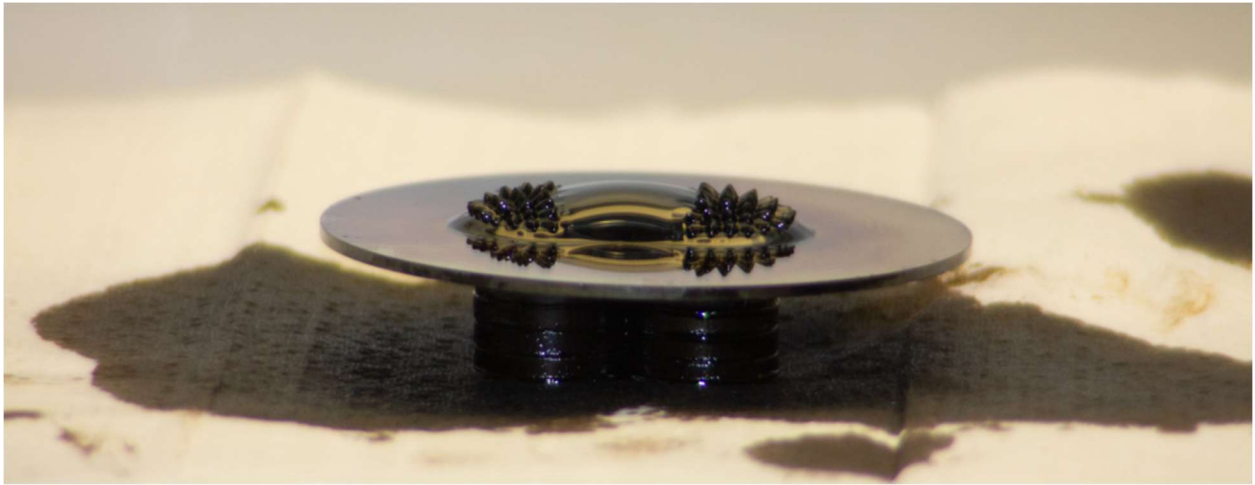


“Fluid Slug”

Team Seconds, MCEN 4151 Fall 2023



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Coauthors:

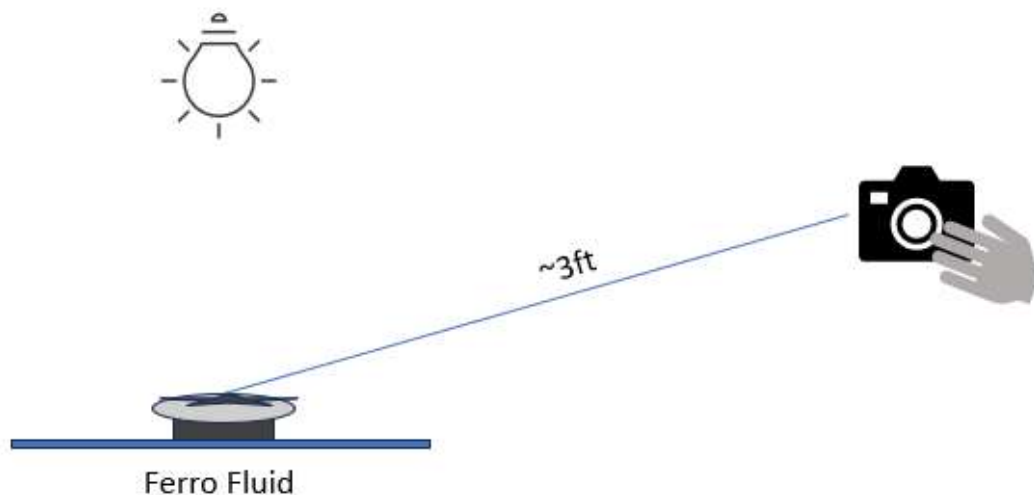
Team Chard – Ben Clairday, Venkata Durvasula, Corey Murphey

The Art

The image taken above shows the interesting effects of a magnetic field on ferro-fluid. This photo was taken in the ITLP at the university of Colorado Boulder with assistance from Team Chard consisting of Ben Clairday, Venkata Durvasula, and Corey Murphey. The intention of this photo was to not only visualize a magnetic field but to capture its reflection and setup for the viewers pleasure and understanding.

The Set Up

The photo was taken at the ITLP as previously mentioned. It was taken under the lighting of the kitchenet on the ground floor. A small mirror about 3 inches in diameter was set atop two stack of 4 magnets. The need for the stacks was to induce a strong enough magnetic field to produce the spikes seen on either side of the ferro fluid. The small mirror gives the photo more dimension for the viewer.



The amount of ferro fluid used was a caps worth from the bottle. Poured onto the mirror after the magnets were set underneath. Pouring without the magnets to retain the fluid results in a mess. Before the picture was taken the mirror surface was wiped clean around the fluid. The stack of magnets is set next to each other but I intended to play with their spacing to see the effect on the fluid. The resultant slug-like formation of the ferro fluid was the simplest to set up.

The Physics

The most visually interesting part of the photo is the spikes of the ferro fluid. Ferro fluid itself consists of small particulates of a ferric compound and a carrier oil. The ferric particles react to

the magnetic field of the magnets and produce the spikes shown in the image. A result of normal-field instability, a fight with gravity, and surface tension spikes form on the surface of the ferro fluid.

The fluid can be seen bubbling in the middle as the two sets of magnetic fields fight.

The Image

The camera used was Cannon EOS Rebel T3. The image was cropped to focus on the ferro fluid and show less of its surroundings.

Resolution (Uncropped)	4272x2848
Resolution (Cropped)	3586x1380
Exposure	1/60
F Stop	5.6
ISO	800
Focal Length	200mm

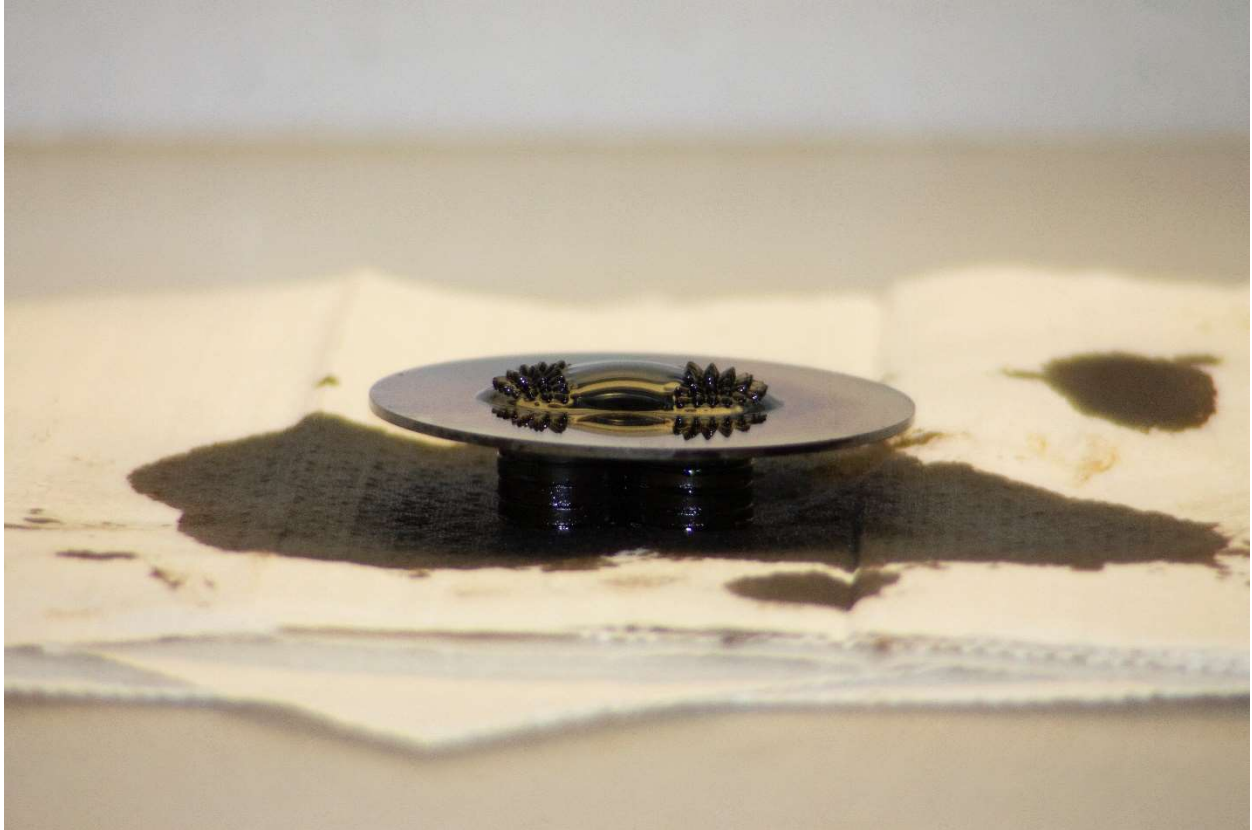


Figure 1 Original Image

Conclusion

Working with ferro fluid gave me a lot of insight into magnetic instabilities caused by magnetic fields. This compared to instabilities due to physical properties is an interesting difference.

References

<https://ucscphysicsdemo.sites.ucsc.edu/physics-5c6c-demos/magnetism/ferrofluid/>