

Get Wet Assignment

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The purpose of the Get Wet assignment was to gain an understanding of how to develop images of fluid flows. The objective was to set up a simple apparatus that will create a simple aesthetically pleasing fluid flow. Many attempts were made at creating the instability of Saffman-Taylor in a Hele-Shaw cell, but the lighting and camera positioning proved too difficult for a first project. So an easier apparatus composed of milk and blue dye was used to examine the dispersion and dilution of the food dye into the milk after they make contact. This phenomenon produced an image that is not only visually stimulating but also displays characteristics of non-linear fluid flow.

First, a cereal bowl six inches in diameter was filled with eight ounces of milk. Although the cereal bowl was red, the milk created a perfect background for the image. Secondly, the kitchen light source was powered approximately six feet above the bowl. Finally, two drops of blue food dye were released 3 inches above the bowl into the milk immediately after the milk was slowly stirred in a clockwise manner. The approximated velocity of the milk was .5 cm/s. Immediately after the two drops were released, a picture was taken using a digital camera. The apparatus setup can be seen in Figure 1.

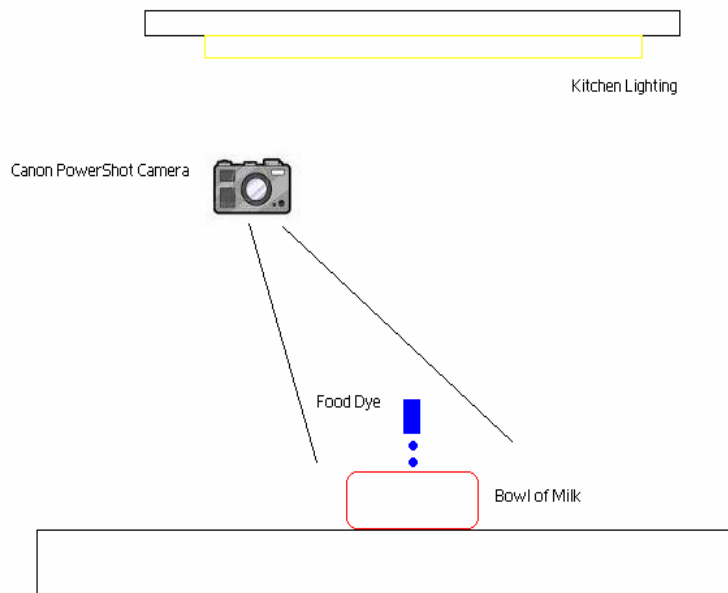


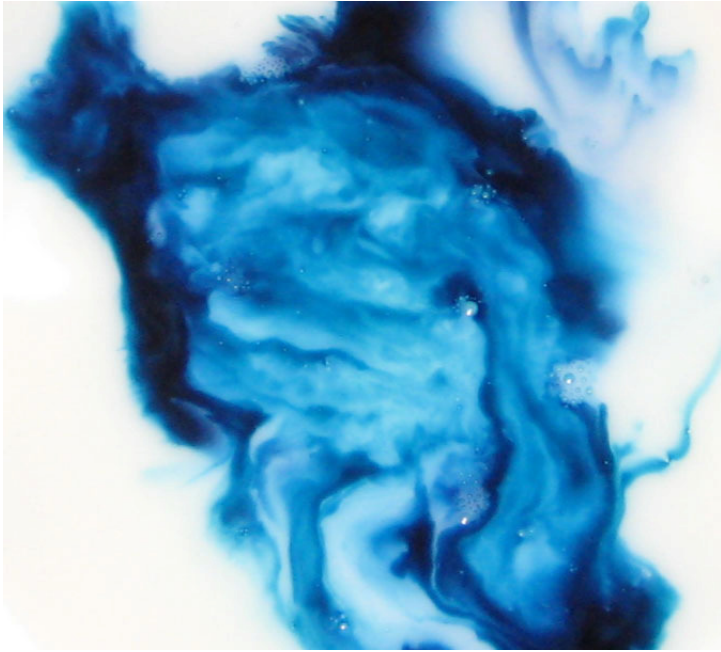
Figure 1

The visualization technique used for this apparatus was a fluid dyeing technique. Undiluted blue dye contrasts sharply with the white milk so the dispersion and fluid flow could easily be recognized. The only lighting used for this apparatus was the kitchen lighting which uses three 60 Watt light bulbs. The flash of the camera was turned off as it created a light reflection off of the milk's surface.

The field of view in the final image (see appendix) is a rectangle that measures 3.75 inches by 3.383 inches. The distance from the surface of the milk to the camera lens was approximately 2.5 feet. The focal length of the lens was 7.1 mm. A digital Canon PowerShot SD750 camera was used to take the picture which has a capacity of 7.1 megapixels. The shutter speed of the camera was 1/60 seconds and the ISO speed rating was 200. Therefore the time resolution was 3.33E-5s. The aperture value of the camera was f/9. There was little manipulation to the original image except for zooming in and cropping of the final image using Adobe Photoshop(see appendix).

The image reveals that the food dye disperses radially outward from the center with hints of fingering in the outer regions. There is a slight hint of a vortex which was expected but it is not as dominant as I would have liked. This could possibly be due to the fact that the bowl was more square in shape than an actual circle. Since the milk is denser than the dye, the dye stayed on top of the milk which created a visually pleasing image of the milk flow in the bowl. I dislike the image because I thought there could have been a greater vortex. I'm not quite sure about the fingering that occurs in the upper right corner of the image. Maybe it could be due to the type of milk used and the resulting fat content that pulled on the dye. I believe that I fulfilled my intent of creating a aesthetically pleasing image of fluid flow although I would like to see a greater vortex if the image were to be recreated.

Appendix



Final Image



Initial Image