Team Image Report #1

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Film 4200
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Fig 1: Final, Edited Flame Image

Introduction:

The purpose of this assignment was to work with a group to create an image which both artistically displays a fluid flow visualization, and highlights the physics behind the flow. My group consisted of Cameron Misegadis, Danielle Metzner, Kyle Thatcher, and myself. Together, we decided to photograph flames and their reflections in an effort to capture a unique and artistic perspective of fire. With the use of special salts, we hoped to add a spectrum of colors to the fire in order to create something truly surreal and beautiful.

Setup and Procedures:

Required Materials:

- Isopropyl alcohol (16+ oz)
- Water (+ container for transporting)
- Mystical Fire packets
- Long nosed lighter
- Fire extinguisher

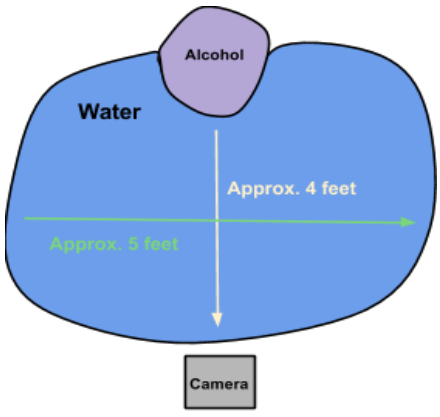

Fig. 2: Experiment Setup Diagram

We set up on a concrete slab outside, which was away from any plants, doors, or other flammable/potentially hazardous areas. The experiment took place at night, in order to provide a purely black background. While the black background is not necessary for the experiment, it helps to bring out detail in the flames, allow the flames to boldly pop in the images, and create a surreal, disillusioning effect.

Water was transported to our area and poured in a large area over the concrete. The puddle had a diameter of approximately five feet. A small area at the edge of the circle was kept dry; this is where we poured the alcohol (see Figure 2). While three group members were gathered around with cameras, the fourth lit

the alcohol, fire extinguisher on hand.

For some photos, Mystical Fire color changing packets were used. These packets contain powder with flame colorants, such as copper (which turns the flame blue-green), barium (which turns the flame light green), and calcium (which turns the flame red). As these materials are heated by the fire and burned, the electrons of each specific element intakes the heat energy. When the electrons release this energy, it produces light. Since each element contains unique electron energy levels, different elements will often give off differently colored lights when burned. Unfortunately, the Mystical Fire packets only managed to tint the bottom of the flames briefly, but did not color the entire fire or color the flames very intensely (see Figures 3 and 4). This was likely because we did not use an entire packet all at once, and therefore probably lacked an adequate amount of powder to significantly change the color. Also, the Mystical Fire instructions state that they are only to be used on wood burning stoves; since we used isopropyl alcohol for fuel, it is possible that either the temperature of the fire was too different from that of a wood, and/or that the alcohol was absorbed by the powder and dampened it, causing it to react slightly differently.

Fig. 3: Flame after addition of Mystical Fire packet

Photographic Details:

For my image, I used a Canon Rebel XS 10.1 MP DSLR camera with an image--stabilizing, EF--S 18--55mm standard/wide angle zoom lens (aperture range of f/3.5--5.6). Because of the low lighting, the f-stop was set to 4.5, while the shutter speed was set to 1/500th of a second in order to crisply capture the quickly moving flame. Since fire burns very brightly, I set my ISO to 400 to avoid overexposing the flame, while keeping the contrast high and avoiding excess film grain. Because the fire was constantly moving, it was very difficult to manually focus; therefore, I actually had better success with setting the camera to autofocus for these photos. My white balance was set to “shade”, as this option was the most similar setting to nighttime that I could choose from.

The photo was taken in the darkness of a cloudy night, without any additional lighting. However, since we set up near a building, there was a small amount of fluorescent light coming in from the window and glass door closest to our area. Though, this light was dim enough so that it did not visibly affect the photos. Our cameras were set up at the edge of the puddle on the end directly across from the fire. In order to capture a reflection of the flame in the puddle which was of equal size and proportions to the actual flame, the cameras were leveled on a parallel plane approximately two inches above the ground.

My photo was only lightly edited in Photoshop. Though the background was already pure black, I increased the contrast slightly to sharpen some of the details in the flame, and to reduce the size of the visible

portion of dimly lit ground on either side of the fire. In order to create a more unique flame picture which would stand out amongst the others from my group, I desaturated the photo almost completely to grayscale, but left just enough color so that a blue tint would hint through. By leaving this small amount of blueish saturation, the image did not appear flattened or one-dimensional, as color photos which are digitally converted to grayscale often do. My image was also straightened slightly in order to make the streak of the flame and its reflection parallel with the side edges of the photo.

Conclusion:

While the experiment was neither as complex or controlled as I had originally wanted, I am extremely satisfied with my image. I am amazed at how crisply the reflection of the flame appears in the water, and at the beautiful shapes and flows created by the fire. Since flames move extremely quickly and unpredictably, I had initially feared that my images would include a large amount of motion blur, or would look like time-lapses. However, since the flame burned brightly enough for me to use a relatively quick shutter speed, I was pleased to discover how sharply focused the edges of the flame were captured against the pitch black background. Considering the amazingly intense saturation that my unedited images naturally had, I was hesitant to adjust the colors too drastically, at first. However, the blueish desaturation of the image did not cause loss of detail and boldness of the impact of the photo, as I had feared. Instead, I feel that the grayscale actually adds a ghostly quality to the flame, which I found to be both eerily beautiful and unique.

I feel that my photo captures the erratic, but smooth flow of the fire quite wonderfully. Additionally, the ripples from where the burning alcohol meets the water perfectly display the effects of the thermal draft from the extremely hot, high energy flame upon the resting water. I do, however, wish that the Mystical Fire packets had worked properly in creating a dramatically multicolored flame. Unfortunately, if the dullness of color was caused by the way in which the alcohol saturated the powder, I do not see a way of avoiding this for future experiments. Perhaps, in the future, I could find or create a liquid substance to add to the alcohol which would color the flame without extinguishing it. In the future, I would also like to perform an experiment which was more easily controlled, and which features much more complex fluid dynamics. However, all things considered, I am quite impressed with all of the photos produced by my team in this experiment, and despite the disappointment from the Mystical Fire, I would consider this a very successful project.