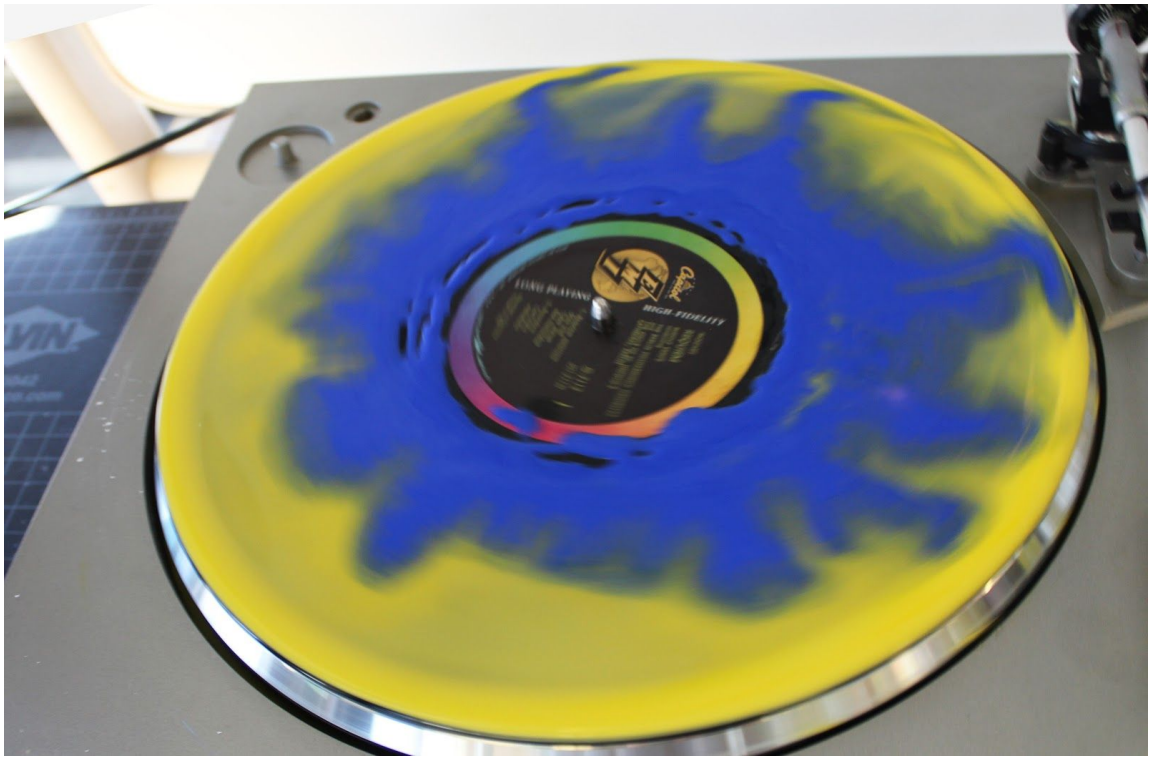

Figure 1. Photo of flow from Nikon during expiriment.

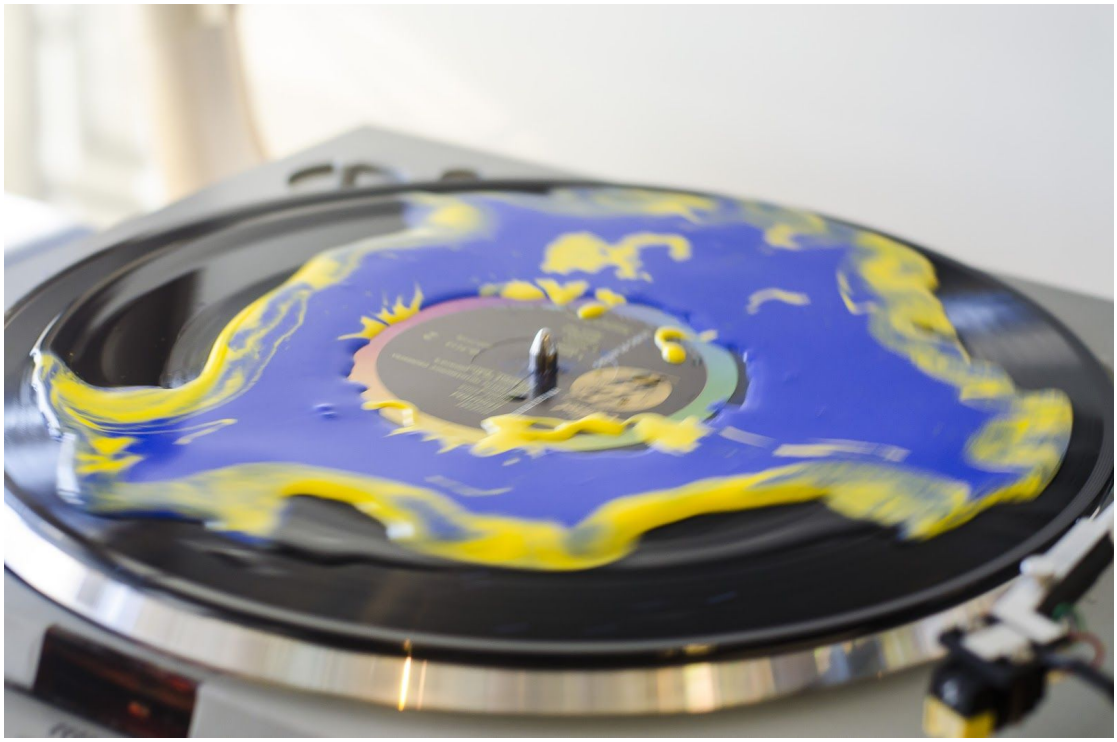

Figure 2. Side View of Oobleck in revolution

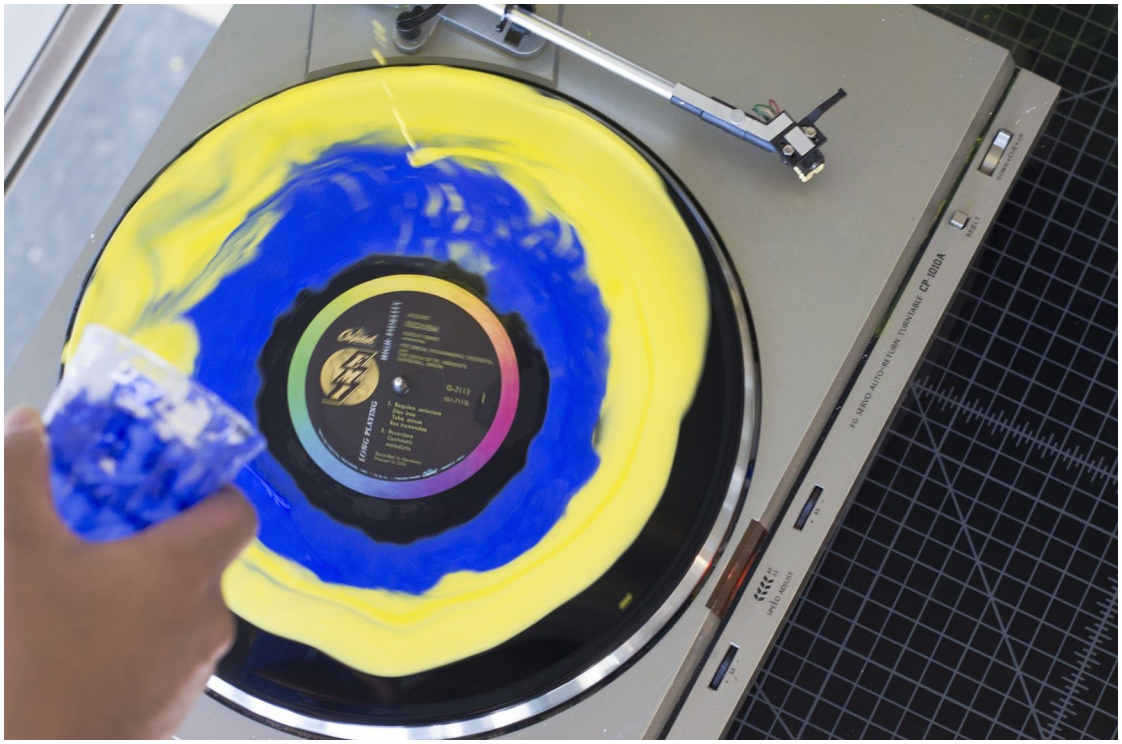

Figure 3. Top view of Oobeck being poured.

Video 1.
https://vimeo.com/256461300

3/15/18
Summer Thompson

Contrasting Colors of Oobleck and Rotational Inertia

Report and Images by Summer Thompson for Team First Project with collaboration from team members Abby Rastatter, Brandon Toves, Zach Hinck, and Garrett Wolcott. Video and Report by Summer Thompson for the 2018 Spring Flow Visualization Class at CU Boulder.

For this assignment, my group and I were interested in capturing the unique properties of oobleck, a non newtonian fluid in which viscosity increases with the rate of shear strain. I had the idea of using rotation as a force to strain the oobleck, so we decided to borrow proffessor Hertzberg's record player. Garret sacreficed the Behtoven Requim record which we used as a

base for our flow. By pouring Oobleck onto the record, we were able to capture the rope coiling instability of the fluid onto a surface, the trans state property of oobleck under stress, and a relaxation of the fluid after the rotation had stopped. In the video I included 3 different pours of oobleck, Zach poured the yellow Oobleck from the right and Brandon poured from the left of the camera.

To get these shots and video, we used a vinyl turntable, a 12” diameter beethoven record, and two mixtures of oobleck and artist pigment. We poured the oobleck from about a foot above the record. We performed this experiment multiple times and adjusted the water content of the oobleck to achieve a thinner more pourable liquid. The video shows the trials in reverse, the last being the dryest oobleck mixture and the second and first being the wetter mixture. The second clip of the video best demonstrates the rope coiling instability. I believe this is from the added water and lower viscosity which allowed the fluid to be poured and reach a small enough diameter to coil under its own weight when it reached the surface of the record.

We chose ultramarine and yellow artist pigment and mixed 2 tablespoons of each with 1 cup of cornstarch and ½ cup of water. We further diluted the mixture with about ¼ cups of water to get the first flow consistency. This additional water allowed the oobleck to be poured as a liquid but the high viscosity caused the fluid to coil in the rope coiling effect.

The colors of artist pigment used were Sennelier French Ultramarine Blue and Light Cadmium Yellow. We chose to rotate the flow to get more symetrical and dynamic footage of the fluid pours. I used leftover pigment from a project for Carson Brunns Color class of Fall 2017. We used a table and a whiteboard as backdrop for the experiment. We set up 10 feet from an upper story window which illuminated our apparatus with natural light.

The camera used to film the video was my mirrorless Fujifilm x-pro1 with a 50mm nikon e-series lens and fotasy Nikon to Fujifilm x-mount adapter. The field of view was approximately

12 inches across, the same diameter as the record, but offset to the right to show the arm of the record player. The camera was on a tripod, and the lens was 2.5 feet from the center of the record. I used premeir presets to edit the video. I increase the contrast and saturation of the colors and editted in transitions, titles, and music. The Song I chose was *Get a Hold of Me*, by Corey Wade. My camera shoots at 24 fps the video and the specs are ISO 400, 1/100, f/5. In hind sight I should have increased the ISO and used a faster shutter speed to better freeze the flow.

The Video reveals the mixing effect of rotation on non newtonian fluids and the relaxation after stress has been released. I am proud of this image and its what I set out to create in my initial ideation of the project. I also think this flow is quite interesting to watch and aestetically pleasing because colors and motion. If I could do it again, I would have increased my shutterspeed. I think the video does an excellent job of showing the fluid charcteristics of oobleck under stress and in a relaxed state.