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# 2026 Team Second Report

I took this picture for our Team Second for Flow Visualization. The goal of this assignment was like our past assignments and was to continue exploring and learning about the world of visualizing flow phenomena. The intent of this image was to demonstrate individual water droplets coming from a hose with clear resolution. The picture was taken by spraying the hose on the shower setting at around a 15-degree angle from the vertical to create an arc.



Figure 1: Original Unedited Team Second Image.



Figure 2: Final edit of Team Second image.

The setup for the image was very simple as I only had a hose with a shower setting nozzle. This setting allowed for the most individual droplets which I think made for the most interesting image. I was able to hold the hose with one hand and take the picture with the other hand, and I was just using the trees in my backyard as my background, which are not too distracting. Here the only forces on the flow are gravity and some surface tension forces wherever the droplets are interacting with each other. The spatial resolution of this image is moderate, as each droplet is clear, but when zooming in some clarity is lost. The temporal resolution is better, as I was able to use a very fast shutter speed to completely stop each water drop in motion.

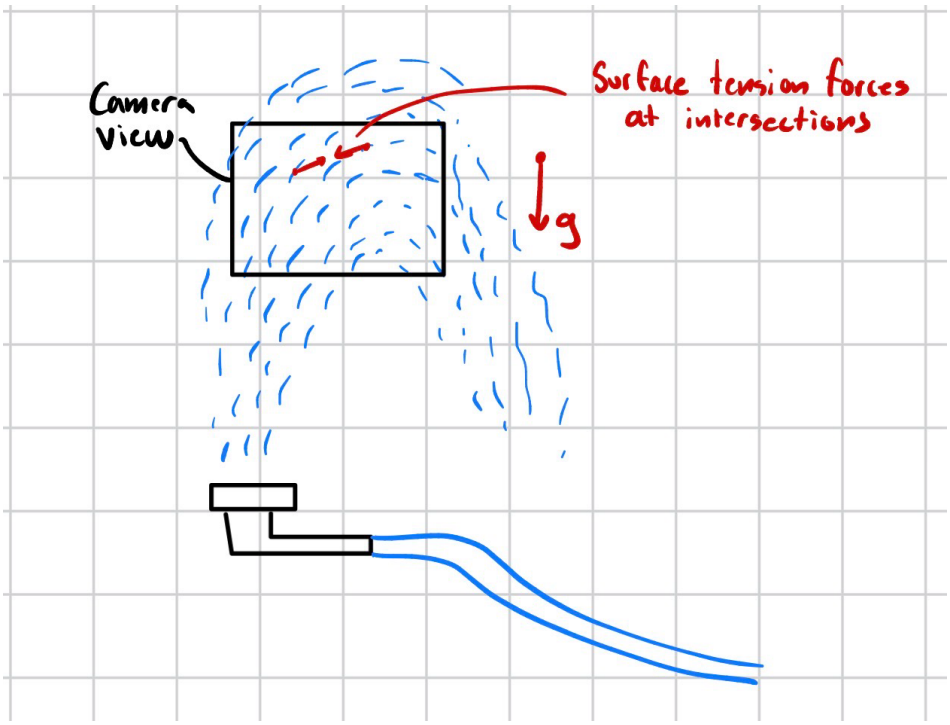



Figure 3: Sketch of flow setup.

For this analysis I chose to calculate the capillary number which describes how much external forces will cause a droplet to deform from its original spherical shape [1]. A capillary number is defined by

$$Ca = \frac{\mu \boldsymbol{V}}{\sigma}$$

where $\mu$ is the dynamic viscosity, **V** is the characteristic velocity, and $\sigma$ is the surface tension. I found the characteristic velocity of the water to be about two meters per second, and water has a dynamic viscosity of 0.001 Pa*s, and a surface tension coefficient of 0.072 N/m [2]. Plugging in these values we get

$$Ca = \frac{0.001\ Pas * 2\frac{m}{s}}{0.072\frac{N}{m}} = 0.0277$$

A capillary number of less than one is indicative of a droplet that is not much affected by external forces and thus remains very spherical in shape, which is supported by the image which shows many perfectly round water droplets.

To take this picture I held the hose with my left hand and the camera with my right hand and was able to take the picture easily. It was a sunny day which made the lighting good for the water. The lighting was very bright, and it made for some interesting effects with the water. The

camera was held around 6-10 inches from the waterfall in the shoot, which was enough to keep the droplets in focus clearly, and the background non distracting.

This image was taken on a DLSR Canon EOS Rebel T2i. The picture was taken with a 55-millimeter focal length lens, with an aperture of f5.6, a shutter speed of 1/4000, and an ISO2000. The original image was 5184x3454 pixels, and the edited final image was also 5184x3454 pixels as I did not need to crop this image at all. I thought the framing of the original image was good as it was, so all I changed in post processing was the contrast, and colors to bring out the details and increase the clarity.

I think this image reveals water droplets in a very interesting way, and I think that the reflection of the light and the rainbow effects are very appealing. I like the colors the most about this picture, because they work well with the background. I think the fluid physics are shown well and overall was a very fun project. To develop this idea further I think it would be good to get an even faster shutter speed, or to find a better zoom lens so that I can get even closer into the shot to really bring out the details of each droplet.

References:

[1] Wikipedia (2025) https://en.wikipedia.org/wiki/Capillary_number

[2] The Engineering Toolbox (2004) https://www.engineeringtoolbox.com/water-surface-tension-d_597.html#gsc.tab=0