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Go With The Flow
South Boulder Creek

For the final group project, I decided to work separately from the group to search for a natural phenomenon. As a kayaker, I know there are river features called "holes" (which are areas of subduction) that I wanted to capture. While I found several the images wouldn't take well. I finally had to adjust the ISO in order to aptly capture the movement of the water. I found more pour overs (a similar feature, like a small waterfall) than holes and took several photos of those as well.

For this picture, there is no apparatus. I just wandered up South Boulder Creek on a sunny day, looking for the right feature. In the creek, there are manmade playholes, for kayakers. These are made by adding large rocks for the water to flow over. As the water carries its momentum over the rocks, it creates a vacuum directly behind them. The vacuum is backfilled by the water not coming directly from the rocks, as well as from around the edges of the rocks. This creates a cyclic filling effect, as the vacuum becomes full, it flushes out extra water then absorbs more. The cycle depends on several features; velocity gradient of the water, size of the rocks, shape of the rocks, shape of the shore bed, among others. The shape of the rock is critical, the more smooth and spherical it is, the stronger the vacuum and thus the stronger the backfill. By walking off approximately 10 feet then timing how long it took to float a tennis ball (a somewhat widely used practice by the US Forest Service) I estimated the surface flow. Using less distance would provide more accurate results, but would also be harder to accurately take. I took the surface flow and used the formula for open channel Reynolds number:

$$Re = 4RV/\nu \qquad [1]$$

By guestamating that R, the channel width was about 8 ft, I found the Reynolds number of this stream to be 845, which is laminar flow. This is not a surprise because of the fluid appears to be smooth.

To visualize this flow, no setup was required. All I needed was a nice hole, which is environmental. The lighting is bright, natural sunlight, without flash, during the middle of the day. I stood above the stream, approximately 2 ft. aways and took a picture that was about 1.5'x2' feet. Getting an appropriate ISO to capture the motion without blurring was the hardest part.

Camera Information:

- Mark: Sony
- Model: DSC-H2
- F/Stop: f/4.5
- Shutter Speed: 10/10000 sec
- ISO Rating: 160
- Focal Length: 67.8
- Flash: Did Not Fire
- Size: 2861 x 2112 pixels

I adjusted the levels in Photoshop in order to bring out the areation in the background of the photo. I also increased yellow to bring the surface of the rock out from underneathe the water.

This image reveals the flow over a rock with moss on it. I really like the various textures. The water casts a smoothing effect over the already smooth rock, and when it comes off the point is spectactualarly untransparent. I did want to caputure the backfilling of the vacuum better, and tried to modify the blues to increase the areation to emphasize this, but was not as sucessful as I had intended. If I were to take this shot again, I may try going a little further downstream and shooting up the creek to catch the hole better, but from a creative perspective, this was much more effective.

References:

[1] http://mysite.du.edu/~etuttle/tech/opench.htm#Chan