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MCEN 4151-001

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Get Wet Assignment – 2019 Fall

Prior to this project, I had no experience using a DSLR camera. The purpose of the Get Wet Assignment was to familiarize ourselves with our cameras and flow photography in general. Art and science often coincide and ultimately our goal was to produce a quality photo that depicts a scientific flow. I decided to view a laminar diffusion flame by burning celluloid plastic ping pong balls. The celluloid is highly flammable and burns well so I thought this would make an interesting photo.

In order to create a combustion flame, there must be a chemical reaction between a fuel chemical and an oxidizer chemical. This combustion releases heat and visible light in the form of a flame. Depending on the flow rate and when the flame was mixed, different types of flames are produced. In this case with igniting the ping pong ball, a diffusion flame was produced. A diffusion flame occurs when the fuel and the oxidizer are not premixed, but rather combine through diffusion [1]. The fuel for the ping pong ball was the celluloid plastic and the oxidizer was the oxygen provided by the surrounding air. This diffusion flame was laminar in nature, meaning it was smooth and low velocity. My image was taken as the fire was burning out producing two separate laminar diffusion flames on the left and right of the ping pong ball. This occurred due to the spherical nature of the ball and the fact that the celluloid plastic fuel was tallest towards the edges of the burned sphere.

The visualization technique used was the illumination of the flame itself. The materials used were 40 mm orange Pro-Penn 3-Star Table Tennis Balls, a long 10-inch butane lighter, a Nikon D3200 Camera, and a black table cloth. A diagram of the setup is shown in figure 1 below. A black table cloth was placed under the ping pong ball and over the box to create a black background. The image was taken outdoors under my deck to reduce the wind. As this picture was taken at night, the only lighting was the illumination from the flame itself. My girlfriend Aria helped me produce this image by lighting the ping pong ball on fire using the butane lighter, as I manually focused and captured images.

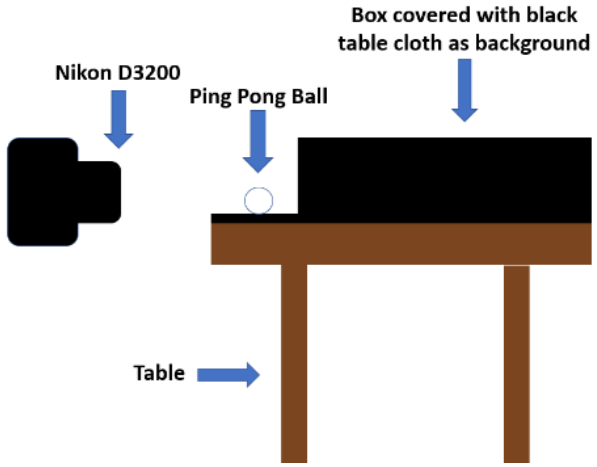

Figure 1: Side-view of the setup

I used a digital DSLR Nikon D3200 camera with an AF-S Nikkor lens. The focal length of the lens was 35mm and the maximum aperture of the lens is 1:1.8G. The distance from the object to the lens was roughly 6 inches and the object was 1.57 inches tall. The original image had a width of 6016 pixels and a height of 4000 pixels compared to the final image with a width of 3350 pixels and a height of 3267 pixels. The exposure specs are as follows: F-stop – f/8, exposure – 1/15 sec., ISO – 200, max aperture – 1.6, metering mode – center weighted average, and flash mode – no flash. I took over 50 photos using manual focus from multiple angles, before deciding on my image. 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. I feel as if the editing highlights the flow better and puts the focus solely on the object. The editing enhances the image making it more balanced and visually appealing without altering the scientific details of the image.

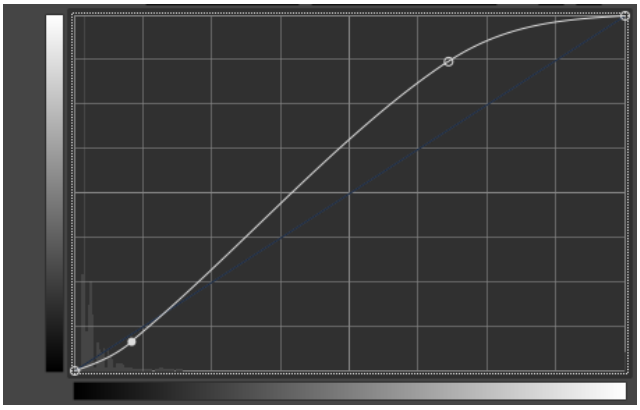

Figure 2: Adjusted color curve in GIMP 2.10

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

This image of a ping pong ball on fire reveals the flow of a laminar diffusion flame. It resembles a falling meteor, which creates a larger feel to the object. I like the focus on the object I achieved by using a black cloth background, but I was hoping to capture a clear image of a larger flame. The fluid physics are shown well as the flame is smooth in nature and the color gradient can be scene throughout the flame. I believe I fulfilled my image intent but would like to improve my manual focus and exposure setting skills.

Works Cited

[1] Williams, A. “FLAMES.” THERMOPEDIA, Thermopedia, 14 Feb. 2011, http://www.thermopedia.com/content/766/.