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Flow Visualization 2015
Team 1

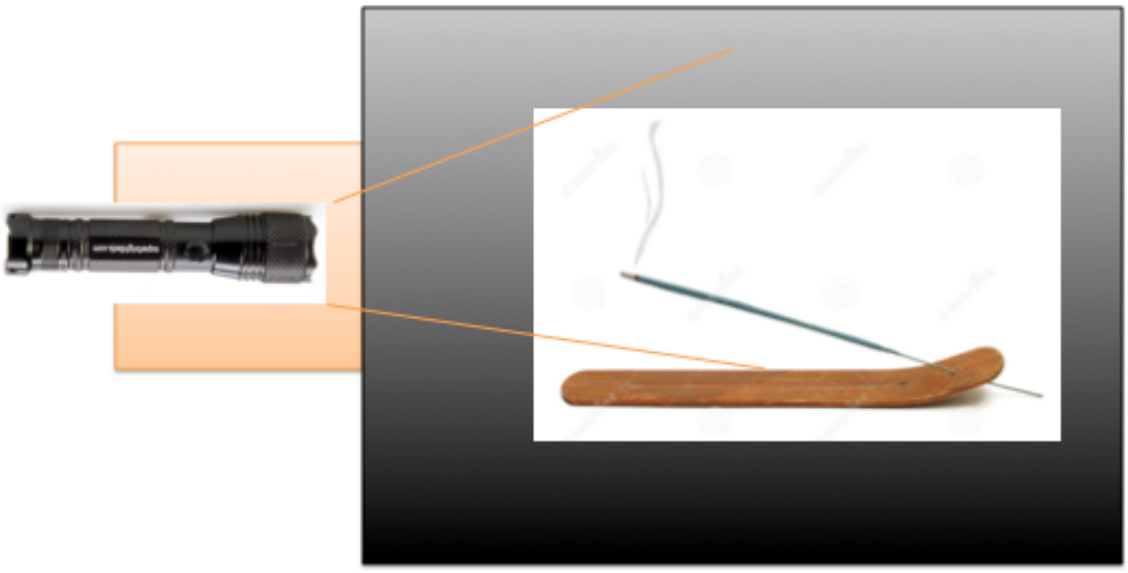
Introduction

This image was created for the Flow Visualization 2015 course, Team 2nd image. This image sought to capture the beautiful motion of incense smoke. Incense smoke creates very elegant, striking motion and curls as it rises. This image focuses on the turbulent portion of the smoke, and the amazing vortex whorls that are created.

Flow Apparatus

The correct set up and lighting is imperative in capturing a good picture of smoke. A black backdrop was used. The incense was placed in front of the backdrop. The room was dimly lit. A flashlight was used to light up the smoke. The flashlight was placed about one foot to the side of the incense stick pointing directly at the smoke. A piece of cardboard was connected to the side of the flashlight, as a blinder, to direct the light only at the smoke. This kept the light from lighting up any of the black background. A remote flash can also be used. This creates a very striking image. The background is completely black and the smoke is bright and white. Figure 1 shows a schematic of the set up used.

Figure 1



Flow Phenomenon

Incense smoke always serves as a very good visualization of laminar transitioning into turbulent flow. This image only captures the turbulent flow. However, the smoke when it initially comes of the stick is laminar. Laminar flow is characterized by smooth flow in which the two fluids, in this case air and smoke, do not mix together. During laminar flow viscous forces are greater than inertial forces. Conversely, in turbulent flow inertial forces are greater than viscous forces. Turbulent flow, where the fluid layers are being mixed macroscopically, is depicted in this image. [1] As the smoke reaches turbulence it folds over into vortex folds that are clearly visible in the image.

Photographic Technique

Below outlines the photographic specifications that were used to create this image.

Camera	Canon Rebel t5i
Lens	50mm f/1.8 II
Aperture	f/1.8
Shutter Speed	1/200
ISO	1600
Focal Length	50mm
RAW image size	5184 x 3456
Final Edit image size	3372 x 2248

I used a 50mmm f/1.8 lens. This lens allows for a very large aperture setting, which lets in a lot of light. Since the picture was being taken in a dim room, which the only source of light as a flashlight, it was necessary to use a very large aperture. The large aperture allowed for a shutter speed of 1/200, which was fast enough to freeze the flow. There was not much post-processing necessary for this image. The combination of good camera settings and a good light set up allowed for a very good raw image to be taken. The only post-processing I did was cropping, and

Below, figure 3 shows the raw unedited image, and figure 4 shows the final edited image.

Figure 3

Figure 4

Overall, I am very excited about this picture. This was a fun subject to shoot because it produced a very large, varied collection of final images. It was hard to choose my favorite. Moving forward, I think it would be interesting to have multiple incense sticks and to observe how the smoke from each interacts.

References

[1] Kothandaraman, C. P. *Basic Fluid Mechanics*. New Delhi: New Age International (P), 1999.