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Flow Visualization
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Group Project 2

For our second group project, Group Beta had a number of ideas in mind, paired with a number of failed attempts. Our first idea was to attach a solid wooden cylinder to a drill, then put paint on it and spin it quickly in a fish tank of water to visualize what happens to the paint as it spins off the cylinder in water. Though the physics could be seen, it was next to impossible with our resources to get a useable photo due to the speed of the flow. We also experimented with a vortex visualized in a wine glass using water, a black light, and highlighter ink. This too proved to be somewhat difficult to capture because the ink dispersed and mixed in with the water very quickly. In the end, we worked with the open channel flume ITLL, and using food coloring and various shapes of blocks, created a visualization of flow past bluff bodies. My photo came by chance as we worked in between shapes by draining and then refilling the flume.

The open channel flume we used looked something like this for my photo:

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

The flume allowed us to regulate the speed, amount of water, and direction (to some extent) of the flow. We filled the channeled with water from left to right through

the flume, then blocked off the flow, capturing the water inside the main glass area. We then sent a wave of water backwards. My image was taken when the flow under the triangle was faster than on top.

To visualize the flow of the water around the block shapes (cylinder and triangle), we injected food dye of various colors mixed with water (to dilute it) approximately 2 inches from the block. The dye would then go with the flowing water over and around the block. For lighting, we over lit and backlit the shape using household, 60 watt bulbs, approximately 4 inches away. No flash was used, as it reflected off the glass of the flume. It was important to have a lot of light, as the flow was so fast we needed a fast shutter speed to capture the flow.

This photo was taken with a Canon EOS Digital Rebel with an 18-300 telephoto lens. The shutter speed was $1/320^{\text{h}}$ of a second (0.003125 seconds) as to capture as fast as possible the quick flow of the dye and water, at an aperture of f13. The focal length was 92 mm and the ISO was 400. In Photoshop, I raised the contrast and then used the healing brush to take out distracting water droplets that were on the flume. The final image is 2048 x 1360 pixels.

This image reveals the speed of flow and how it reacts when a bluff body is imposed on it. The fluid physics shows that though the speed of the water is the same both left and right of the triangle, the speed of flow on top and bottom are different (the bottom flow is faster, which is why more water is going under the triangle than over). I like the image, because though it isn't what I originally intended to visualize, it's something unique and interesting. It would be interesting to try this with other objects, speeds of water, and liquids in the flume.