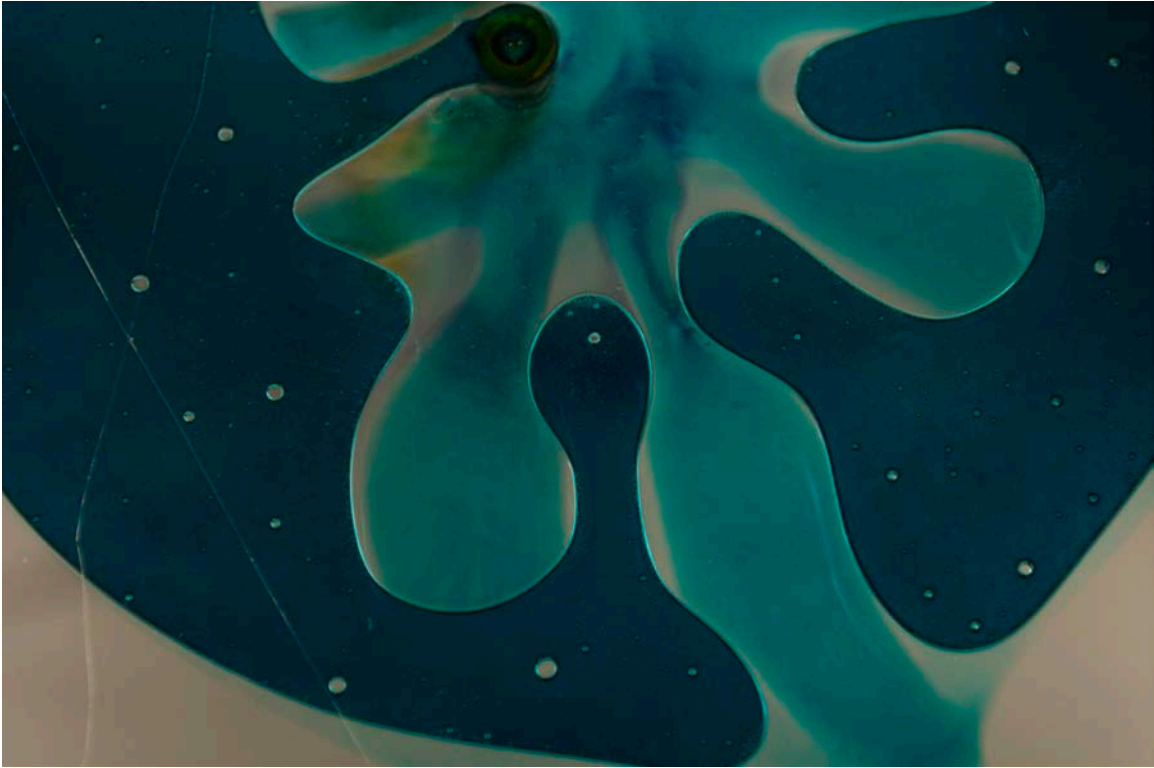


Team Image #1 Write Up  
Hele Shaw Cell Experiment

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(video)

<https://vimeo.com/88289316>

## **Purpose of Image:**

For Team Image # 1 my group and I decided to attempt the Hele Shaw experiment. I was fascinated by the abstract imagery this experiment created. With this experimentation I wanted to cinematically investigate the gloopy abstract fingerings of textural bright colors and air bubbles that this flow visualization formed. I am very visually intrigued to experiment with color and how it flows within watery movements, and this flow visualization was one that really emphasized this type of interesting fluidity.

## **Team**

Here is a list of people I worked with to analyze and create this image

1. Jason Brownstein
2. Davis Zillis
3. Ben Healy

## **Materials**

- |                    |                           |
|--------------------|---------------------------|
| 1. Karo Corn Syrup | 1. Sony HDR SR11 (Camera) |
| 2. Food Coloring   | 2. Tungsten Light Kit     |
| 3. Water           |                           |

## **Set Up**

The set up for the Hele Shaw experiment was fairly easy. Luckily, the ITLL lab had a specific contraption that is solely meant for the Hele Shaw, this spared our team a lot of time setting up and more time experimenting! The contraption resembles a medium sized nightstand. The flat top of the apparatus contains two clear glass panels. The bottom panel contains a small hole drilled in the center of the glass. Then there is a small tube that connects into this hole and goes down about 12

inches underneath the contraption. Followed by a large syringe, which contains the colored water.

While setting up this experiment lighting was the trickiest part. As one can see in the photo below our team was working within tight corridors, so positioning the lights was difficult. We had a standard tungsten professional light kit, and we lit the experimenting area with stadium type lighting. Also we placed a light underneath the apparatus that lit and pointed upwards. We used a light kit because in order to photograph this type of flow visualization we had to really illuminate the liquid so the camera could capture all the textures that were inside this experiment.



### **Flow Apparatus**

In order to achieve the flow we squeezed out about two tablespoons of corn syrup over the bottom piece of glass. Then we placed the top piece of glass sandwiching the corn syrup in-between the bottom and top glass panels. Then in order to make the swirly sprouts of abstract shapes we injected colored water with the syringe. The colored water was pumped through the syringe and into the corn syrup. This was the process of how we created the flow.

## **Flow Discussion**

The Hele Shaw experiment is demonstrating the Saffman-Taylor instability. Which is when one liquid with a lower viscosity penetrates a liquid with a higher viscosity creating fingering shapes of fluid flow. (1) So in this case the corn syrup is of a higher viscosity and the water is of a lower viscosity. When our team pumped the colored water into the corn syrup it created these 2 dimensional fingering shapes.

## **Photographic Technique**

Video: 1920 X 1080 1080i

F/Stop: 8

Shutter: 1/200

ISO: 200

In addition to the photographic technique that was used I implemented color correction and cropping techniques within Final Cut Pro. I did this because I wanted the colors to pop and be wilder to the eye. So the fingering of the fluid flow could be clearly highlighted with a bright pop of colors. Also, the cropping was used in order for the viewer to see the fingering more closely.

## **Conclusion**

The purpose of this image is to demonstrate through the Hele Shaw cell experiment the Saffman Taylor instability. I was happy with the outcome of this project, and I my team and I worked well together. Though, one aspect that frustrated me was my camera. I do not think I want to use the Sony HDR Sr11 anymore when it comes to macro cinematography. There were some focusing and spatial issues that were impossible to correct due to the fact the camera was not equipped for some of things I wanted it to do. But other than that everything went well, and cannot wait to work with my partners again!

## References

[1] "Fluid Dynamics for Physicists" by T.E. Faber, Cambridge University Press,

Cambridge 1995, pg 297-301