

Abby Rinerson

Team Third

ATLS 4151-001

12/11/19

Assisted by Lucas Garcia, Nick Scott and Brian Gomez



This image was taken for the third team assignment for Flow Visualization. My team wanted to explore the flow created by Ferrofluid and strong magnets. I intended to create a visually appealing image that simultaneously displayed the flow dynamics of ferrofluid. My team took turns placing the magnets beneath a petri dish then placing the ferrofluid over the top, along with India ink. Unfortunately, Brook Shade was not available during the time we met so she did not participate in this experiment.

The set up of this experiment starts with the petri dish laid upon a few layers of magnets and then the ferrofluid is poured over the top. The India ink is added later, both teal and yellow. Once the ferrofluid is present near the magnets it creates a sort of coned structure, with the base of each cone in a sort of hexagonal shape. The smaller sphere of ferrofluid in the image is approximately one inch in diameter. Ferrofluid contains tiny magnetic particles which in turn allows its shape to transform when present near magnets (“The Science Behind Ferrofluids.”).

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We found that the more magnets you place under the fluid, the more cones appear, and the smaller they get. The cones, or spikes, are formed when “the magnetic surface force exceeds the stabilizing effects of fluid weight and surface tension” (“Ferrofluid Fun.”).

The visualization technique used is the actual fluid. We can see the flow and the effect of the magnet through the ferrofluid cones. We obtained the ferrofluid from Professor Hertzberg and got the rest of the materials online. After placing the fluid in the dish we added a base layer of India ink then diluted that layer with the other color to an appealing tone. We did not adjust the lighting in any way, we simply used the lighting provided in the ITLL lobby.

I decided to use this image, as opposed to a close up of the actual ferrofluid, because I was interested in the symmetry as well as the mixture of colors. The field of view is approximately three to five inches and the lens was one or two feet from the dish. The focal length was 50, aperture was 5, shutter speed was 1/60 and ISO was 1,600. I took this image on my Canon EOS 80D. The original and final images are 6,000 x 4,000 pixels. I edited the original image in Lightroom in order to fix the lighting and make the colors a bit more vibrant. I then edited it in Photoshop to remove ferrofluid stains in the background and make the image more centered. The image was slightly cut off at the top so I created another layer and copied the side edge of the dish to make it appear as though the full dish was present in the image.

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The image reveals how ferrofluid behaves when magnets are present, as well as how two unmixed India ink mixtures interact over time. I really like how the image turned out, especially the color scheme and mixtures. I wish it was slightly more focused, however I think the ferrofluid cones are still visible.

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Citations

“Ferrofluid Fun.” *PhysicsCentral*, www.physicscentral.com/explore/action/ferrofluids.cfm.

“The Science Behind Ferrofluids.” *The Science Behind Ferrofluids* | *Apex Magnets Blog*, 30 Oct. 2015, www.apexmagnets.com/news-how-tos/the-science-behind-ferrofluids/.