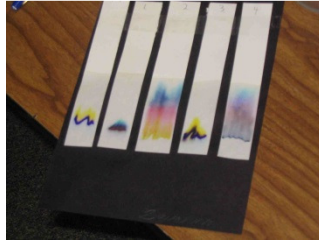


# *The Scientific Method*



The **Scientific Method** is a procedure that has characterized natural science, consisting in systematic observation, measurement and experiment, and the formulation, testing, and modification of hypotheses.

The steps to the scientific method:

1. Make an **observation** about something that interests you.
  - What do you see that makes you want to ask a question?
2. Propose a **hypothesis**.
  - What question do you have about your observation?
3. Test the hypothesis through an experiment.
  - Conduct an experiment that will prove or disprove your hypothesis.
4. Analyze data.
  - What are the results of your experiment?
5. Accept or reject the hypothesis.
  - Was your hypothesis right? You may wish to run the experiment again to show further proof of the results.

Let's look at the steps one by one.

Step 1. Make an observation about something that interests you. In our example we will use black markers.

- Is a black marker really made up of just black ink?

Step 2. Propose a hypothesis.

- I think black markers are made up of many different colors.

Step 3. Design an experiment to find out what colors make up black markers.

- Use paper chromatography to separate the different colors in a black marker.
  - Items needed: black water color marker, coffee filter, a cup, water, tape, and a pencil.

The experiment:

- Cut the coffee filter into strips that are approximately  $\frac{1}{2}$  inch wide by 3 inches long.

- Draw a pencil line on all the strips about ¼ inch from the bottom of each strip.
- Using the black marker, draw a dot on the line. Make sure that all the dots are around the same size.
- Tape each strip to the pencil with the dot at the bottom edge.
- Lay the pencil across the top of the cup so the coffee filter edges just touch the water. Be careful not to have the dot in the water. You want the water to be pulled up through the filter.
- Once the water reaches the top of the filter, take the pencil off the cup and let the strips dry overnight.

Step 4. Analyze the data.

- What happened to the black dot?
- What color(s) do you see that have spread out on the coffee filter?

You may notice that there are three primary colors of red, blue and yellow. You may also notice a mixture of those three colors.

Step 5. Accept or reject the hypothesis.

Our hypothesis was: I think black markers are made up of many different colors.

- After conducting the experiment, this was what we concluded. Yes, indeed, black markers are made of many different colors.

## Vocabulary Terms

**Chromatography:** the separation of a mixture by passing it in solution, suspension or a vapor (as in gas chromatography) through a medium.

**Hypothesis:** is a proposed explanation for what you are observing.

**Observation:** the act of viewing and taking notes on what is occurring during an experiment.

For additional information:

<http://www.livescience.com/20896-science-scientific-method.html>

[http://www.ihmc.us/groups/voluntology/wiki/291f0/Paper\\_Chromatography\\_Science\\_Background.html](http://www.ihmc.us/groups/voluntology/wiki/291f0/Paper_Chromatography_Science_Background.html)