

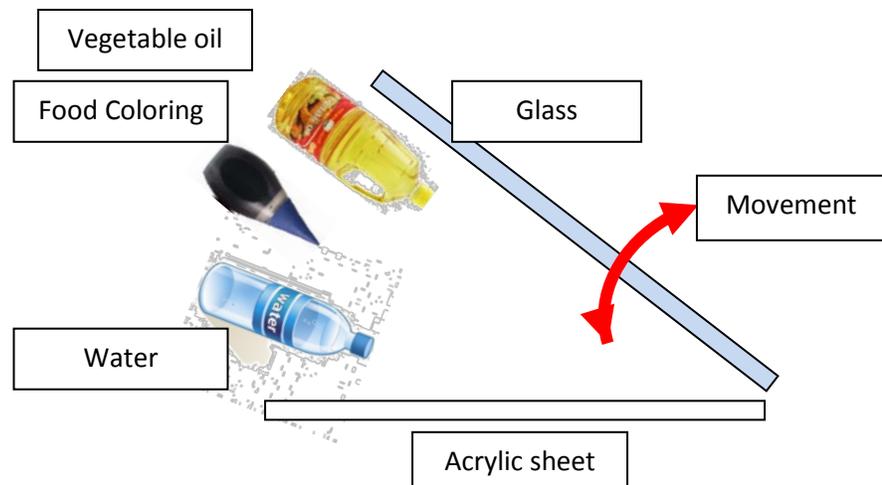
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Flow Visualization
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f/2.8 : f-stop
1/100 sec : exposure
ISO-80 : iso speed
5 mm : focal length
Canon SD870 IS: camera
12 inches: distance
2795 x 746 : dimensions
no : flash

Group Image 2: Hele-Shaw Phenomena: Saffman-Taylor instability

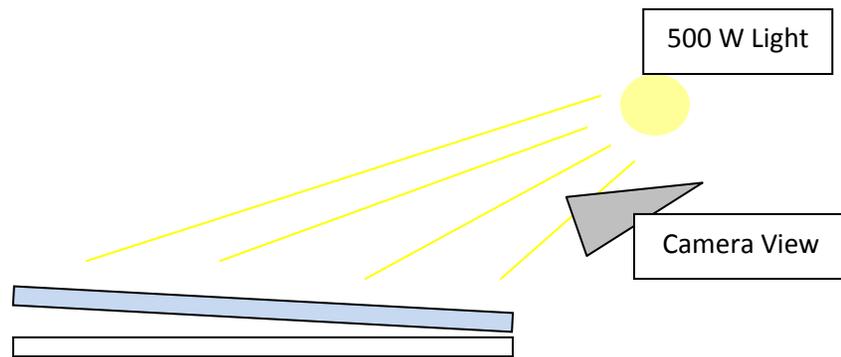
This image was created to show viscous fluid interaction in the Hele-Shaw experiment apparatus. The intent of this image was to recreate the finger like phenomena due the difference in viscosity's of the fluids (air and oil)¹. This image was taken as part of the group 2 image, but due to time conflicts with our schedules the group took pictures at separate times, without the aid of our other group members. The experiment was difficult to use and the syringe used to inject the liquid continually failed and an alternate method discussed later was used to separate the two fluids. I was trying to capture an image that looked like a forest of trees made of liquid.

This photo was taken in the ITL using the pre-existing Hele-Shaw apparatus. The experiment is designed to have a syringe that injects fluid through a little hole in the bottom of two parallel plates. I was having a difficult time creating a tight seal around the syringe so instead of injecting the fluid through the syringe I poured small amount of fluid between the two plates. After the mixture of Vegetable oil food color and water was mixed as much as it could, the glass plate was lowered on top of the acrylic sheet. From here I would raises one side of the glass and the air would rush in-between the two parallel plates. The glass only needed to be raised about a half inch, then could be placed back down and rose again repeating this action for different visual results every time.



1. <http://polymer.bu.edu/ogaf/html/chp44exp1.htm>

The visual technique used here was to contrast the fluid color with the background acrylic sheet color. These colors were visible through the transparent piece of glass on top. The mixture of the water, oil, and food coloring created an uneven mixture and added a visual texture to the fluid. The bright lighting used in the experiment allowed for a very visible look at liquid fluid. To do this a 500W full spectrum light was used 3 feet from the surface of the glass. With this bright light no flash was required on the camera. The camera and light location be seen in the figure below.



For the image, I wanted to capture the interesting fingers that are created between the interaction of the air and liquid as the glass was being pulled away. The field of view of the final image spans approximately 12 inches. From the surface of the glass to the camera was 24 inches. The camera was set to automatic settings with an f-stop of f/2.8, exposure of 1/100 sec, and a focal length of 5 mm. Post processing was done in Photoshop to brighten up and change some of the colors in the image. This mainly involved changing the background color from a muted white to a bright yellow, and shifting the curves to emphasize contrast in the image. A heavy landscape crop was used to bring attention to the slender fingers and make the image look more like a forest of liquid. The original image can be seen below.



I hope that the image reveals an interesting fluid phenomenon that shows the interaction between air and liquid. The flat crop size of the image should bring interest to the slender fingers created in the fluid. The only aspect of the image that I would improve would be to keep repeating the raising and lowering of the glass to get a more uniform, repeatable spread of designs. By repeating the experiment many more times, this might have been achieved.