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Flow Vis
Group 6

First Group Report

This being the first group project, the team wanted to do something a little more complicated than the Get Wet project. An idea was thrown around which consisted of directing water into a tunnel that only allows for unidirectional flow. This design was 3D printed out of acrylic and glued together. Now came the idea for the actual fluid. The team didn't want just a dyed liquid because that's very simple and not very aesthetically pleasing. One team member, Greg, came up with the idea of letting shaving cream dissolve in water, giving it a pearlescent glow.

To set up and film this, the team attached a funnel to a hose, and then attached the other end of the hose to the tunnel. A bucket was placed underneath to prevent any liquid from making a mess on the floor. As the liquid was being poured through, the team realized it wasn't actually as interesting as it had originally sounded, so different applications of the liquid was being thought up. The team poured the liquid into a beaker and experimented with different lighting effects, some by having two lights on the side of the beaker, and some by having the beaker being held up by the actual light (the lights were held by myself, Greg Collins, and Brent Eckles). The latter is how this video was taken. However, for this image the team also twisted the beaker to see the liquid move due to the no slip layer of the liquid.

This video displays the beaker being twisted, and then liquid moving around more so at the bottom of the beaker. This movement of the liquid is due to the no slip layer. The no slip layer is a layer of liquid that, like the name says, doesn't slip along the surface. A typical velocity profile of a free flowing liquid on a surface is shown below in Figure 1. This shows that at the surface the liquid is not allowed to move, which is why when the beaker was twisted, some of the liquid followed the wall of the beaker. The liquid that was along the surface was using friction to pull its neighbors along with it, which is why we see a large amount of liquid flowing around the beaker. When the beaker was suddenly stopped, the force that was applied disappeared with nothing to actually stop the liquid, so the liquid kept moving in the circular fashion (Unknown).

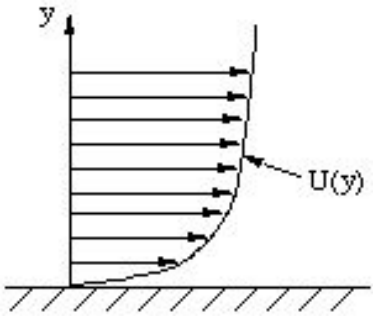

Figure 1: Velocity Profile

This video was filmed with a Black Magic Pocket Cinema camera (which Duncan Lowery operated) with a resolution of 1920 x 1080. The iso was pumped up to 800 because the

shutter speed was set to 1/96 seconds. The lens used was an 80-200mm lens at an aperture of f8 with the camera being 4.5 feet away from the beaker. The liquid (which was made by Greg Collins) was made by filling a jug up ¾ of the way with water and filled the rest with Barbasol shaving cream. After letting it settle for 20 minutes, the liquid was run through coffee filters (Greg Collins). The shaving cream doesn't fully dissolve in the water which is why it has this pearlescent look to it. The white in the video is the shaving cream in the water, which surprisingly reflects the light much better than the water.

For this image, the liquid was placed in the beaker and then set on the light. Four drops of blue dye was then added by Greg Collins, Brent Eckles, and myself to the liquid to help the white of the shaving cream pop out in the camera more. The beaker was then quickly turned 180° and stopped to capture the flow of the liquid.

If I were to do this experiment again I would only try to improve the lighting a little bit, I feel as if the light wasn't shown in the image as much it would drastically improve the image. I also would have liked to understand video editing a bit more because I wasn't able to do anything besides cropping the video due to confusion with the editing software. Because of this, I will most likely be sticking with images, however it was definitely worth trying to make the video.

Sources:

Unknown. "Flows With Friction." *Princeton University*, The Trustees of Princeton University, www.princeton.edu/~asmits/Bicycle_web/frictionflows.html.