Flow Visualization
Fall 2019
Team First Report
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My team and I decided in our first team image assignment to fill a bubble with fog and observe what might occur inside the bubble. Also, we were trying to observe the flow of the fog once the bubble is popped for a small period of time. The fog at that time would be exposed to the atmosphere which made it easier to capture the image. For my image, I captured the bubble with fog before popping, while some of my teammates captured it once and after it popped. My teammates who helped with this experiment are Austin Ramirez, Jon Cohen, and Julian Cruz. The image was captured inside Austin Ramirez's house.

Forming a bubble by blowing is interesting and to do that, a person would be blowing from a wand filled with soap and water. The liquid film which is typically water would interact with air which is the external fluid and that would produce bubbles flying and popping (1). A gas jet would be fast enough to make a bubble when the density of the gas being blown, the width of the soap film, the distance between the gas blowing nozzle and the film, and lastly the size of the nozzle are all determined (2). Wind speed is needed and there are a couple of parameters that determines that, like the size of the wand. The speed needed to blow a bubble is within 10-100 meters per second according to the researchers where the tubes were ranged from 0.04 inches to 8 inches (2). From figure 1, we can see that the light reflected shows unique colors that designate the thickness of the molecular layers, such as the purple color alongside the yellow color on the bottom right corner.

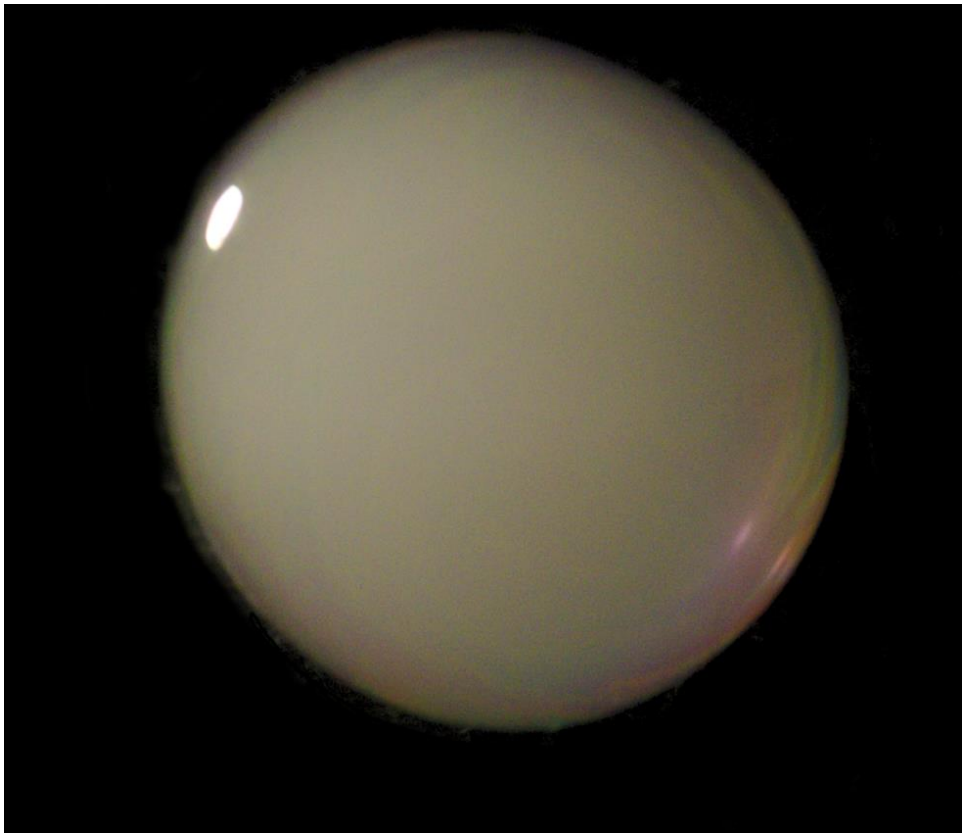

Figure 1. Team First Final Image

The setup for this experiment was that we used a tablecloth inside Austin's house such that the bubble can be popped in the middle ideally, soap bubble that was purchased from target, plate, vaporizer for the fog, and lastly a bubble wand (tube). We first gathered the plate filled with the soap bubble. Then one person would take a deep inhale and use the vaporizer to blow the fog through the tube. As a result, a bubble would form and grow as the visualization technique would be that the fog would start to fill the bubble. The number of attempts we did was too high as some of the bubbles would be too small, as well as it would end up in a wrong placement. Furthermore, the concentration of the bubble soap was low which made it hard to form huge bubbles. In terms of lighting, a small lamp was used to shine on the table and no flash was necessary. In general, the room we were in during the experiment was mostly dark.

Fujifilm X-T1 was used to capture the image as it was under a manual exposure mode with an aperture of F2.8, a shutter speed of 1/180 sec, a focal length of 16 mm, and an ISO setting of 6400 without a flash. The field of view was about 4ft wide and 3 ft high as it wasn't large. The pixel dimension for the image is 4936 x 3296. The distance between the camera and the desired object was approximately 2 feet. The final cut processing was done using Gimp as a photo editor. Gimp was used such that the picture could be cropped, changed in exposure and contrast, and lastly the background which was changed entirely into black. Figure 2 below shows the original picture before it was edited through Gimp.

Figure 2. Team First Image Without Editing

This image reveals the phenomena of having a fog inside a bubble. Although it is a simple idea, the flow is very relaxing to observe. What I like about the picture is the lighting and

that the bubble feels static and real. Furthermore, I think changing the background into a plain black color as well as zooming into the bubble helped perceiving the flow, eliminating distraction and giving the vapor good contrast. What I may have done differently is I could have cropped the bottom black border to make the image more symmetric. All in all, I think the intent of the image was achieved that resulted in a great overall picture.

References

(1) Conover, E. (2016, February 19). Focus: Physics of Blowing Bubbles. Retrieved from https://physics.aps.org/articles/v9/21.

(2) Schwartz, S. (2016, March 11). Blowing bubbles for science. Retrieved from https://www.sciencenewsforstudents.org/article/blowing-bubbles-science.