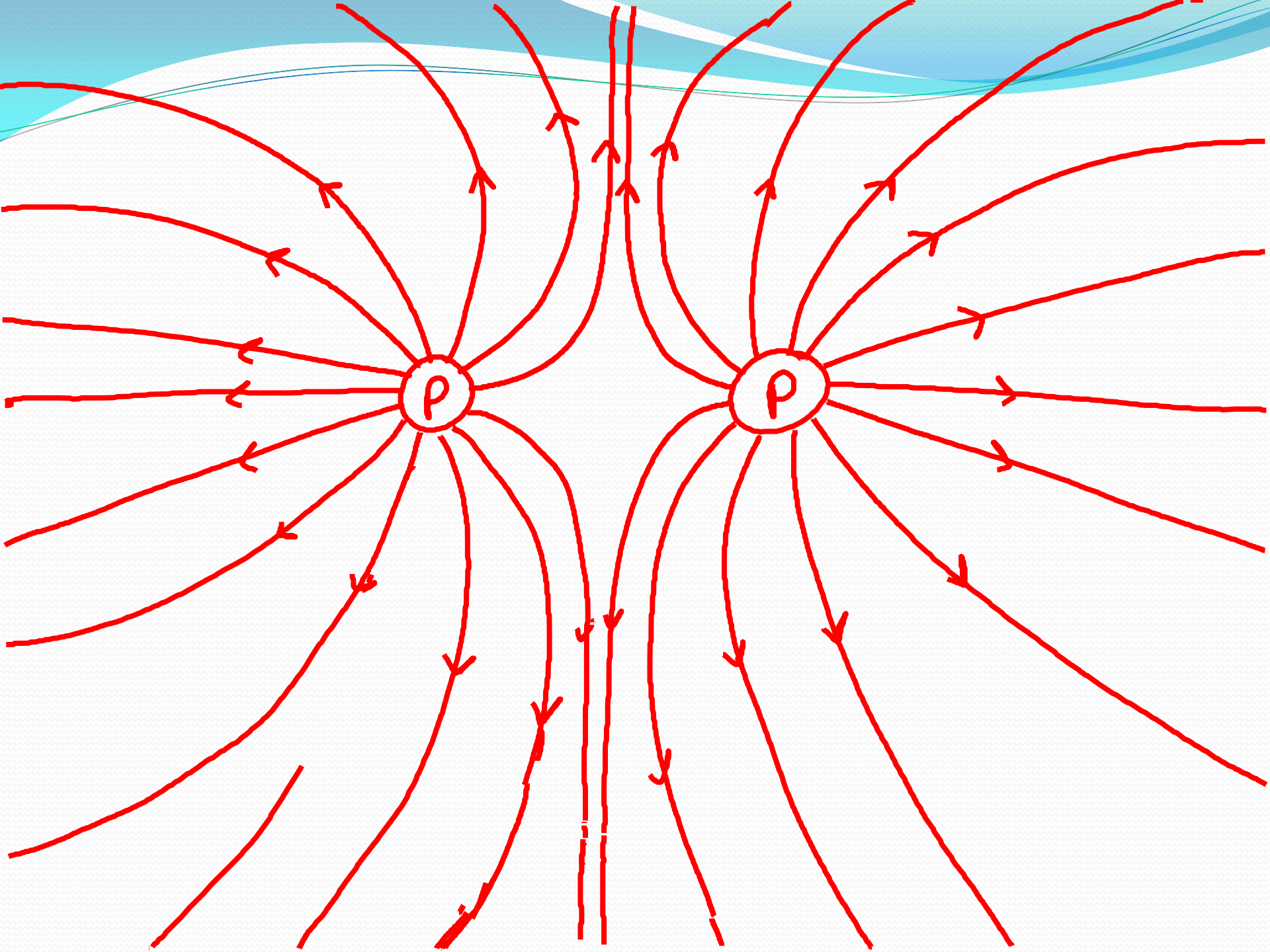
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Charles-Augustin de Coulomb

- French 1736-1806
- Engineer, French Army; structures, fortifications, and soil mechanics.
- Studied friction and machines, electricity and magnetism
- Inspect of public instruction

- Side note: French Revolution was in the 1790's and as a military officer he survived it.

Coulomb's Law

- Floating Styrofoam cup.
- What is the charge of the VDG?
- $F_e = \frac{kq_1q_2}{d^2}$
- $k = 9x10^9 Nm^2/C^2$
- q=Charge (C)
- d=distance between charges (m)

$m = 0.004\,kg$

$g = 9.81\,m/s^2$

$k = 9 \times 10^9\,N m^2/C^2$

$d = .20\,m$

$q =$

$F_e = F_g$

$$\frac{k q^2}{d^2} = mg$$

$$k q^2 = mgd^2$$

$$q^2 = \frac{mgd^2}{k}$$

$$q = \sqrt{\frac{mgd^2}{k}}$$

$m = 0.004\ kg$

$d = .31\ m$

$k = 9 \times 10^9\ N\,m^2/C^2$

$$F_g = F_e$$

$$mg = k\frac{q^2}{d^2}$$

$$mgd^2 = kq^2$$

$$\frac{mgd^2}{k} = q^2$$

$$q = \sqrt{\frac{mgd^2}{k}}$$

$$q = \sqrt{\frac{(0.004)(9.81)(0.31)^2}{9 \times 10^9}}$$

$$q = 6.47 \times 10^{-7} C$$

$$q = 0.647\ \mu C$$

Have a good weekend!!