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Flow Visualization

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For this last project we used dry ice to create an image, which captured a phenomena in action. It was interesting to experiment with different liquids in the dry ice and to examine how the two substances reacted together. The vegetable oil we used did not adapt to the dry ice at all, the oil actually only created bubbles it didn't create any smoke or cloud formations. When we added food coloring to the dry ice it just beaded off completely. The only liquid that created a flow was hot water added into the container/ vase once the ice was already inside.

Use of dry ice as a solid fuel stimulant allows the fluid mechanics of the problem to be separated from the combustion process to create the image. We set up a yellow backdrop on the kitchen counter and placed different vases, jars and plates to see the difference of results the dry ice created. Flow visualization indicated that the mass transport near the dry ice surface was greatly increased when velocity oscillations were present, when the dry ice was positioned at an acoustic velocity antinode. We then placed a red jar on top of the yellow fabric. Added the dry ice into the jar and filled it with hot tap water. Once the water was added the ice began to sizzle and over flow the jar with steam/smoke. We tried a variety of ways to create an interesting flow visualization project. After many attempts, we found that placing a hollow tube in the middle of the jar and pulling it back out created a ring around the object. This image was interesting because it showed us the pressure of the two objects could produce entirely separate phenomena. The rings outside the jar showed that the pressure inside was hard to keep

steady due to the disturbances of the airflow. While trying to create a steady vortex, it was hard to capture the vortices in action white trying to photograph the smoke in motion. The overflow of the condensed water particles rotated in a circular motion and created vorteces, some more distinct than others, depending on how fast of slow we pulled the glass tube off the top of the jar. The longer we allowed the smoke to build up inside the jar before releasing it, resulted in a more defined image to capture because of the depth and thickness of vortex rings.

This photo was taken with a canon at a shutter speed of 1/40. The exposure was taken manually with a focal length of 21.00 mm. Although the flash was on, we did have two other desk lamps set up for extra lighting, in order to capture more detail in the smoke formation. The ISO speed was 400. I used Photoshop to change the color to black and white and to crop the bottom part of the vase. The top was the main focus of the image because that is where the over flow of the smoke was coming from.

I enjoyed playing around with the dry ice for this project because there was such a variety of ways to experiment with it as well as many different phenomena's going on within the mixture of the dry ice and different liquids.