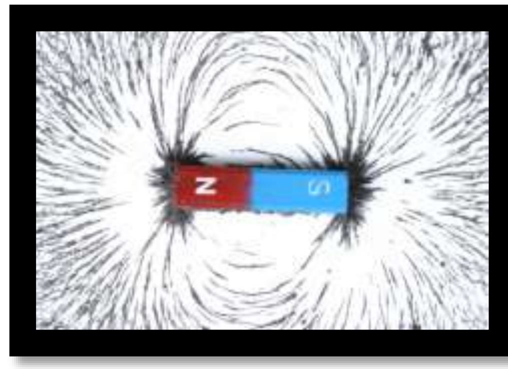
Visible Electric Fields

Overview: Time to figure out not only which way those electrons are moving, but what *fields* they are creating when they pile up. You know how to build up a static charge (balloons, anyone?), and how to tell if it's a positive or negative charge (gliders, anyone?), but now we're going to sneak a peek at the electrical field those pesky electrons generate. This is going to be important to know, especially when we get to magnetism.

What to Learn: Did you also know that electrical charges have an *electrical field*, just like magnets have a magnetic field? It's easy to visualize a magnetic field, because you've seen the iron filings line up from pole to pole. We're going to do a similar experiment with electric fields.



Materials

- 1 teaspoon dried dill (spice), depending on the size of your cup
- Vegetable or mineral oil (about ½ cup)
- 1 disposable cup
- 2 alligator wires or 2 strips of aluminum foil
- 1 balloon and/or other items to build up a static charge from previous lessons

Lab Time

1. Fill a cup with vegetable or mineral oil – you need about an inch.
2. Sprinkle small seeds or spices on top, about 1 tsp dill.
3. Build up an electric charge by rubbing a balloon on your head. You should be a pro at this by now.
4. Bring the balloon near the oil without touching the cup.
5. What happened to the spices? Be sure to look *carefully.* Write your observations:

6. Does it matter which end of the balloon you hold near the oil?

7. What if you move it a bit near the dish? Does this affect the dill at all?

8. Fill out the table below:

Charged Object Applied to Wire #1	Charged Object Applied to Wire #2	Observation (What did the seeds do?)
Balloon-Hair, Negative Charge	*Nothing*	*Seeds rotated and moved toward balloon.*

9. Draw a picture of your best experiment run that shows the electric field:

Reading

The dill leaves are all shaped like rods, which move to line up in the field (which is why round particles like cinnamon and pepper don't work as well). The dill has a balance of charges, meaning that there's an equal amount of both plus and minus charges.

When you bring a charged object close, the negative charges in the dill are attracted to the balloon and the positive charges are repelled, so one side of the dill becomes minus and the other plus. Since the dill is free to move in the liquid, it lines up in the electric field to indicate the charge direction.

Note: If your dill isn't moving at all, your object may be too "dirty" (e.g., have too much oil from your fingers) on it to hold a charge. Clean it with rubbing alcohol after you use soap and water, and you should see better results.

Exercises

1. What happened when you brought a charged balloon near the dill?
2. What side of the dill was attracted to the balloon?
3. What happened when you brought two negative charges near the dill?
4. Were you able to make the dill come out of the liquid and onto the balloon without touching the oil?

Answers to Exercises: Visible Electric Fields

1. What happened when you brought a charged balloon near the dill? (The negative charges in the dill are attracted to the balloon and the positive charges are repelled, so the dill lines up to indicate the field direction.)
2. What side of the dill was attracted to the balloon? (Positive)
3. What happened when you brought two negative charges near the dill? (The dill will move less than if you had placed a positive and negative charge at the wires/aluminum foil.)
4. Were you able to make the dill come out of the liquid and onto the balloon without touching the oil? (If you move the balloon just right, the attractive electrical charge will pull the lightweight dill right up out of the oil and onto the balloon.)