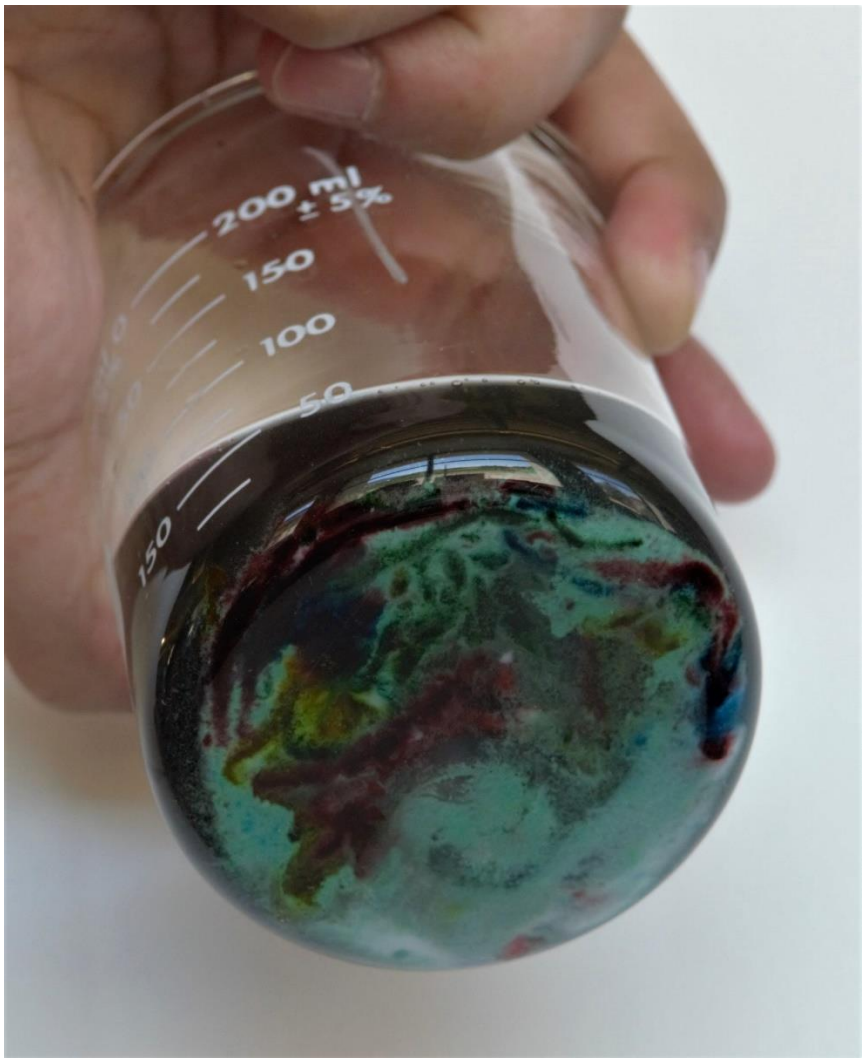

Team Third Report

Brandon Toves

Flow Visualization: 4151-4200-001

Intro

The image depicted below displays a mixture of several different fluids and dyes. The purpose of the image was to attempt visualizing different features of flow phenomenon within fluid dynamics utilizing a variety of differing viscosity fluids. This report outlines the different phenomenon that may have occurred, outlines how the experiment proceeded, and which features were edited to produce the finalized image.

Figure 1: Original Unedited image

Set Up

The materials needed were a 200 ml beaker, heat gun, and a white poster board. Several fluids were available including, four food coloring dyes, black ink, isopropyl alcohol, baking powder, Elmer's glue, and hydrogen peroxide. The experiment occurred in the ITLL upstairs in the afternoon in a well-lit space. No external light sources were utilized. Several cameras were used to record and capture the experiment as it was performed. Namely, an Iphone 7 and a Nikon D3400 DSLR were used to capture the photos.

Experiment

The experiment was performed several times. Initially, we used only two different fluids, 91% isopropyl alcohol and ink. In Figure 2 below, you can see that the flow displayed interesting flow phenomena, however the backdrop and colors itself were very plain and simply. We wanted to enhance the colors within the image so we attempted using different dyes, although the ink was too overpowering in color. We attempted using other stimulants to dilute the potency of the ink and increase the color using dyes. Several trials were performed, varying the order and volume of each fluid poured and mixed.

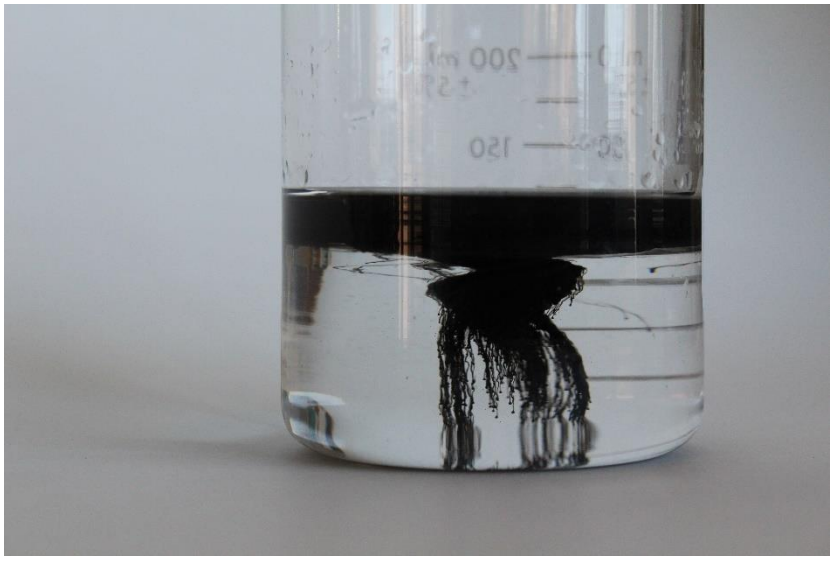

Figure 2: Initial experiment using alcohol and ink

Initially both alcohols (50 mL each) were poured in with differing potencies (70% and 91%). Food coloring dyes were then added to create a basis of color (red first, then yellow, green, with blue last). Attempting to create a thicker fluid for the dyes to stick to, Elmer's glue was added, creating a thicker surface for other fluids to latch onto. Baking soda and a heat gun were utilized to excite the flow, allowing all of the varying fluids to mix. Lastly, 3 droplets of black ink were added. Manual stirring and a heat gun were used to further mix all of the fluids within the beaker.

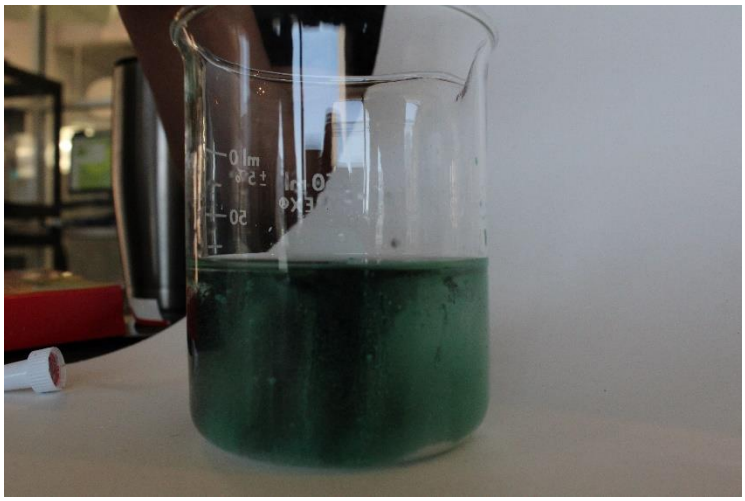

Figure 3: Moment when ink was added and manually mixed

Flow

These fluids had varying densities and chemical properties. This experiment really was the culmination of all the fluids we had available and it was unclear as to which flow phenomena were being enacted due to the robust method of mixing all the fluids. We wanted to highlight the ink dispersion, utilize the dyes to enhance the colors, and use the heat gun and baking powder as catalysts for the experiment mixture.

Post-Processing

The image I selected was captured during different phases of the disposal. Garrett took the photo with his Iphone 7, three feet away from the beaker. The windows were to his back, although the light was well dispersed. The image was cropped to eliminate the blank white space and really focus in on the residual fluids resting on the bottom of the beaker after the mixture had occurred.

Conclusion

This experiment revealed that the beauty in fluid phenomena can be derived from experiments that aren't necessarily set up. We wanted to capture something different, and as we lifted the beaker, discovered the residual fluids on the bottom of the beaker. These characteristics indicate how utilizing catalysts and several fluids can reveal various flow phenomena.

Figure 5: Final Image post experiment

Sources:

"Dispersing Process." How to Disperse and Stabilize Pigments, www.inkline.gr/inkjet/newtech/tech/dispersion/.

"Isopropyl Alcohol." National Center for Biotechnology Information. PubChem Compound Database, U.S. National Library of Medicine, pubchem.ncbi.nlm.nih.gov/compound/isopropanol.