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MCEN 5228
Group 1 – The Big Blue Wake

Experiment and see what comes about, that was what the intent of this project and the use of the flume apparatus. Our team experimented with several flow rates, water heights and obstacle combinations to produce a wide variety of flow phenomena within the flume. Through this experimentation we captured several images of intriguing flow phenomena using the flume. *The Big Blue Wake* was one example of what was viewed. It captures a wake reflecting off the boundary walls downstream of the obstacle.



The Big Blue Wake shows a wake that was created from the water hitting an obstacle upstream that then fell over a block as a small waterfall and continued to flow down the length of the flume. The wake created was reflected off the boundary walls during the duration of the flume, only clearly showing one of the wakes that were created because the second was of a much lower magnitude. This effect was accomplished by keeping the obstacle at an off angle rather than 90 degrees to avoid symmetry. Lord Kelvin showed that the wake behind an object the waves propagate at an angle of 35.16 degrees open to the direction that the object is moving in the water. This holds true with the wake captured in this image! The remaining details of the flume are that the water had traveled approximately 5' after the waterfall. The waterfall had a height of 2". The flow was turbulent for the entire duration of the flow after the waterfall, and because of this the Reynolds number was not calculated/estimated. The width of the channel was approximately 3".



To observe this phenomenon, the key set up was the object located upstream. No special lighting was used or any dye or place markers. The water was cycled through at a relatively high flow rate for the flume and the image was taken from as far downstream as possible. The lighting consisted of the ambient fluorescent lighting in the basement of the Integrated Teaching and Learning Labs at CU-Boulder.

The member of our group that took this picture did so using a Sony DSLRA100 camera. The image size was 2592x3872 pixels at 72 dpi. The image exposure time was set at 1/40 and an FNumber of 56/10. The depth of field was small, about 1 foot, hence the blurring upstream and towards the end of the flow. The ISO setting was 400. After Photoshop editing was done, the image size was cropped down to 2592x3632 pixels. A few gradient layers were added to the sides of the image and the blue was turned up as to highlight the water. Reflections were still visible through the gradient layers along the lower side walls.

This image captures the effects of a wake in between two boundary walls. This image was liked for as many reasons as there were to improve on it. The symmetry was a

beautiful part of this image but it would have been more appealing if the image had a larger depth of field. Regardless I think that the colors would have to be enhanced in any future shot due to the dull colors with in the flume. But all in all it was considered a success. All members of the group were exposed to something new that we had not seen before.

References:

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