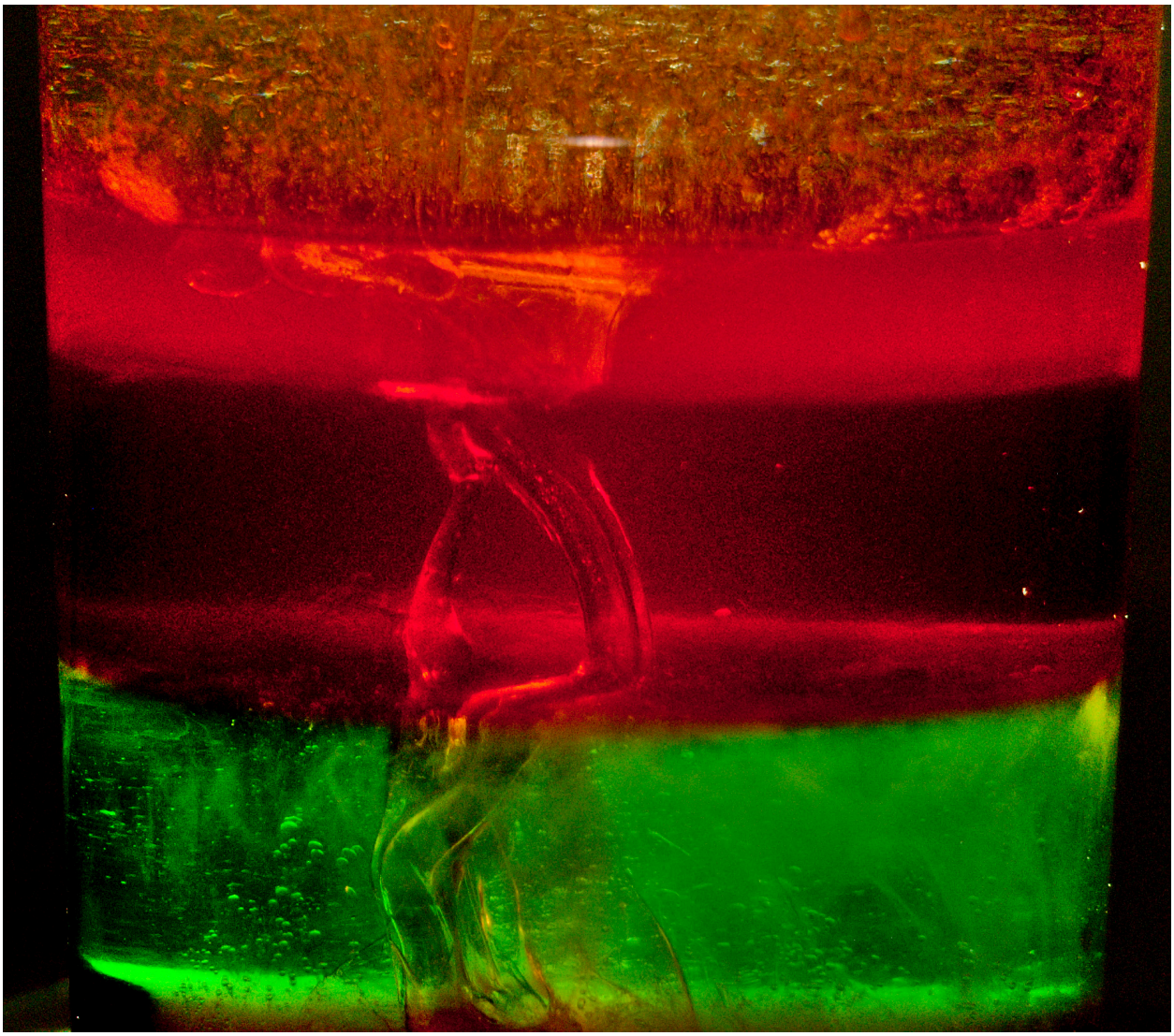

Dawood Ahmad // Team First Report

October 13, 2019

MCEN 4151 - 001

Collaborators: Faisal, Meg, Audrey, Sam

Introduction

The intent for this image was to use the different densities of fluids to show clear boundary layers due to separation by density as the fluids fall into their respective layers. Using a tube that was submerged then pulled and twisted upwards, a disruption in the layers was observed and captured. Each fluid fell from the tube to its layer in a spiraling manner without while staying within that fluids boundary layer

Setup

The setup for the experiment utilized a paper projector, vase, clear plastic tubing, and five fluids with different densities. The fluids, ordered from highest densities to lowest, were: maple syrup, dish soap, colored water, canola oil and isopropyl alcohol. First, the vase was filled with the fluids with the most dense fluids being at the bottom. After the fluids settled in their respective layers, the vase was placed on the paper projector. The paper projector was then turned on in a dark room, and was the only source of light for the image. The camera was then held roughly 16 inches away from the vase (Figure 1).

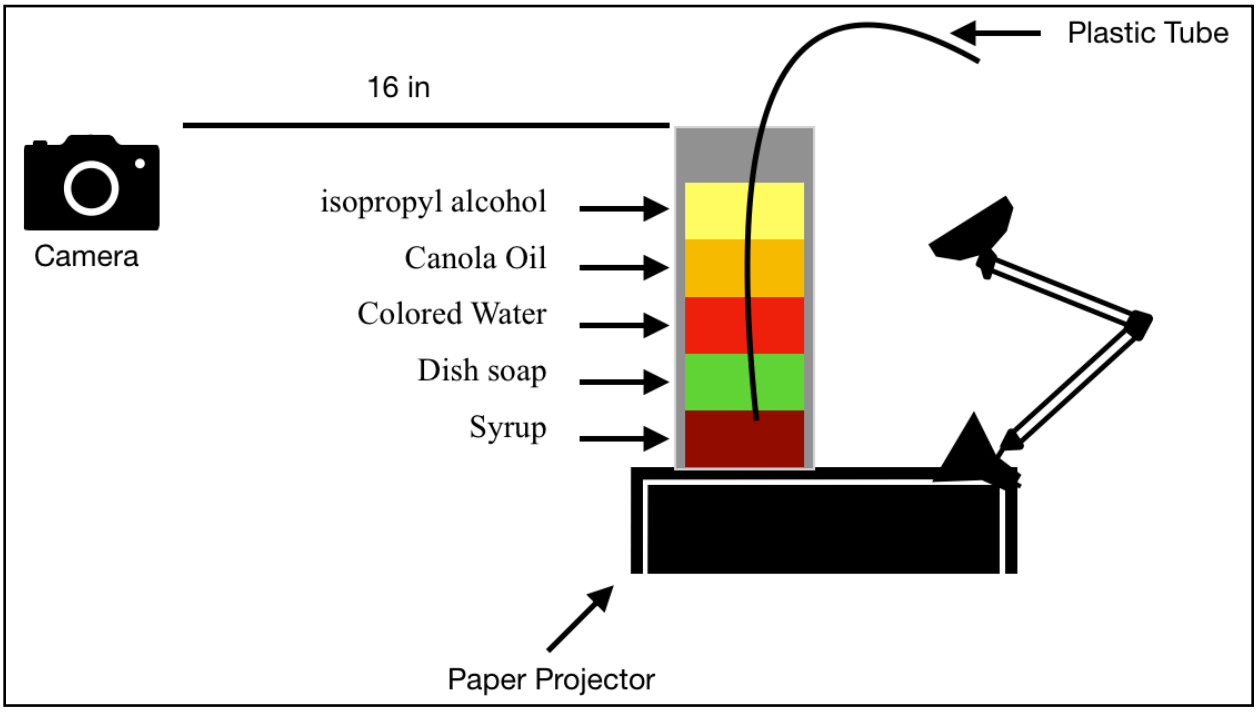

Figure 1. View of the setup

Flow Science

The photo shows the phenomena of immiscible liquids and density separation. When liquids are insoluble in each other they are called immiscible. The fluids falling to their respective layers is due to their different densities. The fluid with the greatest density will find its place at the bottom of the vase, in this case, the maple syrup. The fluid with the least density will find its place at the

top, in this case, the isopropyl alcohol. The maple syrup and isopropyl alcohol have the densities 1.37 g/mL and 0.789 g/mL respectively. Having immiscible fluids, we don't see them mix.

camera settings

The camera used was a Nikon D3300 with pixel size 6016x4016. The focal length was 30 mm, Aperture was F/4.2, ISO was 900, exposure was 1/500. The lens was a Nikon AF-S DX Nikkor 18-55mm.

Edited photo

The original photo involved the five fluid layers, however, during editing the photo was cropped to focus on the dish soap and water layers. The edited photo wasn't cropped to the edges of the vase so that the picture doesn't look curved. Instead editing the saturation created a black background, and the sides of the vase were left visible. After cropping, the saturation and contrast were adjusted to make the colors of the layers more vibrant. Also This allowed for the falling stream to be more visible.

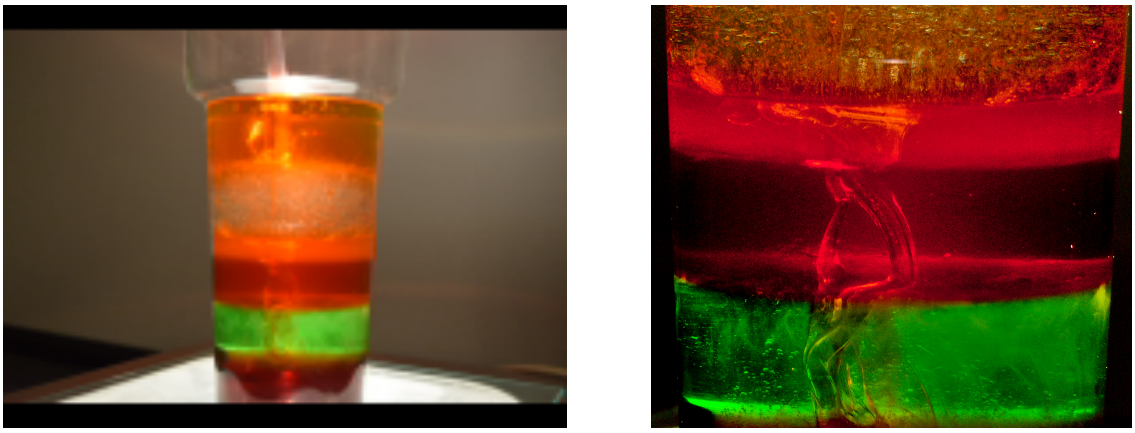

Figure 2.Image on the left is original photo. Image on the right is edited

conclusion

The image displays separation by density and a clear boundary layer is shown. Due to the tube being twisted and pulled upwards, the falling streams fall to their respective layers without mixing. I like how the end result came out, especially after editing. The twisted streams remind me of DNA, and the green layer feels like a radio active hazardous material. I wish I could have utilized all the layers in the vase instead of the two layers shown. Also, I feel that the editing of the photo can be improved as it does have a grainy feel to it.