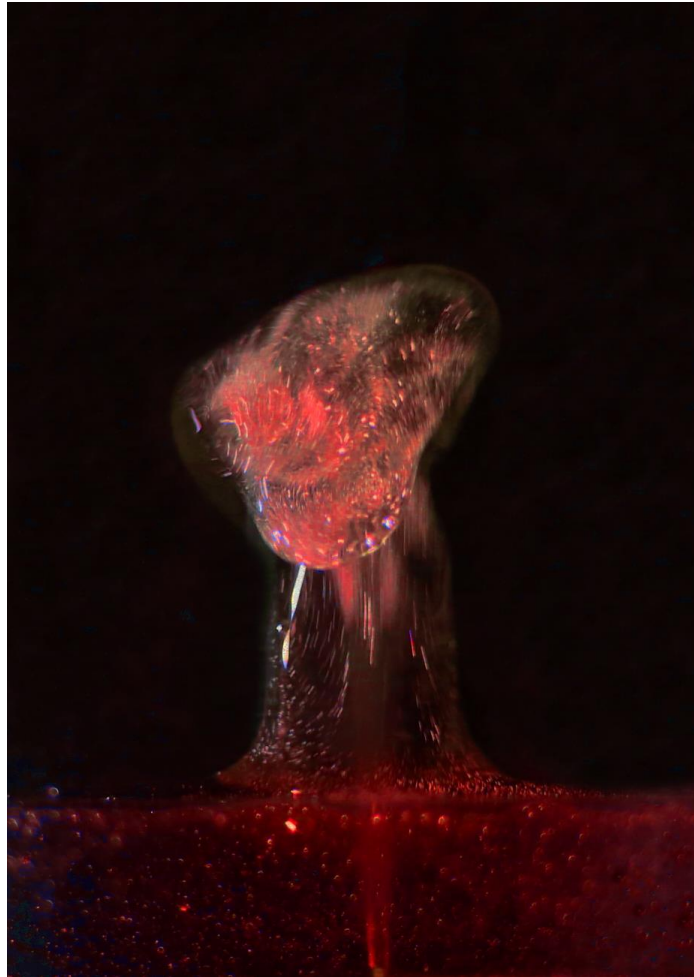


Eric Robinson
Team Third Report
MCEN 4151 – Flow Visualization
5/6/2018

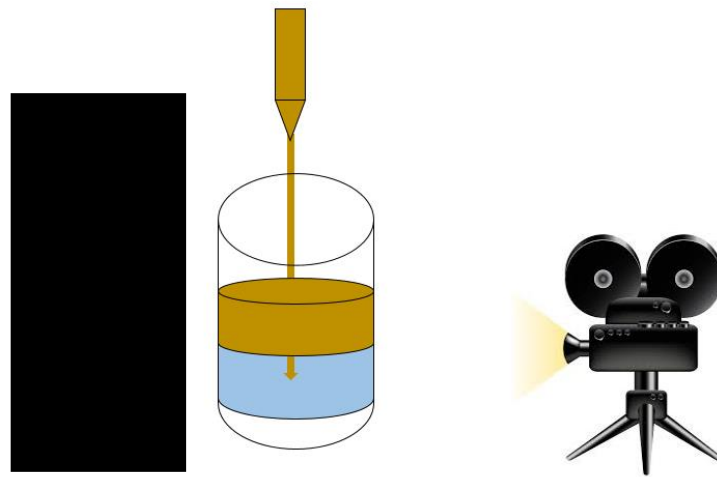
Inverted Image of Canola Oil in Water



This image is an edited image from an experiment involving water and canola oil. The experiment was to observe the boundary layer between the oil and water due to the difference in densities. I worked with my team, including Luke Collier, Zachary Marshall, Philip Nystrom, and Yousef Shashtari, to set up the experiment and take several still images. The idea was to set up the boundary layer and then spray oil directly through the top layer. We believed this would create interesting “plumes” when the image was rotated 90 degrees, an example of which is in the image.

The diagram below shows the setup of the camera, spray bottle, and flow stream made using Microsoft PowerPoint. The team used a glass beaker filled with about 4 inches of water and 1

inch of canola oil. An additional spray bottle filled with canola oil was used to spray fluid directly vertical into the beaker at high velocity. This created a viscous layer that stayed separate from the water. We also included a black sheet of plastic to improve lighting conditions. The team observed bubbles of oil that would not dissolve in the water. We also experimented with different food coloring in the oil, but we did not have much success due to the difference in density of the dye and oil.



Setup of Experiment

The science behind the experiment is based on surface tension and density properties. The oil has a lower density than water and does not easily dissolve which allows the oil to stay in a stable layer above the water. When the additional oil is sprayed through the layer, the surface tension maintains the oil surface and creates odd shapes similar to the one above.

The FOV on this image is approximately one inch by three inches. I chose this region to focus on the specific stream here and reduce the background distractions. The flow was about 2 feet from the camera, which used a standard 18-55mm lens. I used a Pentax K100 for the shot shown above. In the end, I used Gimp for the color enhancements as I was able to change the oil color from a dark yellow to the red shown. I also reduced noise from reflections off the glass and darkened the background overall to maintain focus on the flow.

I like how the image came out as a display of density and fluid interaction. It is always interesting to see how the fluid will not mix and maintain a stable boundary layer. I also like how the shape is almost alien-like and the colors are very cool. Red on black has always been a favorite combination to me so I liked my choice of hue change.