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Flow Vis

## Project #1: Get Wet

The purpose of my image was to capture the effects of a water drop interacting with a body of water. My intent was to capture one of the phenomena that a water drop creates when hitting a fluid surface such as the “Crown of Thorns” or the “Worthington Jet” made famous by A. M. Worthington and Harold Edgerton.

The apparatus used to create the desired picture was a large straw dropping water into a 4”x6”x1” dish from a height of 8-12”. The drop of water falls to the liquid water interface and creates a small cavity in the water due to its kinetic energy and inertial effects. The water is displaced and forms a “crown” of water for a short amount of time. This was termed the “Crown of Thorns”. Due to the instability of the water cavity, water is forced back into the cavity from all sides at the same time eventually colliding with itself and forming a small jet vertically into the air. This phenomenon has been termed the “Worthington Jet”. The jet in the picture is approximately 2 inches high off the surface. The water drop was from a straw with a diameter approximately 3/8 of an inch. Because of this and the relatively small drop height, the Reynolds number is fairly small with most of the fluid movement in the laminar region. As seen in the picture, the effects of surface tension are noticeable between the jet and the water surface.

The technique used for creating this picture revolves around light. To get the most light onto the area of focus, I set up my apparatus on a sunny day and then placed a mirror to reflect sunlight onto the water dish. This helped get rid of residual shadows and also increased the amount of light onto the viewing area. The water was dyed with a few drops of red dye. This gave me a more opaque object to take a picture of rather than just clear water. The dish itself was white which produced a vibrant red color in combination with the red water.

The photograph was shot on a Canon Digital Rebel XT. The field of view is fairly small, approximately 2-3 inches. The settings were as follows:

Lens: Canon 18-55@55 Zoom lens  
-- Promaster +4 and +1 close up filter  
-- Promaster UV filter

Aperture: f/8

Shutter Speed: 1/1000 sec

ISO 400

The stock picture was shot with RAW format at 2304x3456 pixels (8.0MP); 240 ppi. Photoshop processing on the image entailed cropping, temperature adjustment, and also a grayscale conversion for one of the photos.

The image does a fairly good job of revealing the physics behind a water droplet hitting a pool of water. The image also shows the bending of light through the water/air interface. This image also is a good representation of surface tension effects on a water/air interface at low Reynolds numbers. For the picture itself, I enjoy the vibrant mix of colors between the blue, red and the orange reflections off the bottom of the dish. The B/W photo showcases the fluidity of the surface of the water while undermining the underwater reflections. While producing this image, I had a very hard battle between shutter speed and aperture. Without a stationary apparatus, I could not produce a drop that was consistently in focus, and when it was, of good form, only half of the drop would be in focus. The picture is fairly blurry at high resolutions. If I were to do this again I would try and have a smaller aperture to get a greater field of view. To develop this fluid concept I could change the size of my droplet and also how high I dropped it from to see if had any effect on the way the jet is formed.