



The Academy of
Natural Sciences
of DREXEL UNIVERSITY

Magical Moving Milk



Materials:

- Milk (2% or higher milkfat)
- Dish soap
- Cotton swabs
- Paint brushes
- Food coloring
- Shallow plate or wide bowls

Instructions:

1. Fill a plate or bowl with milk.
2. Drop in at least 2 drops of each of four colors of food coloring. The more variety of colors the cooler the painting.
3. Generously dip the end of a cotton swab in dish soap.
4. Dip the cotton swab into the milk next to a drop of color.
 - a. Watch the color burst as soon as the dish soap touches the color! It's a great effect but very short lived. Once there is a little dish soap in the milk, it no longer "bursts."
5. Gently swirl the cotton swab through the different colors to make little rivers of color start to form.

Questions to ask:

- What do you see happening to the milk?
- Why do you think that's happening?
- What new colors were made when the milk began to mix?

About this experiment:

Milk is mostly water but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk).

The secret of the bursting colors is the chemistry of that tiny drop of soap. Dish soap, because of its bipolar characteristics (nonpolar on one end and polar on the other), weakens the chemical bonds that hold the proteins and fats in solution. The soap's polar, or hydrophilic (water-loving), end dissolves in water, and its hydrophobic (water-fearing) end attaches to a fat globule in the milk. This is when the fun begins.

The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules. During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity. As the soap becomes evenly mixed with the milk, the action slows down and eventually stops.

Try adding another drop of soap to see if there's any more movement. If so, you discovered there are still more fat molecules that haven't found a partner at the big color dance. Add another drop of soap to start the process again.

Background information courtesy of [Steve Spangler Science](#)