Getting Wet

Michael Guenther

Flow Visualization: 4151-4200-001

The image depicted below is that of the natural flow of smoke from burning incense. Its purpose is to display a baseline for future pictures, which will possibly use smoke to demonstrate different aspects and characteristics of certain phenomenon within fluid dynamics. It is important to understand the properties of the medium with which one is working, and this picture helps to demonstrate those properties within smoke.

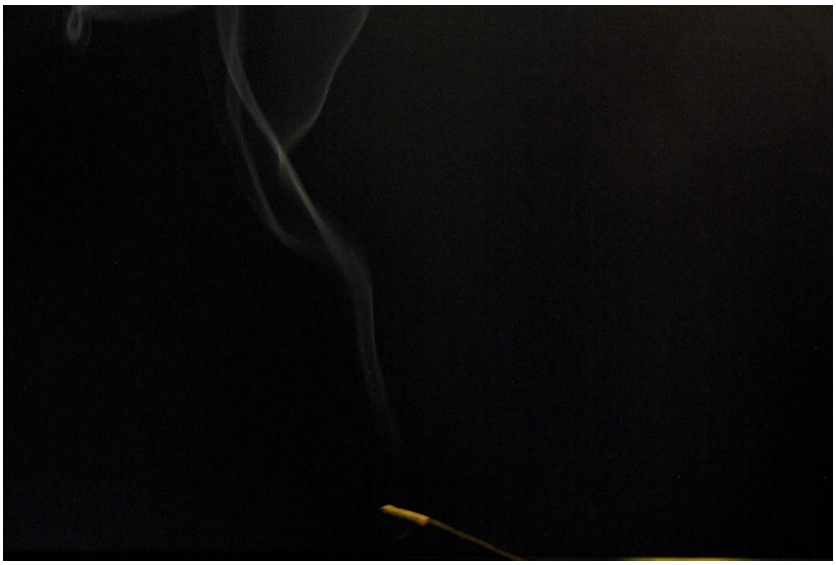

Figure 1: Original Picture

There is not a lot of information out there regarding the physical nature of smoke in stagnant air, but one possible explanation for it comes from the University of Illinois regarding cigar smoke. It is apparent that smoke at the end of a cigar is constantly being heated by the cigar making it rise. Initially the cigar smoke will behave in a laminar fashion. However, as the smoke rises its speed will increase due to buoyant forces provided by the cooler air around it. This in turn will eventually cause the smoke to take on a turbulent flow (Q & A). This principle should also apply to the smoke produced by an incense stick.

Figure 2: Supplies used in taking the picture

This picture was taken in my bedroom with a 1:2.8 16-50 mm lens on a Pentax DSLR camera, a single stick of HEM cinnamon incense and an incense holding stand that I acquired at a Hindu themed gift shop, a BIC lighter found at a gas station, and a black computer screen. I used my computer as the backdrop, elevated the incense on some books so the smoke would be completely encompassed by the backdrop, turned on a lamp on my desk so the smoke could be picked up on camera, and then lit the incense with the BIC lighter. I ensured that the air in the room was as stagnant as possible moving very little while taking the picture.

In taking this picture, I set the field of view to 50 mm one foot away from the apparatus. The focal length was set to one foot with an aperture of f5.6 and a shutter speed of 1/15. This was to ensure that a sufficient amount of detail and light was captured at the same time. Initially the picture was 3872 pixels wide and 2592 pixels high, but I it to a size of 2769 pixels wide and 2268 pixels high. In editing the rest of the picture, I adjusting the curve as shown below in Figure 3. I continued by converting the picture over to a greyscale format. After that I adjusted the brightness which can be seen in Figure 4. I eventually finished the editing by adjusting the levels which are displayed in Figure 5.

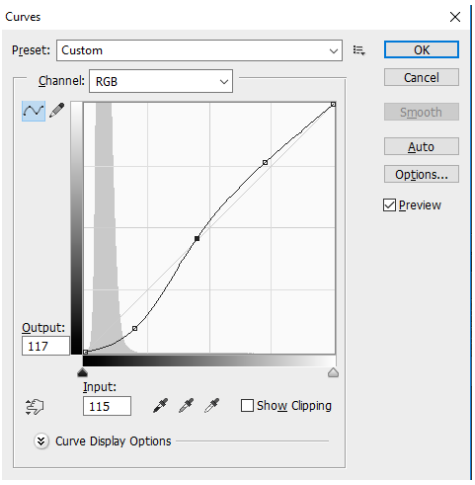

Figure 3: Adjusted Curve

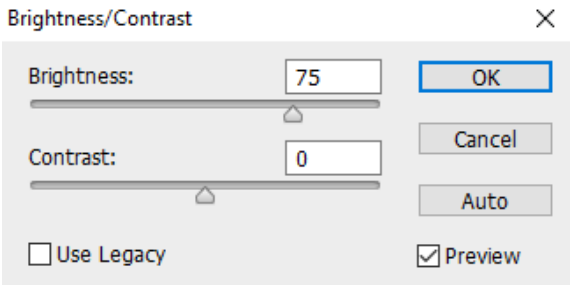

Figure 4: Adjusted Brightness

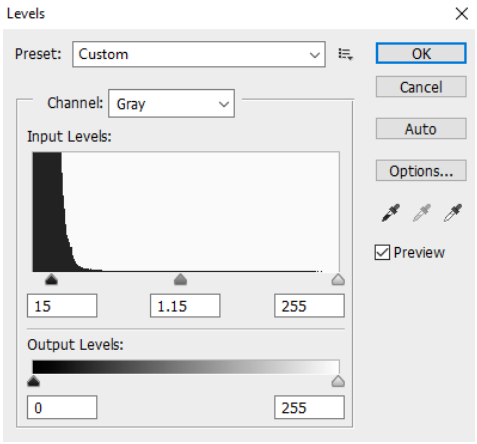

Figure 5: Adjusted Levels

The final result is an image that displays an interesting laminar flow of smoke which splits into a more turbulent stream. It is a serene picture that draws your eyes to the intersection of the laminar and turbulent flow, which is great since it is what smoke does naturally in stagnant air. I do believe it would have been nice to have a larger demonstration of this occurring with more smoke. However, adding a larger source of smoke may inherently change the nature of its flow. Either way it is something that would be interesting to examine in future pictures.

Sources:

Q & A: Cigar Smoke and Fluid Dynamics. (n.d.). Retrieved February 04, 2018, from https://van.physics.illinois.edu/qa/listing.php?id=2179