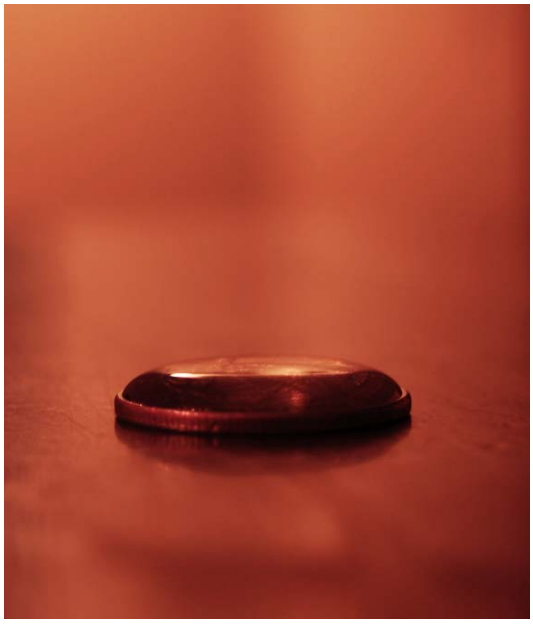
Flow Visualization: Get Wet Report

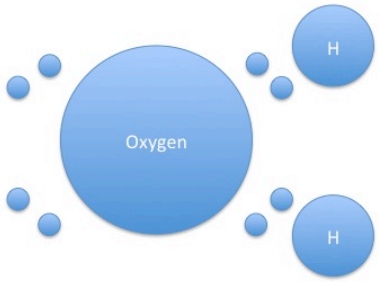


The image seen above is the final submission for the initial flow visualization assignment, *Get Wet*. Since this is the first image captured for the class, the key focus was to get the highest quality photo while demonstrating some type of fluid phenomena. In this particular case, a quarter was slowly covered in water until a surface tension bubble formed on the outer shell. The initial intent of this image was to highlight waves passing through the fluid. However, this turned out to be impossible to achieve since the surface tension was broken with any type of wave forming movement. Hence, the final image seen above was photographed to not only show off surface tension, but to also demonstrate the reflections of light that take place between the quarter and the water. The lighting presented a very difficult challenge, but after several trials, the camera was able to capture a photo demonstrating the desired phenomena.

The water and quarter were set up on a lacquered oak surface to achieve a beautiful grain structure below the quarter. Initially, light was utilized from three separate sources. However, this caused an obnoxious glare in the image that could not be ignored. It also took the attention away from the surface tension and caused one to focus on blemishes in the table. After several adjustments, only one light ended up being used and this was at a distance of 20 feet so that the picture could capture the tension and avoid any issues arising from glare. The one problem encountered with this

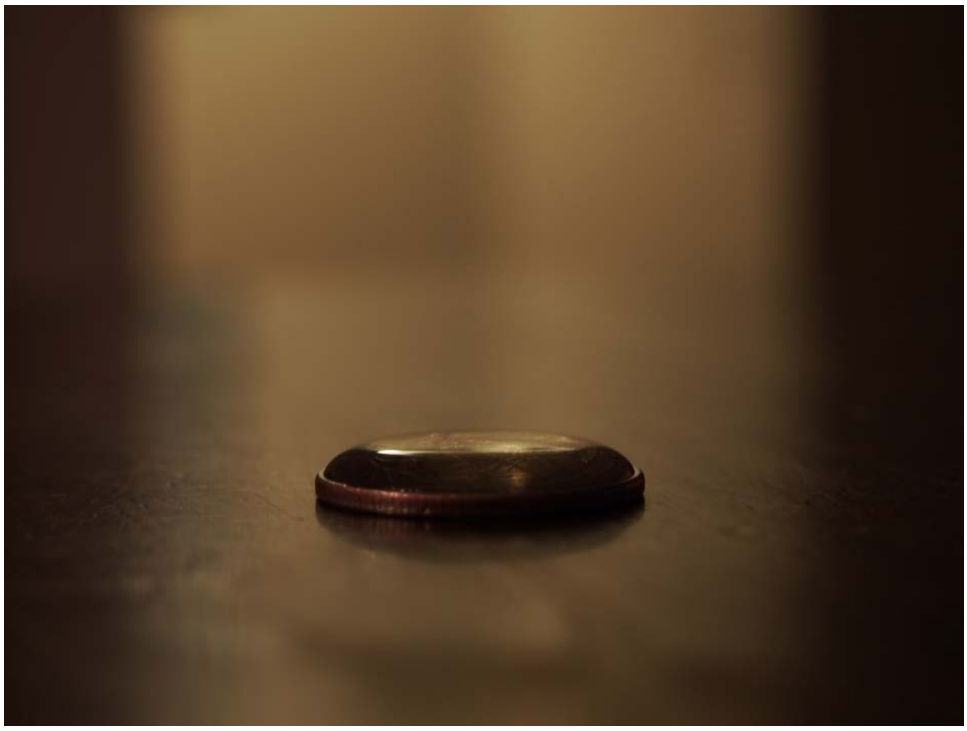
lighting scheme was the fact that the water was too dark to allow a view of the quarter's surface. However, by changing the aspect ratio in Photoshop, the water became much more transparent and visible.

Although the physics behind this phenomenon are quite basic, they still present an interesting view into polarity. Water is one of the more basic molecular structures that exist. It is composed of one oxygen atom and two hydrogen atoms. The hydrogen atoms are covalently bonded to the oxygen atom through bond sharing. However, there are still two unshared pairs of electrons that surround the opposite side of the atom. This causes a water molecule to have a partial negative charge on the side containing the unpaired electrons, and a partial positive charge near the hydrogen atoms. Thus, when lots of water molecules are combined, there will be intermolecular attractive forces between the molecules. In technical terms this is referred to as van der Waals forces, and it is the reason that surface tension happens in water. One other example that illustrates this chemistry is watching insects run across the surface of water without ever seeing them fall in.



For future attempts at recreating the image, an identical setup can be constructed without difficulty. The tricky part would be to get the proper lighting, which can be accomplished through experimentation. To get a similar image, one would need to minimize the lighting used, but if more water glare is desired, then increasing the lighting accomplishes this quite nicely. No camera flash is necessary in this scenario and using one would undoubtedly yield worse results.

The original image spanned an approximate three-inch wide by five-inch high area before being cropped to two inches by four inches. Many of the default camera capabilities were used as they provided the best focus for the image. The camera, an Olympus Pen E-PL5, was located approximately 12 inches from the quarter. A focal length of 42 mm was utilized in order to best focus on the subject of interest. Alongside the focal length, an F-number of 5.0, an exposure time of 1/20, and an ISO of 200 were selected to illustrate the best clarity of the situation. With regards to final production value, several modifications were made to the photo in order to keep the viewers eyes on the area of interest and prevent them from straying somewhere else. The original, unedited picture can be seen below with a resolution of 947x710.



In conclusion, the quarter image demonstrated surface tension in an elegant, beautiful manner. Although no wave was created in the water, the main goal of the image was met as the viewer can clearly see both the transparent elements of water as well as its obvious polarity. If this image were to be taken again, it would be recommended to use a more powerful lens and thus keep more pixels in the final picture. It would be interesting to see if the cloning tool in Photoshop could prevent unnecessary table reflections in future images. However, overall the image was a success and is pleasing to the eye.