Team Second Report

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Background

The purpose of the second team image project was to capture a fluid flow phenomenon that results in an interesting and good-looking image. The experiment needed to be controlled so the steps in the experiment process could be repeated to get similar results. In my second team experiment, I decided to dye shaving cream with food coloring and press that colored shaving cream through a strainer, which resulted in different colored shaving cream noodles on the other side of the strainer.

Setup



Figure 1: Team second image setup

To setup this experiment, I brought out a spaghetti strainer, a cereal bowl, three different colors of food coloring, and Gillette shaving cream as seen in Figure 1. The first step in this experiment was to pour 1-2 ounces of shaving cream into the bottom of the strainer and drop 3 droplets of each food dye color into the shaving cream. I used a simple dinner knife to stir the food coloring throughout the shaving

cream. Then, I used the bottom of the cereal bowl to evenly push the colored shaving cream through the strainer. I would like to acknowledge my roommate, Eric Etl, for being the one pushing the bowl down on the shaving cream while I got a good angle from under the strainer to take a high quality picture. As my roommate pushed the shaving cream through the strainer, the noodles came through the strainer at a rate of approximately 1 cm/s. The density of the shaving cream was about 0.8 g/cm³, which is less than the density of water (1 g/cm³) meaning shaving cream will float in water. The Reynold's number of the resulting shaving cream being pushed through the strainer is,

$$Re = \frac{\rho VD}{\mu} = \frac{0.8 \left[\frac{g}{cm^3}\right] * 1 \left[\frac{cm}{s}\right] * 1[cm]}{0.5 \left[\frac{g}{cm * s}\right]} = 1.6 < 2300$$

where ρ is the density of the shaving cream, *V* is the fluid velocity through the strainer, *D* is the diameter of one of the strainer holes, and μ is the dynamic viscosity. By inspecting this equation, it can be seen that the flow of the shaving cream is laminar because 1.6 (Reynold's number of the shaving cream) is less than 2300, resulting in laminar flow. This makes sense because the flow velocity of the shaving cream was so low and the flow of the shaving cream was very smooth when it came through the strainer.

Visualization Technique

Once my roommate started pushing the shaving cream through the strainer with the cereal bowl, it was time to capture the flow phenomenon with a high quality image using my Nikon D90 DSLR camera. I went through several iterations of taking the picture, changing the lighting source, the focus on my camera, and the distance from the lens of the camera to the colored shaving cream noodles. The first lighting source I used was the sunlight coming through the window; however, this resulted in a glare coming off of the shaving cream and the strainer that was distracting. Then, I closed all the blinds and turned off the lights around the experiment and used my cameras built in flash as the lighting source. This resulted in a much better lighting technique because there was no glare and the entire experiment could be

seen with no distractions. When the final picture was taken, the distance from the lens to the shaving cream was about 2 feet.

Photographic Technique

As explained earlier, I used my Nikon D90 DSLR camera to capture the image.



Figure 2: Original unedited image

The image in Figure 2 is the original image I took with my camera. It can be seen that I used the flash from my camera as the lighting source due to the shadows in the picture and the glare on the blinds in the background. I did not like how much of the surrounding background was in the picture, so I uploaded this image to Photoshop to do some cropping and image enhancing.



Figure 3: Final edited image

Figure 3 shows the final image that I uploaded to flowvis.org. I cropped the picture so that the colored shaving cream noodles were the main focus of the image and to get rid of the distracting background. I also increased the color contrast and used Photoshop's color enhancing tools to make the colors in the photo pop.

Conclusion

In conclusion, I was pretty happy with the final result on my second team image. I really like the look of the shaving cream noodles, how none of them are exactly the same shape or color. One thing I would like to change if I repeated this experiment is to add more food coloring into the shaving cream before pressing it through the strainer because one can still see white in the shaving cream. Overall, I think this is a very interesting and colorful image, and this assignment taught me more about Photoshop, fluid flow of shaving cream, and different lighting techniques.

References

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