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Arts 5097

This image was taken by myself, with the assistance of Tanner Ladtkow and Tim Read, for our first group project. The purpose of this image was to show the Saffman-Taylor instability in a Hele Shaw cell. This image was used to show the behavior of liquids at different densities and viscosities. This behavior of the liquids is what creates the "finger" like patterns that are formed.

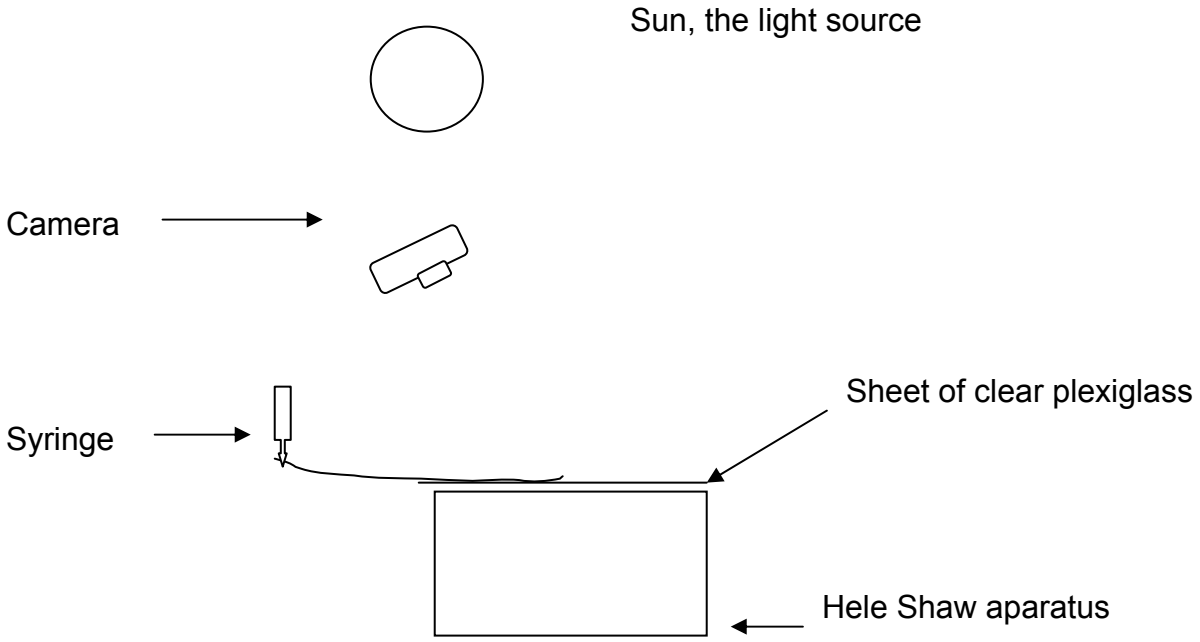

Fig 1: Project Set-up

We used the Hele Shaw apparatus, which has a piece of glass affixed to the top of it. On this piece of glass we dropped a couple ounces of plain corn syrup. We then carefully placed a piece of clear plexi-glass with a small hole drilled its center on top of the corn syrup. In the hole we placed one end of a tube that was connected to a syringe holding a mixture of green food coloring and isopropyl alcohol. This green mixture is less viscous than the corn syrup. When this less viscous fluid was injected it displaced the

more viscous corn syrup. This displacement is the cause for the "finger" like patterns that formed.

The flow was seen due to the food coloring and alcohol moving through plain corn syrup. We dyed the alcohol with the food coloring until we reached the desired hue of green. Because we diluted the food coloring with isopropyl alcohol the movement of the liquid moved very quickly. Because we were using the sun as the light source, I used a faster shutter speed of 1/500 of a sec. to catch the movement of the fluid displacement.

The field of view of this image was about 1 square foot. I stood about 3 feet from the apparatus as I took the image with a 85mm lens with an aperture of f: 8. I used a digital Nikon D-70 with an ISO of 250 to take the image. I used Photoshop only to check the levels of the exposure and to check the tones of the image and to make the image pop. The image was cropped from the original slightly to 3000x2400 to capture the most intriguing aspects of the phenomena.

This image reveals the patterns created by the Saffman-Taylor instability on a Hele Shaw cell. I like that we did capture the behavior of the two different liquids, however, I wish that we would have tried to use more that one color when experimenting to get a more interesting image. The physics shown in this experiment is the displacement of a viscous liquid by a infinitely less viscous liquid. I feel that we fulfilled the intent of this experiment, however, if I could do this experiment over, I would try to think of new ways to do it. I would like to have tried something that would have created a more interesting image.