



Vapor Plume being Generated by Force Through a Drinking Straw

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Team First Assignment
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The first assignment that our team decided to explore was using vapor to capture various different phenomena. Water vapor has become increasingly more common in every day life with the relatively new fad of “vaping.” There are countless YouTube videos of individuals creating extraordinary flows using vape; unfortunately, my friends and I are not that talented. Fortunately, vapor can generate very interesting flows in even the simplest experiments. I assumed that blowing this vapor through a small opening would generate a very interesting effect, luckily, I was able to capture some of this in a few tries.

The experimental setup can be seen in Figure 1. The background for this image was a black mini-refrigerator. This background was chosen because it provided a clean, matte-black plane that would contrast the white smoke being blown through the straw. I made a point to really provide a nice, bare background in response to the critiques I received on my “Get Wet”

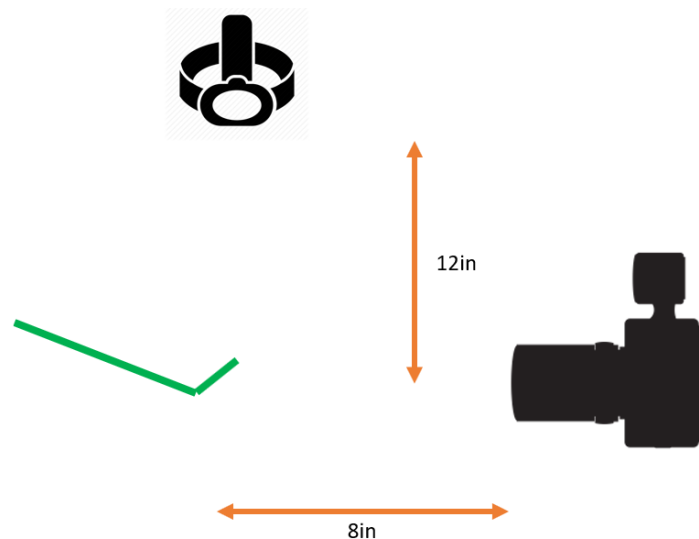


Figure 1: Experimental Setup

assignment. I chose to utilize a bright green straw to bring some color and life into the image. I felt that because this image would primarily be a black and white contrast, the addition of a bright green straw would provide a very nice color change within the image. Green was chosen mainly because it is my favorite color, the color would not have impacted the overall outcome of the image.

In contrast to my Get Wet assignment, this experiment required much less precision and was much easier to accomplish. The camera that was used to take this photograph was a Canon EOS Rebel T6. This experiment did not require extremely quick shutter speed; thus, the shutter speed was set to a moderate 1/25s. Because this shoot was conducted inside, direct sunlight was not an option. To effectively light the vapor plume, I utilized a Black Diamond hiking headlamp. This was positioned above the smoke plume as seen in Figure 1. The ISO was increased to 800 to obtain a bright, but still sharp image. The camera settings used were as follows:

Photo Dimensions	5184 x 3456 Pixels
ISO Speed	ISO - 800
F-Stop	f / 5
Exposure Time	1 / 25 sec
Flash Mode	No Flash
Focal Length	43 mm

Table 1: Camera Settings

I was extremely pleased with the outcome of the raw image; however, I knew that I could really make the colors pop with some post-processing. I preformed my post-capture editing through Gimp. Figure 2 shows the progression through the editing process. As seen in the raw image, the green color of the straw was slightly harsh which prompted me to play with the color curves. Additionally, the background was not 100% black which prompted me to darken the lower end pixels and bring out the lighter colored ones. Finally, the image was cropped to focus on more of the subject of the picture. To generate the final image, a simple color correction curve was utilized to create a much more mellow image.

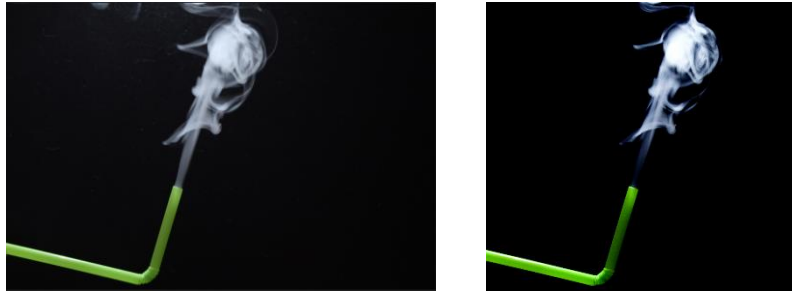


Figure 2: Image progression after editing. Raw file is shown on the left, final edited photo on the right.

Note that in Figure 2, the raw file contains some distracting smoke towards the top of the photograph. Using the clone and heal tool in Gimp I was able to remove many of these distracting smoke elements and create an image that is extremely pleasing to the eyes.

With help from Professor Hertzberg, we were able to identify some very unique physics within this image related to smoke and vapor. As the smoke begins to leave the straw it begins to form what is known as a “starting-jet.” This phenomenon is responsible for the generation of the mushroom formed towards the top right of the image. Starting jets are very visually pleasing and are not easy to capture in a still camera setting. Luckily, I was able to time this image just right to provide a great display of this unique fluid mechanic. Additionally, it is also interesting to note the role that buoyancy plays in this image. Obviously, the vapor is blown out of the straw at high velocity causing the vapor to move upwards in the image. As the starting jet begins to curl over some of the vapor, the velocity decreasing allowing gravity to take over and cause the smoke to fall.