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MCEN 4151-001

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# Team First Assignment – 2019 Fall

The purpose of the Team First Assignment is to capture a more complicated flow with the help of a team now that everyone is familiar with flow photography. For this Team First Assignment, team four decided to capture the Rayleigh-Taylor instability by pouring diluted acrylic paint mixed with silicone. This acrylic pouring technique has been used to produce cells highlighting the different densities in the paint mixture.

The formation of these cells relies on the Rayleigh-Taylor instability. This instability occurs when fluids, in this case the acrylic paint, of varying densities interact with one another [1]. Usually, the darker the paint, the denser the paint is. By layering our paint from most dense being purple down to the least dense being white, we were able to observe this instability. The denser purple fluid sinks to the bottom, forcing the less dense white and green to rise. The added water and silicone help the paint flow more easily and creates greater separation as the silicone also rises towards the surface. The flow of the acrylic pouring was laminar and smooth in nature, corresponding to a relatively low Reynolds number.

The visualization technique used was the flow of the diluted acrylic paint and silicon mixture. The materials used were plastic shot glasses, a red solo cup, a 6” x 6” canvas, Astroglide silicone lubricant, and Craft Smart Matte Acrylic Paint, specifically the purple, green and white colors. First, the three colors of acrylic paint were filled into separate plastic shot

glasses and then mixed with water. The mixture was roughly 0.75 ounces of paint to 0.75 ounces of water in order to dilute the acrylic paint. In addition, two drops of Astroglide silicone lubricant were added to the shot glasses and then mixed. Next, the paints were poured into the red solo cup in the following order of decreasing density: purple, green, and then white. The 6" x 6" canvas was placed on top of the red solo cup and then flipped 180 degrees in one smooth motion. The red solo cup was then lifted vertically, causing the mixture to pour out and spread across the canvas. Cells began to form and spread out along the canvas. The canvas was tilted to ensure that the paint spread across the entire canvas from corner to corner. A diagram of the setup is shown in figure 1 below. The image was taken outdoors during the day, which provided some light. In addition to natural light, a 18-watt (1260 lumen) light was held directly above the canvas. Jamie Frankel captured the image as I poured the paint mixture and held the light.

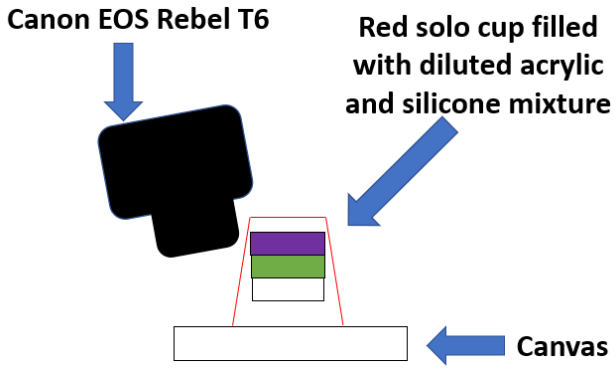


Figure 1: Side-view of the setup

The image was captured using a Canon EOS Rebel T6 camera. The focal length of the lens was 55mm. The distance from the object to the lens was roughly 4 inches and the object was a 6in x 6in canvas. Both the original and final image had a width of 5184 pixels and a height of 3267 pixels. The exposure specs are as follows: F-stop – f/9, exposure – 1/100 sec., ISO – 320, and flash mode – no flash. I then manipulated the color curve and cropped the image using GIMP 2.10 software. The adjusted curve is shown in figure 2 below. The original image is

compared to the edited image in figure 3. The editing really brings out the colors of the image and highlights the cells that were created. Also, the editing makes the image much more visually appealing without altering the scientific details of the image.

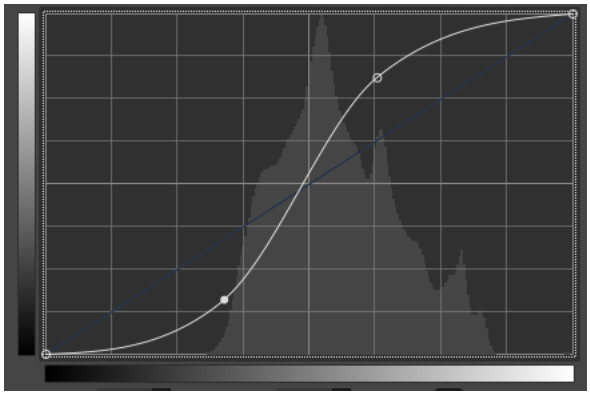

Figure 2: Adjusted color curve in GIMP 2.10

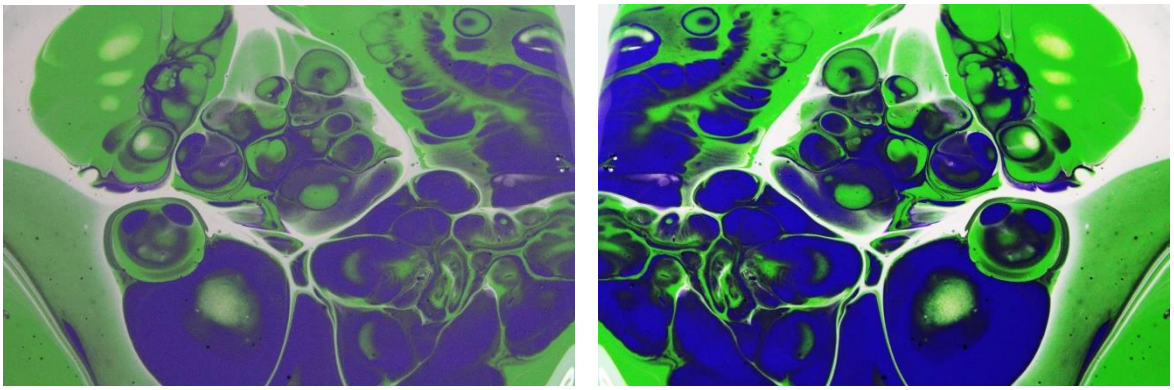

Figure 3: Original (left) vs Edited (Right)

This image of cells forming through acrylic pouring reveals the Rayleigh-Taylor instability. The white in the image resembles water ways and has a very branch-like feel to it. The fluid physics are shown well as the cells are clear and prominent throughout the image. Team four effectively fulfilled the intent for this image, but one area of improvement would be to use different colors and possibly more than three colors. This would create a more interesting and more appealing image.

Works Cited

[1] Post, Jenny. “How to Get A Cell Free Acrylic Pour.” How to Get A Cell Free Acrylic Pour, AcrylicPouring.com, 29 Aug. 2018, https://acrylicpouring.com/how-not-to-get-cells/.