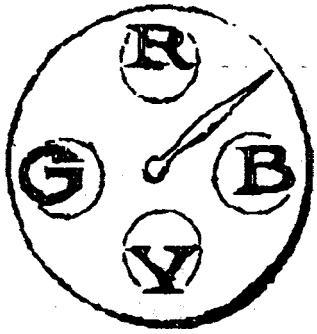

HAILSTONES AND HALIBUT BONES

by

Mary O'Neill

Color is a wonderful part of out lives. It makes pictures and foods more appealing. It serves as an indicator in science because it tells the observer that a chemical change has occurred when a color change appears. Its presence can also supply some magic and provide a student experience that is open-ended and encourages careful observations.

Whole milk contains a certain percentage of fat. Liquid dishwashing detergent acts as an emulsifying agent that can surround the droplets of fat and separate these droplets from the milk. This activity shows the student consumer why detergent is necessary to clean greasy dishes.

MATERIALS: room temperature whole milk, Petri dishes or containers 10 cm in diameter that are flat and shallow, toothpicks, liquid dishwashing detergent, boxes of food coloring.

ACTIVITY: Place a small quantity of milk in dish and allow the milk to stand for a minute or two until it stops moving. Place a drop of red, green, blue, and yellow food coloring equally spaced around the edge of the dish (see diagram above). Touch a clean toothpick gently to the center of the milk. Observe and ask the question: "Does anything happen?" Now use the toothpick to put a drop of detergent in the milk at the center of the container. Observe what happens for thirty seconds. Add another drop of detergent and observe further. Ask students to form hypotheses about what they see.

TEACHER NOTES: Small plastic dessert plates work for this activity. Their depth is perfect for the right amount of milk. I have found that Dawn™ works well in this experiment, but any detergent works. The "job" of detergent is to surround the molecules of fat in the milk. They work in a similar fashion to the "scrubbing bubbles" in the bathroom cleanser. The detergent could do its "job" without the food coloring, BUT we couldn't see

what was happening.
This experiment is ageless, and grabs the attention of everyone, young or old, that I have ever encountered. It is a great take-home experiment. I have had students try it with chocolate milk! I also have had students show it to older siblings who normally don't pay attention to a younger sister or brother.
It also contains a mystery; the swirling reaction is the same when 2% and non-fat dry milk is used. Chemists are not able to totally explain why. When you do it with your students, they will find every dish has a different pattern even though the same directions have been followed.

ART EXTENSION: Give each student two sheets of white paper towel. Before the milk is added to their dishes, tell them to trace the bottom of the dish on the paper towel, and cut out several circles that are the size of their dish. When they see the pattern on the surface of the milk they like, they can put a circle of paper on top of the milk. They remove the paper and let it dry on newspaper. When dry, the paper provides a "memory" of the experiment. The paper can be cut in strips and laminated; these strips are great bookmarks.

SOURCE: Chemistry Challenges from ICE, University of Wisconsin/Madison.

STANDARDS:
BSL: 1.1, 1.3, 1.5, 4.6, 4.7, 4.8, 11.4, 12.5, 12.7, 12.8
NCTM: none
SCS: A1, B1, B2, H2, H5

O'Neill, Mary. Hailstones and Halibut Bones. Doubleday, 1961. ISBN#0-385-41078-6-595.

The art work at the top is from the original Christa McAuliffe Collection and was drawn by Beverly Noble in 1991.