

# Group Project 3

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MCEN 4228: Flow Visualization

“Smoke form Ambers” is an image of the smoke leaving an amber that dropped from a fireplace onto tile below. The amber dropped close enough to the flue that the smoke was still being drawn. This image was taken after many failed attempts to photograph the effects of static electricity on streams of water and smearing. The amber fell out of the fire while the camera was still readily available and therefore a phenomenon that was only present for seconds and completely without pre-notion was able to be photographed.



The flow of the image is from the bottom left to the top right corner. The hot amber is approximately three inches below the bottom edge of the image and was cropped from the final submission. The flow is laminar in the bottom left and transitions to turbulent as it continues. This indicates a Reynolds number around the laminar to turbulent transition, approximately  $10^6$ . As the stream of smoke becomes turbulent a pair

of vortices begin to form, one very evident on the right side of the flow and another to the left that is just beginning to form. The vortices are caused by the shearing of air and smoke layers. The difference in the speed of the layers causes the inner edge of the smoke to begin to curl inward. As the curling continues the spiral shape seen in eventually formed.

The photographic equipment and settings used for producing the image are listed in Table 1. Lighting was done by ambient light coming through a window to the left of the image and the flash coming from the camera.

Table 1	
Camera	Nikon D40x
Lens	Nikkor 18-200 mm VR
Focal Length	95 mm
Shutter Speed	1/6 sec
Aperture	f/5.3
ISO	200
Resolution	1084 x 701 pixels
Field of View	15 x 12 in <sup>2</sup>

The final image was edited in Adobe Photoshop. First the image was cropped and slightly darkened. The clone stamp tool was then used to remove some spots in the background. The horizontal line running through the image is a joint in the metal making up the vents around the fireplace and an attempt was made to remove it in editing, however this proved to take away from the image, rather than simply remove distractions.

I chose to submit this image primarily because other images I attempted for this project did not turn out to my satisfaction. I would not consider this image one of my better submissions, and it would have benefited with the use of a solid black background and lighting fit for the type of image. The image does, however, give an interesting view of the beautiful flows that happen naturally in our everyday lives that most often go unnoticed. To that end, I considered leaving the image in its original form, without cropping, as it gave the image more of a sense of being real and visible in everyday life.