Saliva Fluid Phenomenon

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Flow Visualization, Team Image #3

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The goal of this flow visualization was to capture the effects of surface tension on saliva. This is not intended to be disgusting; rather I am quite impressed at how this fluid behaves. This image was taken as part of the Flow Visualization course at the University of Colorado at Boulder.

In this image, the saliva is hanging from my mouth. The camera was mounted on a tripod and faced perpendicular to the flow. The fluid seen in the image is between 3 and 4 inches in length. The background is a green poster board which was resting vertically on a chair.

So what's going on? There are two forces primarily responsible for the condition of the fluid shown in this image. The first is gravity, which causes the fluid to thin as it falls. The second force, which keeps the flow from separating, is surface tension. The viscosity of this fluid allows it to thin out into a narrow string without breaking. The large drop at the bottom is the result of inertia in the fluid as it falls. Fluid is still falling due to gravity but it is pooling up at the bottom of the string in the droplet seen. Figure 1 shows a free body diagram of the fluid.

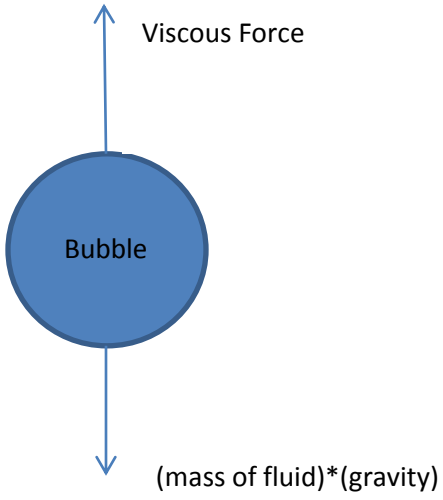

Figure 1: Force Diagram

The following photographic settings were used on a Canon EOS Digital Rebel XS (Lens EF-S 18-55 mm 1:3.5-5.6 IS):

- Flash
- Shooting Mode: Auto
- Distance from lens to object: 50 mm
- Focal length: 20 mm
- Original image dimensions: 3888 X 2592 pixels
- Cropped image dimensions: 210 X 966 pixels
- Exposure: 1/60 sec.

- Aperture: f/4
- ISO: 400
- White balance: Auto

The image was cropped and the green contrast was increased to create the dark green background. The original image is shown in Figure 2 below.

Figure 2: Unedited Image

This image is a great example of the interesting fluid dynamics that are present in so many parts of our life. I am disappointed that I was unable to capture a more focused image but I like the photo overall. More than anything I am impressed that the droplet does not separate given the large droplet diameter to string diameter ratio.

References

Inside NOVA, *Fluid dynamics at your fingertips*

http://www.pbs.org/wgbh/nova/insidenova/2010/06/fluid-dynamics-at-your-fingertips.html