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Project: Team First
ATLS 4151-001
October 10th, 2018

The purpose of this assignment was to collaboratively work on one or multiple projects under the same theme, and my group chose the theme of vapor. Initially I wanted to take photos and videos of vortex rings, as the phenomenon is simply fascinating to me. However, after spending about an hour attempting to capture vortex rings on camera, I was having difficulty with getting enough clarity in the images to produce satisfactory work, both in the creating art as well as being able to see physics in the image. Thus, I decided to improvise and conducted the experiment that became my video. I had previously seen people pour vapor from a glass onto a table which produces a smooth, fog-like flow. However, I was interested in seeing what would happen if I poured vapor onto an object where it produce a less uniform flow, allowing for more detail in the image. Although I did not know what specific phenomena would appear in the image, I got lucky and got some interesting physical flows that occurred.

The flow apparatus was quite simple. All that I did was use the JUUL to produce vapor with my mouth, poured the vapor from my mouth into a cup, and poured the vapor from the cup onto a Nikon 70-200 mm lens. The intent with pouring the vapor from the cup was to stabilize the vapour so as to concentrate the area that the smoke would fall more easily. After the vapor left the cup, the air pressure around the vapor would change due to Boyle's law, causing the vapor to expand while it is dropped from the cup. There were some unexpected physical phenomena that emerged when the experiment was conducted. For one, at several points in the video, but notably from seconds 3-12, vorticity occurs when two sections of the air mass are moving in opposite directions, causing a vortex to form around an axis. I have no way of measuring the velocity of particles at different radii around the vortices that formed, but most of the vortices appear from the footage to be irrotational vortices, which are vortices that differ in velocity as the radius gets bigger (Wiki 2018). There is also a laminar-esque jet impinging on the nikon lens at about 16 seconds into the video, showing the nature of the normal force between the air mass and the surface (Sydeny 2005).

The setup for the shot was created to try to give focus to the vapor, while providing a hue spectrum within it. I conducted the shot in my laundry room with the door closed in order to reduce any air instabilities/interference. The backdrop was created by duct-taping a black blanket to a wall and draping it over a box for the object of focus to lie on. A color changeable LED (set to a purple/pink) was placed such that the beams were about adjacent to the backdrop and the camera was placed roughly 60 degrees from that plane. Conducting the shot was simple: I would trap about two mouthfuls of the vapor in a small glass with my hand, stand behind the camera, and pour the vapor roughly a foot above the lens such that the vapor fell adjacent to the top of the lens.

I used a Nikon d3400 for this shot, which is of the DSLR variety. The camera was only about a foot away from the lens in the shot. The lens that was used to shoot was a Nikon

18-35mm lens and it was zoomed only about 20mm. The video was taken at 1080p at 60 fps. After the video, a slight filter was applied in imovie to saturate the colors more.

The shot has quite a bit of interesting vapor physics, with vortices popping up to and fro, as well as some jets impinging on the camera lens. However, the physics that occurred were in such a loosely controlled environment that I have found it difficult to accurately describe some of the physics in the image. I would have liked to have a more specific physical phenomena to focus on such as a vortex ring because the sporadic nature of the vapor necessitated more complex of a description than my current physics background can provide. Nevertheless, I was happy with the clarity of the video and how the lighting was effective in providing color to the image.

Works Cited

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