

Get Wet Report

Zach Taylor - Oil in Milk

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I was trying to capture a cool looking image using nothing but oil and milk, the phenomenon I was looking for was merely the fact that oil floats in milk. I started by pouring milk into a tall beer glass, then lighting it from below with my phone flashlight. I then dropped olive oil into the glass. The olive oil container has a nozzle that acts more like a pipette, so I was able to get small beads of oil to appear easier than if I had used a typical olive oil bottle. I got a few shots after this but before I got one I liked, my camera's battery died, and I had to wait an hour before trying again, during which I left the milk out on the kitchen table. When I came back the oil had grouped together and discolored, and the milk had reached room temperature, which lowered its viscosity, allowing the oil to move around the surface more freely. I dropped more oil in, spun the concoction with a spoon and tried getting many pictures at different ISOs.

I spun the milk with the spoon enough that a vortex formed along the center of the glass. It is noticeable in the image that the milk towards the center has predictable and smooth flow in the shape of the vortex, while the milk towards the edges is held back by friction with the glass, and that there are more turbulent formations where these movements meet. The newer, warmer oil also moved more freely along the surface than the old oil, which was more spread out over the milk.

The equation for the Reynold's number of a spinning fluid is:

$$Re_{\omega} = \frac{\Omega R^2}{\nu}$$

Where Omega is the angular velocity (around 3 rad/s), R is the radius of the glass (around 0.2 m), and ν is the kinematic viscosity (around 1.94×10^{-6} for room temperature milk). So the Reynold's number should be around 61855 which is turbulent.

I didn't use any special visualization techniques besides the oil, and perhaps lighting the milk from below, which helped to diffuse the light a little, though the glass was too tall to get a good effect.

I used an ISO of 800 for the final picture, which in the given lighting produced a kind of long exposure effect, which helped to visualize the movement of the fluid. In GIMP, I changed the contrast, brightness, and light curves to better show the distinction between the milk and the oil, and changed the hue of the image so that the oil appears blue, which I thought looked better and added more contrast. Finally, I added a vignette to remove the distracting background from around the glass.

The biggest pitfall of this image is the low resolution, which I only realized after taking my final images, and which I will definitely have to be more careful of next time. I upscaled the resolution in editing, but that only added to the blurriness of the image, so I added a sharpness filter and bloom to kind of blend it together. I think the movement of the fluid is clearly demonstrated, however, as well as the difference between the old and new oil.