4/29/2018

Technicolor Living Painting

Summer Thompson

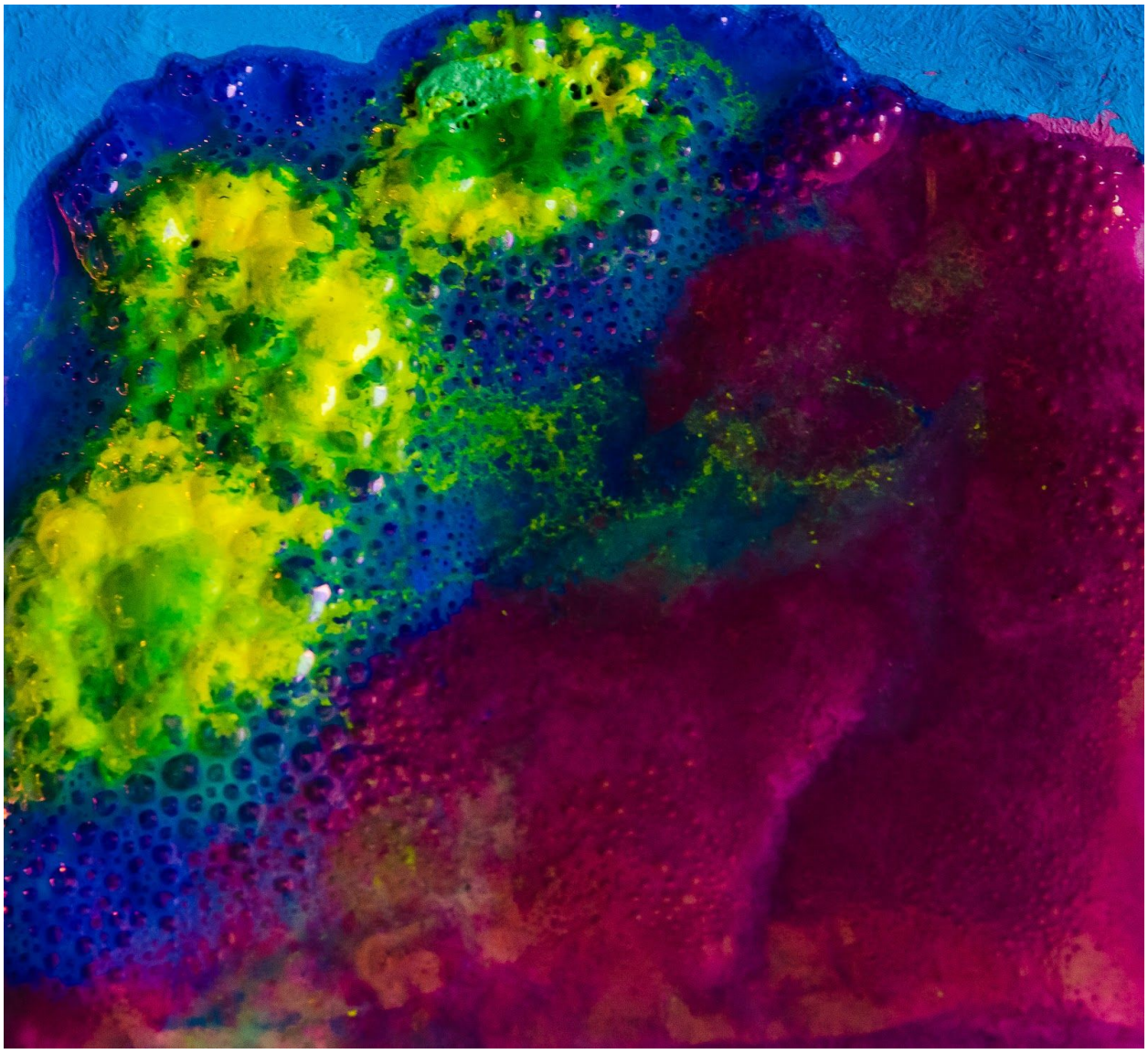

Figure 1, Cropped final image.

Image Report

Photos and Report by Summer Thompson for the 2018 Spring Flow Visualization Class at CU Boulder. These images were created with collaboration from team members Abby Rastatter, Brandon Toves, Zach Hinck, and Garrett Wolcott.

I created this image by making a paste out of baking powder, artist pigment, and isopropyl alcohol. I mixed various colors of this paint recipe and then painted them onto a square of scrap paper. Abby then brought this square of paper outside and we waited until they were dry. We then placed the 4x4 square of paper onto a blank poster board and poured about a cup of vinegar onto the square. The reaction took place over the next few minutes, when figure 1 photo was taken.

The reaction we used to create this flow was baking powder and vinegar. Baking powder is a mixture of sodium carbonate and sodium bicarbonate and a weak acid. Vinegar is a dilution of (3%-5%) acetic acid. The weak acid in vinegar and the baking soda produces two acid-base reaction, where carbonate decomposes into carbon dioxide and water.

$$2\ CH^3\text{-}COOH\ (s) + Na^2\text{-}CO^3\ (aq) \rightarrow 2\ CH^3\text{-}COONa\ (aq) + CO^2\ (g) + H^2O\ (l)$$

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A large amount of carbon dioxide is released, producing the bubbles and distributing the pigment into the vinegar creating a mixture over the area of paint. Surface tension of the vinegar spread the liquid across the square piece of paper, saturating the baking soda paint. As the reaction initialized, the carbonates begin to decompose and release gas, disturbing the dry pigment and coloring the flow. The colors green and yellow were layers of paste which caused their larger volume due to more baking powder being present and the subsequent release of more CO^2 in that area.

The visualization technique used was pigments mixed with our reaction ingredient. The pigments used were Sennelier dry artist pigments in the color mixtures of Ultramarine and Primary Blue, Violet and Primary Red, Primary Yellow, and Emerald Green Substitute. We mixed equal parts baking soda and pigment, then wetted the mixture with isopropyl alcohol. The use of different colors allowed a more interesting flow and achieved our intended aesthetic.

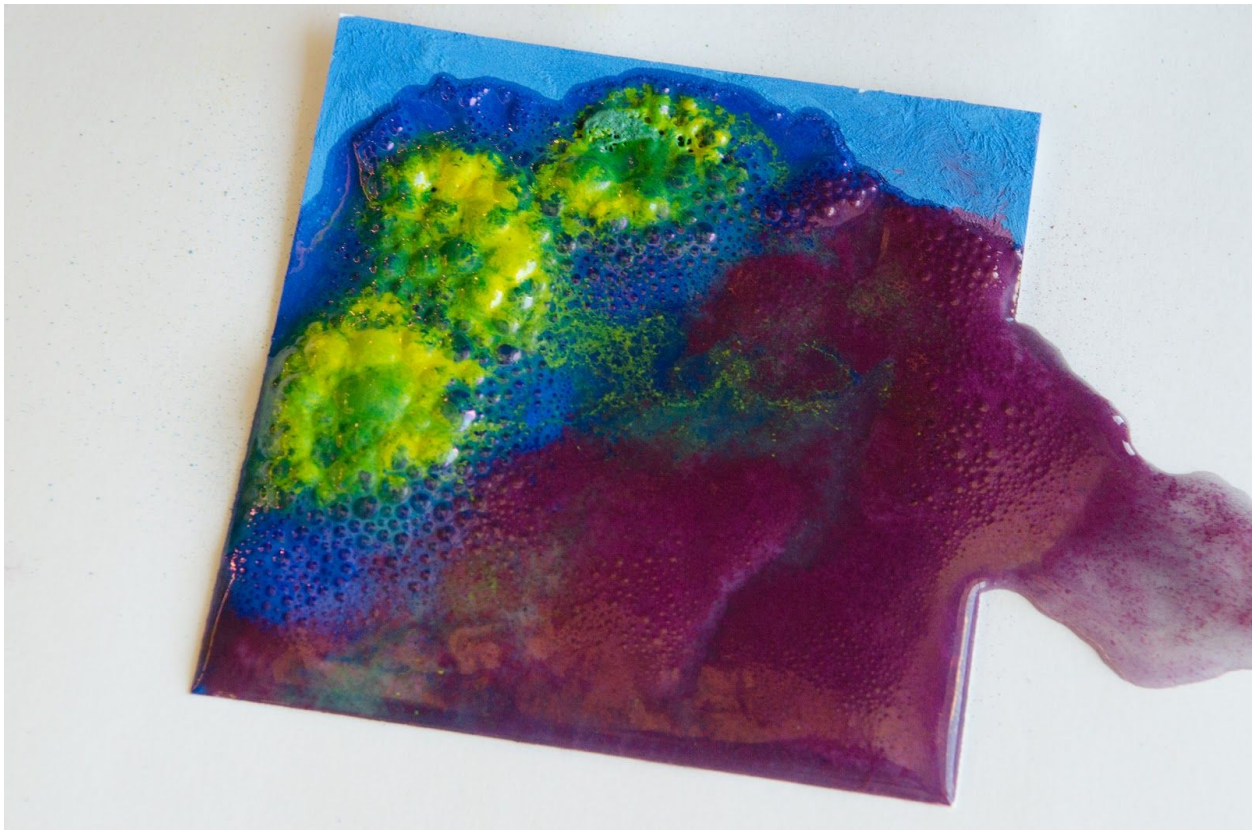

Figure 2. Uncropped original photo, exposure increased 2 stops.

I took this photo with my Nikon D5100 and a 17-55mm autofocus zoom lens. The focal length of the original image was 55mm, a cropped sensor equivalent of 82mm. The shutter speed was 1/80 of a second, the ISO was 800, and the aperture was wide open at f/2.8. The image size is 4928x3264 pixels at 29.2 MB. The uncompressed cropped image dimensions are 2772x2533 pixels. The flow was approximately 1.25 ft from the camera. The camera was at a

45 degree angle pointing down at the flow. The flow was about 6 feet from an uncovered window on the second floor of the ITLL. We did the experiment at around 2 pm so the flow was indirectly lit by the high sun. The edits I made to figure 1 were, cropping, increasing contrast and saturation, boosting the reds, and sharpening.

This image shows the decomposition of sodium carbonate and bicarbonate into CO^2 forming bubbles and distributing the pigment into the vinegar, creating a solution. Overall, I wish I had a more dynamic concept going into this project but overall I'm satisfied with the aesthetic impact and the visualization of the flow. If I were to revisit this project, I would want to paint a 3d object like a dinosaur or a sphere. I think this would heighten the aesthetic of the image and exhibit the flow in a more dynamic way.