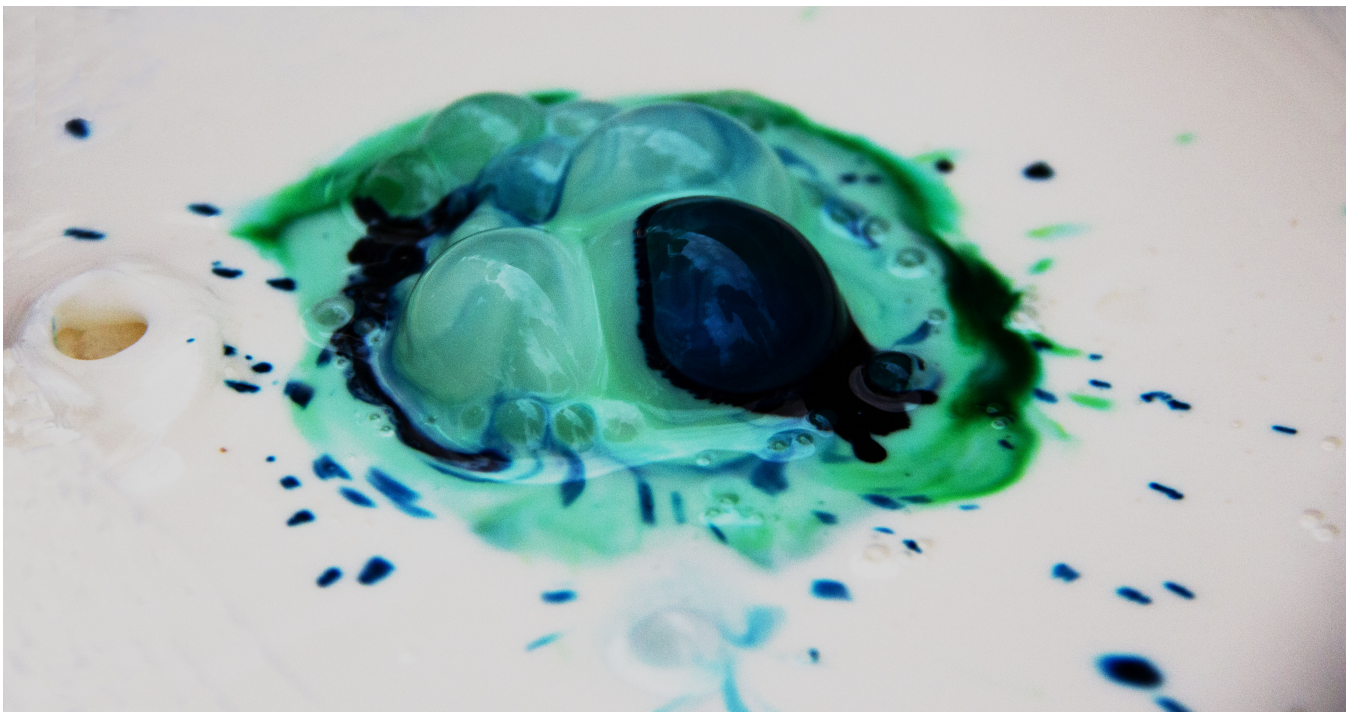


MCEN 4151: Flow Visualization  
September 29, 2015  
Kelsea Anderson



Flow Visualization 3<sup>rd</sup> Assignment: Team 1<sup>st</sup>

**Purpose:**

The purpose of this photograph was to set-up and capture a fluid flow with an assigned group of students. Working together allows us to pool our recourses and use extra hands to help with fluid set-ups. Valuable life skills are also learned when working as a team.

**Materials:**

For the set up for our first team photo our group collected: boxes of cornstarch, dry ice (1lb block), and a collection of clear plastic containers. Each team member contributed 2 boxes of cornstarch each, and Sam and Scott purchased the block of dry ice. I provided the two 6 liter clear plastic storage boxes used for the photographs and Scott provided a larger container for mixing the oobleck. Scott also provided the water, tongs, and gloves needed for this set-up. A list of all the materials used is listed below.

**Materials:**

- 4oz Cornstarch
- 2oz Tap Water at Room Temperature
- 1lb Block of Dry Ice
- 2 6 Liter Clear Plastic Container
- 1 Large Plastic Mixing Bowl
- 1 Pair of Metal Kitchen Tongs
- 1 Pair of Ski Gloves
- 1 Package of Safeway Food Coloring

**Set-Up:**

Two full boxes (2oz each for a total of 4oz used) of cornstarch were mixed with about 2oz of water. The cornstarch was then mixed thoroughly with the water to create a thick oobleck. A layer of oobleck, about 5cm thick, was poured into a 6 liter clear plastic storage container and then a 2cm long piece of dry ice was placed into the oobleck layer and the rest of the saved mixture was poured on top. This was done after much experimentation and was found to be the best way to form bubbles in the oobleck with out having too much steam settling on the top of the oobleck layer, or having too much oobleck for the steam to escape from.

As the dry ice reacts with the water in the oobleck  $\text{CO}_2$  is released. The thick layer of oobleck on top of the dry ice then traps the escaping  $\text{CO}_2$ . Pressure builds as the dry ice releases more  $\text{CO}_2$  and the oobleck begins to form bubble on the top of the oobleck layer as the  $\text{CO}_2$  forces its way out. These bubbles are what were photographed for this assignment. Once the bubbles pop the cold  $\text{CO}_2$  causes the water vapor in the air to condense and form a cloud, making the bubbles appear to erupt and release a geyser of steam.

**Taking the Image:**

In the original set up the oobleck was not colored with any food coloring and so was a slightly off white color. Food coloring was dropped onto the oobleck bubbles and as the bubbles burst and reform the food coloring was mixed into the oobleck. My image was taken after green food had been added for about 1 min coloring was mixed into the oobleck. Sam splashed a drop off blue food coloring onto the green oobleck bubble and I took my image before the bubble burst and mixed the blue and green food coloring.

**Image Specifications:**

Natural sunlight was used to illuminate this image, as this experiment was run in Scott's back yard. Camera setting for this image can be found in Table 1.

Table 1: Camera Settings

Focal Length	Exposure	f/	ISO
178.0 mm	1/2000 sec	5.6	1000

Camera Model: Canon EOS REBEL SL1

Image Size: 5184 x 3456

Resolution: 240 Pixel Per Inch

**Safety:**

Safety was a concern during our experiment when handling the dry ice. Dry ice is frozen carbon dioxide and is typically kept at around -78 degrees C. If dry ice comes into contact with your skin it can cause severe burns. All team members handling the dry ice thick gloves and the dry ice itself was handled with tongs. Once the dry ice was added to the oobleck we were unable to tell where it was in the substance so we had to stir the oobleck until the all the dry ice pieces were found and removed. Only once the oobleck was safe to do so did team members handle the plastic container holding the oobleck.

**Post Processing:**

The image was cropped so that the extra white oobleck around the bubble was not included in the image. Clone Stamp was used to remove parts of the background that remained in the image after cropping so as not to distract from the focus of the image. The color curves were changed slightly to make the contrast between the blue and green colors more dramatic, but only changed slightly other wise the blue turned into a very dark black.

**Reflection:**

I really like the color contrast in this image. The way the blue dye is sliding over the green oobleck layer makes me think of a whale. I also like that I have the excess splashes of blue food dye in my image from the previous bubble's explosion. I wish my clone stamping was a little smoother on the edges of the photograph, but other than that I am pretty happy with how this image turned out. I also really enjoyed taking this photograph with my team. They were all very helpful in adding food

coloring where I wanted it so that I could take this photograph, which I could not have done by myself. I also enjoyed having other people's input on my photograph before I presented it to the class.

## Works Cited

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