**Chromatography**

**Introduction**

Each marker has a distinct combination of pigments that can act as a sort of fingerprint for that marker (or marker brand) when they are separated. When scientists want to separate things they use a technique called chromatography. Chromatography uses the different properties of chemicals to separate them from mixtures.

**Materials (per group)**

Coffee filters

Pack of markers

Scissors

Bamboo skewers

Small cups with water

Pencils

Aluminum Foil

M&M’s

Skittles

Binder clips/paperclips

Plastic dropper (transfer pipette)

**Activity 1 (Marker Fingerprints)**

1. Cut the filter paper into strips.
2. Spot each strip ~1/2 inch above the bottom of the filter with a marker. The spot should be of decent size, at little bigger than this small letter “o”.
3. Label each strip with the color of marker you are testing using a pencil (you don’t want the label to smear).
4. Fill a cup with < 1 inch of water.
5. Carefully lower one of the filter paper strips into the cup so that it touches the water but the marker spot is above the water level.
6. Use a binder clip (or paperclip, if we run out of binder clips) to hold the filter strip in place above the water.
7. The water will rise up the filter paper carrying the marker ink with it. After 5-10 minutes the ink should have separated into its components and can be carefully removed from the water to dry.
8. Repeat for each marker color.

**Discussion**

Markers are made of different combinations of pigments. Because some of those pigments dissolve better than others, the water moving up the strip is better able to move the more soluble pigments. This separation is the basis of chromatography. Because each marker uses a unique blend of pigments, those pigments form a sort of marker “fingerprint.”

**Introduction for activity 2**

Markers aren’t the only things that use pigments for their color. Candy also contain pigments to make them bright and colorful. Much like the marker companies, the candy maker want specific colors and have to find the perfect combination of pigments. By extracting the colored pigments, we can determine what colors of candy are mixed pigments and if different candy companies use the same pigment combos for the same colors.

**Activity 2 (Candy Pigments)**

1. Choose three different colored M&M’s and three different colored Skittles.
2. Place each piece of candy on the sheet of aluminum foil, making sure they are at least a few inches apart.
3. Using a dropper, add 3 drops of water to each candy and let sit for 10 minutes to release pigments into the water drop. (Hint: Flip candy to release pigment from both sides.)
4. Prepare more filter paper strips while candy pigments are being collected.
5. Using the tip of a skewer spot each strip ~1/2 inch above the bottom of the filter with the now colored water. Try and make the spot as small as you can to make the color separation clearer.
6. You will have to repeat each spot 3-4 times to make sure there is enough pigment.
7. Label each strip with the kind/color of candy that you are testing using a pencil.
8. Fill a cup with < 1 inch of water.
9. Carefully lower each filter paper strip into the cup so that it touches the water but the marker spot is above the water level.
10. Use a binder clip/paperclip to hold each filter paper strip in place above the water.
11. The water will rise up the filter paper carrying the candy pigment with it. After 5-10 minutes you will be able to see what pigments are used in candy coloring.

**Discussion**

Just like the markers from activity 1, the color you see in candy is not necessarily the color of the pigments used. You can use this information to distinguish between same-colored candies from different makers!