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TEAM THIRD #3

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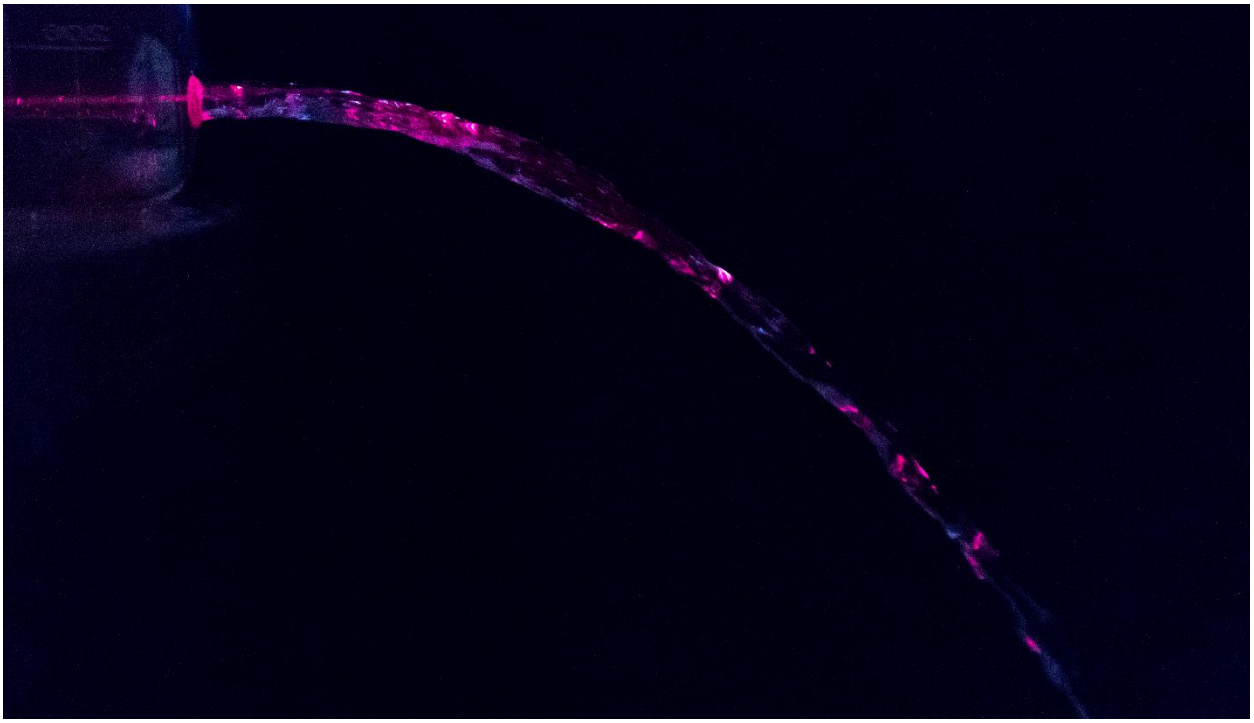
In Collaboration with Garrett Gerchar & Ivan Komodore
Flow Visualization: The Physics and Art of Fluid Flow
MCEN 4151/5151, FILM 4200



Background
Considering the first and second team photos, the drive of this experiment is to capture a snapshot that exemplifies complex flow phenomena with multiple individuals. The ability to work in collaboration with people of different mindsets allows for a more difficult setup where it is possible to capture a more elaborate photograph, just like above. After dealing with fire and chalk powder, the team had decided to lean towards something with water due to its easily observable, but intricate, movement.

Setup
The initial setup of this experiment only contains three main items: water, a clear container with a hole punctured through, and a laser pointer. To produce this photo, the team had purchased a clear Nalgene water bottle and pierced a quarter inch diameter circle about an inch about the bottom. Black electrical tape covered the hole until the start of the experiment. Once the bottle was filled up with water, the laser pointer was setup such that the light rays pass through the

hole. Pulling back the electrical tape, expels the water within the bottle and the users could observe total internal reflection within the stream.

Physical Interpretation

This led to the idea of total internal reflection. By using a laser pointer and a hole for the water to pass through, the user could witness a phenomenon at which a ray of light within a medium does a complete reflection at the boundary where the two-media meet. This occurs if the angle of incidence is larger than the critical angle. The critical is the largest angle that a light ray traveling from one medium (air) to another (water) that can hit the boundary without fully being reflected within the first medium. In most cases, total internal reflection occurs in regions between two transparent media where a ray of light of in a medium that has a higher index of refraction approaches another medium of lower index of refraction at an angle larger than the critical angle. The angle in this case, from water to air, has a critical angle of roughly 48.5 degrees. Thus when performing this experiment, the users could observe the light rays propagating within the water and being "trapped" within the radius of the water flow. The water will continue down the stream until it enters the pool and become turbulent.

Camera Settings

The camera that was used again was a Sony A6300. Multiple shots were attempted because of the difficulty to focus on the stream. The camera settings could be seen below:

Camera

Camera maker	SONY
Camera model	ILCE-6300
F-stop	f/1.4
Exposure time	1/500 sec.
ISO speed	ISO-6400
Exposure bias	0 step
Focal length	30 mm
Max aperture	0.96875
Metering mode	Pattern
Subject distance	
Flash mode	No flash, compulsory
Flash energy	
35mm focal length	45

Post Processing

As seen in the image posted below, some post-processing was done to improve the overall quality of the image. The saturation and brightness were slightly increased in order for the observers to clearly witness the reflection within the stream. The change in color was just to make the photo more visually appealing.