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Film 4200 Flow Visualization
Prof Hertzberg
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Team Project 1 Report

Since my first photograph showing a non-Newtonian fluid appeared on screen in class, many students became fascinated with the flow of this fascinating oobleck. Once I joined my group for the team effort project, the group asked me to spread my knowledge of this fluid. Together, we decided to capture on video multiple examples of the hypnotic flow of the physics in action. Working in one of the engineering labs we successfully were able to record the flows we sought to present.

Over the last weekend of February and over the first weekend of March, 2011, Group 6 mixed almost over two gallons of non-Newtonian fluid consisting of two parts cornstarch to one part water. The only change to the original mixture was adding variants of food coloring to dye the fluid to give both a more aesthetic appearance, but mainly to contrast the folds thus bringing depth. From the main vat of non-Newtonian fluid, a small portion was ladled out onto a smooth surface, dropped from above, to document the flow of the fluid impacting a surface (thus solidifying) and then flowing freely into a liquid. Next, a large amount was poured slowly over makeshift metal block, achieving stairs, to verify the liquid components of this fluid, which rendered some very interesting flow. This non-Newtonian fluid from the stairs pooled together onto a tabletop and then was filmed being agitated and rippled by a finger. As there are two colors from the stairs sequence, when

mixed by the finger it is very interesting to see one color acting like a solid within the liquid color of another.

From here the video is dedicated to motion. Placing large amounts of non-Newtonian in a bucket, letting the mass collect at the bottom. Then turning it open toward the camera began spinning in an anti-clockwise motion. This was repeated several times, each variant being given a different amount of colored food dye to enhance the shadow and increase depth. Most fascinating is watched the non-Newtonian fluid solidify almost instantly due to motion, yet parts remain a liquid and it flows of other solidified parts. The following sequence is the next step from the rotating bucket. The liquid is collected at the bottom then poured out over the rim of the bucket. The non Newtonian ripples and creates a solid wavy husk once it becomes susceptible to gravity that conducts as a surface for its on liquid to flow over. At a certain point the mass becomes to great and the collection of suspended oobleck snaps in half as if nougat or clay. The final shot is a beautiful example of two separate colored non-Newtonian pools within a bucket colliding and being poured out.

Using the HD video functions of my group mates we were able to capture such outstanding video. I unfortunately do not have the exact specs of their cameras. Regardless, the footage was rendered at 720 x 1080 resolution, 650 watt omni kit lighting.

Our main goal was to simultaneously demonstrate the non-Newtonian liquid interacting with its own self as a solid, vice versa, and how gravity affects it.

Successfully, I believe the middle two sequences to be the most powerful. The

bucket spinning and the hovering of the liquid from its rim prove the physics behind it tremendously, while still baffling the eye. Personally, I like the finger agitated sequence the best. In its simplicity it shows the liquid at its constant changing peak as the finger rapidly moves across it.