

Team Second – Galen Melchert

Team eta 9 – Cyron Completo, Sung Moon, Kevin Oh, Hanwen Zhao

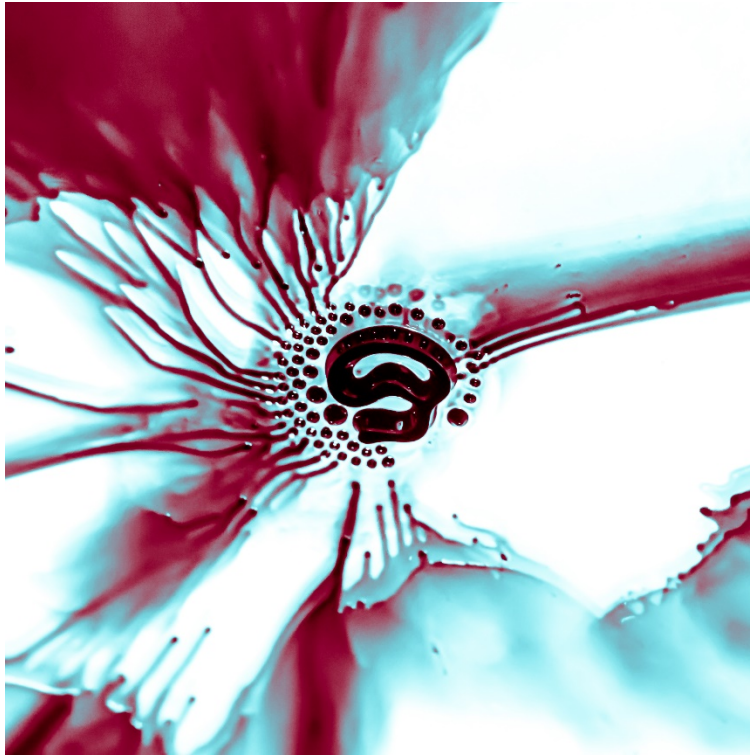


Figure 1: Final image

The intention for this project was to capture the ferrofluid “labyrinth” pattern. It took some experimentation to get anything that resembled this. We tried different magnets, orientation and glass plate separations. Finally we were able to produce some interesting labyrinth images.

To create a ferrofluid labyrinth we used two glass plates separated by $1/8''$. We dropped a small amount of ferrofluid on one of the plates and placed the other on top. Magnets were positioned under the plates. The amount of ferrofluid used was limited by the strength of the magnets, and our magnets were weak. We compiled many magnets together to maximize the field strength. A diagram of the setup can be found in *figure 2*.

We had open expectations. We wanted to capture the labyrinth effect but found it difficult to reproduce. After trying many methods and failing it suddenly clicked and the effect was observed. We found that having magnets pointing in different directions with conflicting fields worked the best.

Lighting was difficult because the glass reflected it well. We lit the plates at a shallow angle with a ring light and an incandescent bulb. The image was taken normal to the surface thus removing any direct reflection of the lights.

Our magnets were smaller than ideal and so the effect was also on a small scale. To capture this I used a 50mm prime lens on my Sony alpha 5100 with an added FOV lens that shifted the FOV between 6-12”. The final image was captured at f9.0 at 1/80s with an iso of 1600. The small aperture was used to

deepen the FOV. Widthwise the FOV was 5" and the camera was positioned about 8" away from the ferrofluid subject.

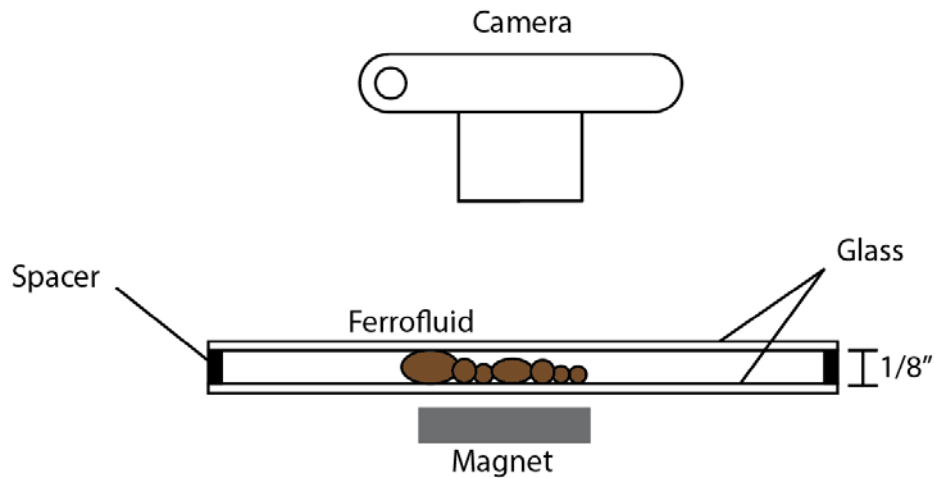


Figure 2: Setup diagram

The image reveals the field instability of the magnets in a unique way. With the ferrofluid trapped between the two glass plates interesting things happened. The multiple magnetic fields the fluid was subject to caused it to get more interesting and produce the labyrinth effect. While we essentially achieved the results we were looking for there are some things that could be improved. Firstly, stronger magnets would have made the procedure and resulting image better. Secondly, the ferrofluid was messy and stained the glass easily. It was hard to just produce the instability without complimentary drips and smears surrounding. The overall effect turned out nicely, but it wasn't what we were after. Adding another fluid that was phobic to the ferrofluid may have improved the effect as well.

References

1. *Labyrinthine pattern formation in magnetic fluids.* Dickstein AJ, Erramilli S, Goldstein RE, Jackson DP, Langer SA. s.l. : American Association for the Advancement of Science, 1993.