Daniel Allen
Flow Visualization
Team Assignment #2
Bubbles
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In Collaboration With:
Anna Gilgur
Jeremy Parsons
Jonathan Fritts

The initial intent of this image was to capture the beauty in the randomness of large bubbles. In collaboration with Anna Gilgur, Jeremy Parsons, and Jonathan Fritts several hours were spent creating large bubbles. After the image capture process was completed it was realized that the images captured were more interesting than originally intended or believed to be. Some captured images included reflections and inversions of background scenery, some images highlighted detailed the color spectrum and some images, like the one discussed in this report, captured a bubble in the middle of "popping."

Standard bubble solution, available at any grocery, craft, or large drug store, was utilized for this experiment. In addition, a small bottle of glycerin (approximately eight fluid ounces) was mixed in with the existing bubble solution. The purpose of adding glycerin to the original bubble solution was to make the bubbles stronger and more resistant to the natural environment such as wind and air impurities by increasing the surface tension[1]. Interestingly, the bubble captured was bursting from the left hand side. This means that at this location, the bubble wall was thinnest and therefore weakest at this point[2].

This photograph was taken on March 15th on a large field with a slight breeze present. In figure 1, the experimental set up is shown. String was tied between two wooden rods to create a closed triangle that the bubble could be blow out of by the user/wind. The camera was held freehand and due to the fast moving nature of the bubbles and small time window before they burst, the camera was set on autofocus. Using autofocus allowed for multiple pictures to be taken throughout the life of the bubble. When the camera was used in fully manual mode, one or fewer images could be captured due to the complexity of following an opaque object that was on the move with only a short lifespan. The image taken, shown in figures 2 and 3, was shot from the ground looking up. In the image, the blue liquid falling off the bottom of the bubble is blue food coloring that was added to the bubble solution. It did not appear that the food coloring, in

Figure 1: Experimental Setup

the quantity added, had any effect on the bubbles produced other than the blue droplets represented.

The image was captured using a Canon EOS Digital Rebel T3 with a 33mm focal length and no filter installed. The image was shot at a shutter speed of 1/200s with an aperture of f/11 at an ISO of 100 with no flash utilized. The original image was 4272 x 2848 with the final image being cropped to 2706 x 2343. The original image was processed in Photoshop by increasing the overall brightness and contrast of the image in order to really bring out the color spectrum visible in the bubble and the vibrancy of the bubble itself. Additionally the darkness of the buildings in the background was increased to remove distraction from the focus on the bubble. The camera used saves image files with a .jpg extension and the edited image was saved as a .tif to avoid further compression. The before and after images can be seen below in figures 2 and 3 respectively.

Figure 2: Original Image

Figure 3: Final Image

In hindsight it would have been advantageous to capture this image with only the sky in the background, ie from below the bubble facing upwards. The buildings can be a little distracting and the sky provides a beautiful and natural background to this captured phenomenon.

References

1. "Blow the Best Bubbles: Scientific American." *Blow the Best Bubbles: Scientific American*. Scientific American, 1 Dec. 2011. Web. 1 Apr. 2013. <http://www.scientificamerican.com/article.cfm?id=bring-science-home-best-bubbles>.
2. "Bubbles." *Bubbles*. University of Miami, n.d. Web. 1 Apr. 2013. <http://www.education.miami.edu/ep/bubbles/Bubbles/bubbles.html>.