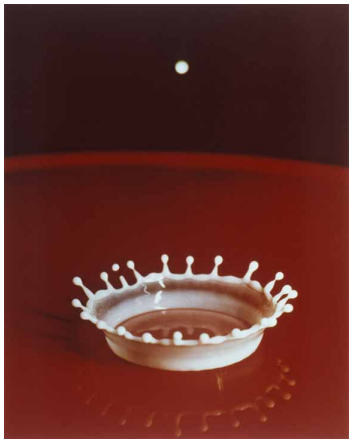
High Speed Photography of Liquids

Stephanie Northway

April 2015

Inspiration

This project was inspired largely by the "liquid sculpture" photographs by Markus Reugels [1]. Exploring the world of high speed led me to the work of Harold "Doc" Edgerton, the inventor of the strobe light and the first person to do high-speed photography in the modern sense of the term. I visited the "Images of Discovery" exhibit at the MIT Museum [3] and was inspired by the work of all three photographers on display (Edgerton, Bernice Abbott and Felice Frankel) as both an artist and an engineer. Many of the people associated with the development of high speed photography have had a scientific bent, including Etienne-Jules Marey and Edweard Muybridge [5]. My photography for this project was not particularly scientific, but high speed photography by its very nature evokes a scientific curiosity, or at least a sense of "how did they do that?"



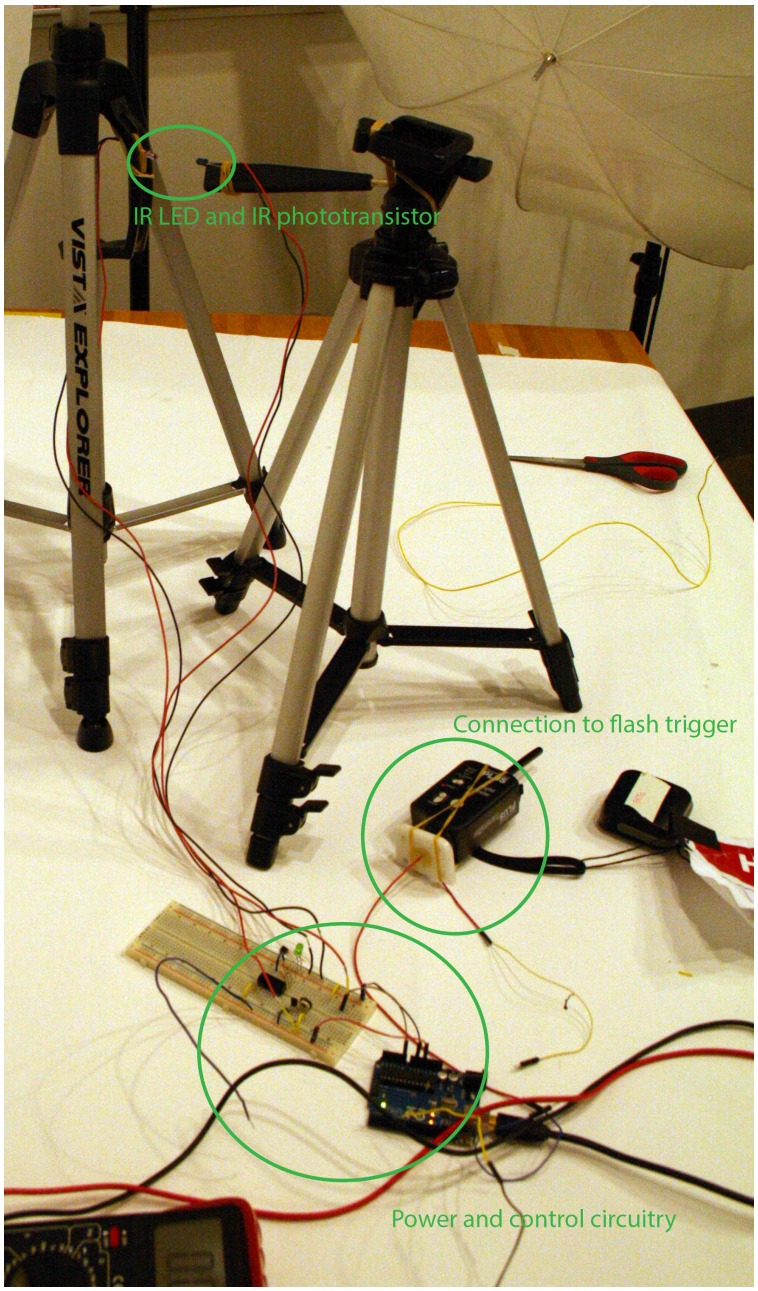
Left: photo by Markus Reugels [1]. Right: the iconic milk drop photo by Doc Edgerton [2].

Artist's Statement

One reason I wanted to explore high speed was to branch out artistically. In the past, I've specialized in macro still life photographs. Macro embodies the idea that everything is amazing if you look at it closely enough. It makes tiny worlds all around us appear, for a moment, larger than life, stimulating the imagination. To me, the capture of things that are small on the time axis (as opposed to the size axis) seemed analogous but more technically challenging. The "staging" of a transient event is an art of its own. Some, like Reugels, have it down to a science. I don't, but through this work I gained a deep enough understanding of the process to have some consistency of quality in my photographs while exploring different materials.

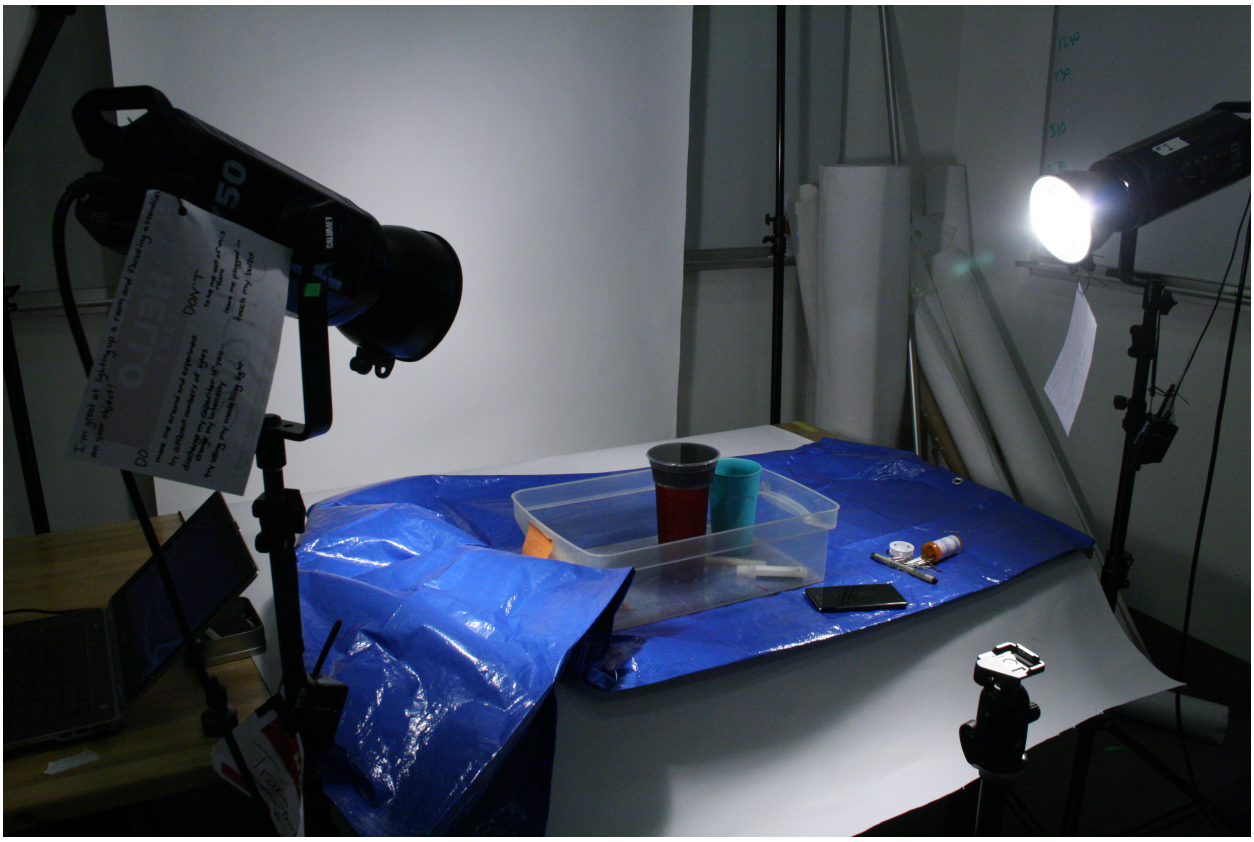
Process & Results

I began with ambitions to make a whole engineering project out of this, which I did for the first half before realizing there were easier ways to do what I was trying to do. I made an IR motion sensor, but soon figured out through experimentation that it was not going to be sensitive enough to be reliable.

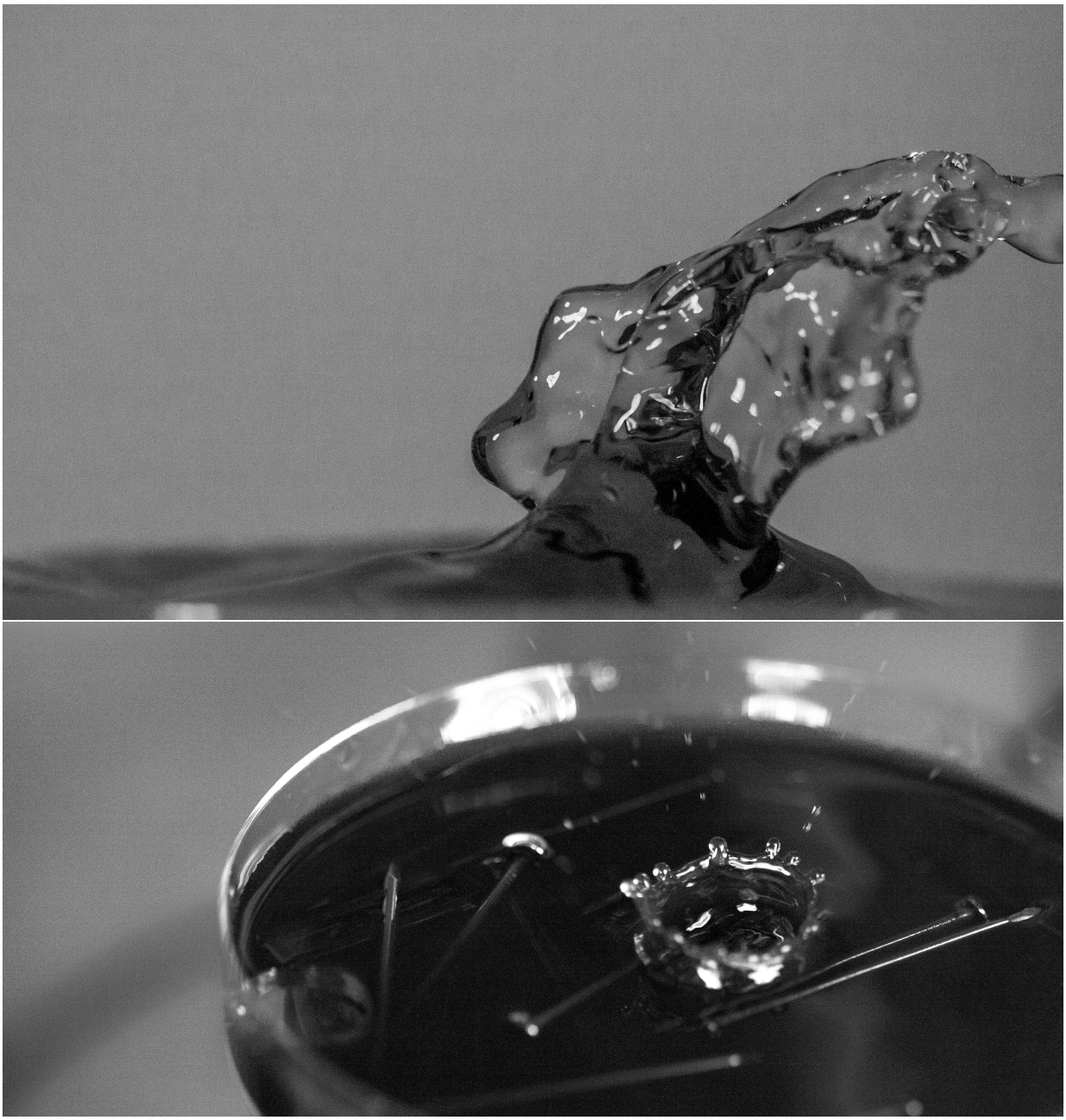


Annotated photo of my very haphazard IR motion sensor.

I could have built a complex setup with a pump and precise timing of droplets (as many have done before me [4]), but decided that I would rather use my limited time to take compelling photographs than build a complex electromechanical system to take them for me.

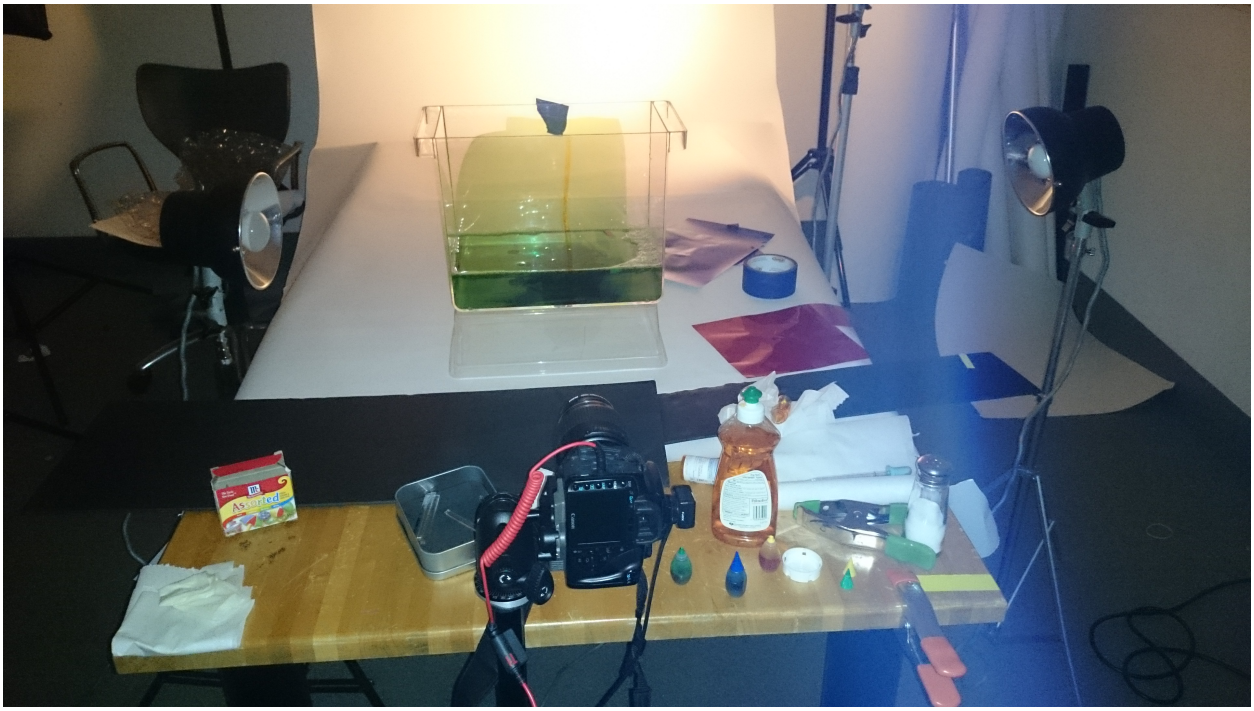


The two photos below were taken with the motion sensor. I ended up connecting it to the shutter instead of the strobes because of the time lag and putting the modeling lights on their brightest setting. In different circumstances I used different techniques with regard to the flash. Sometimes I left the shutter open for a longer time, kept the room completely dark and let the flash duration determine the exposure. Other times I used a higher shutter speed and left the lights on, as in the two photos below. I've included tables with shutter speed, aperture and ISO to indicate which technique I used for which sets of photos.



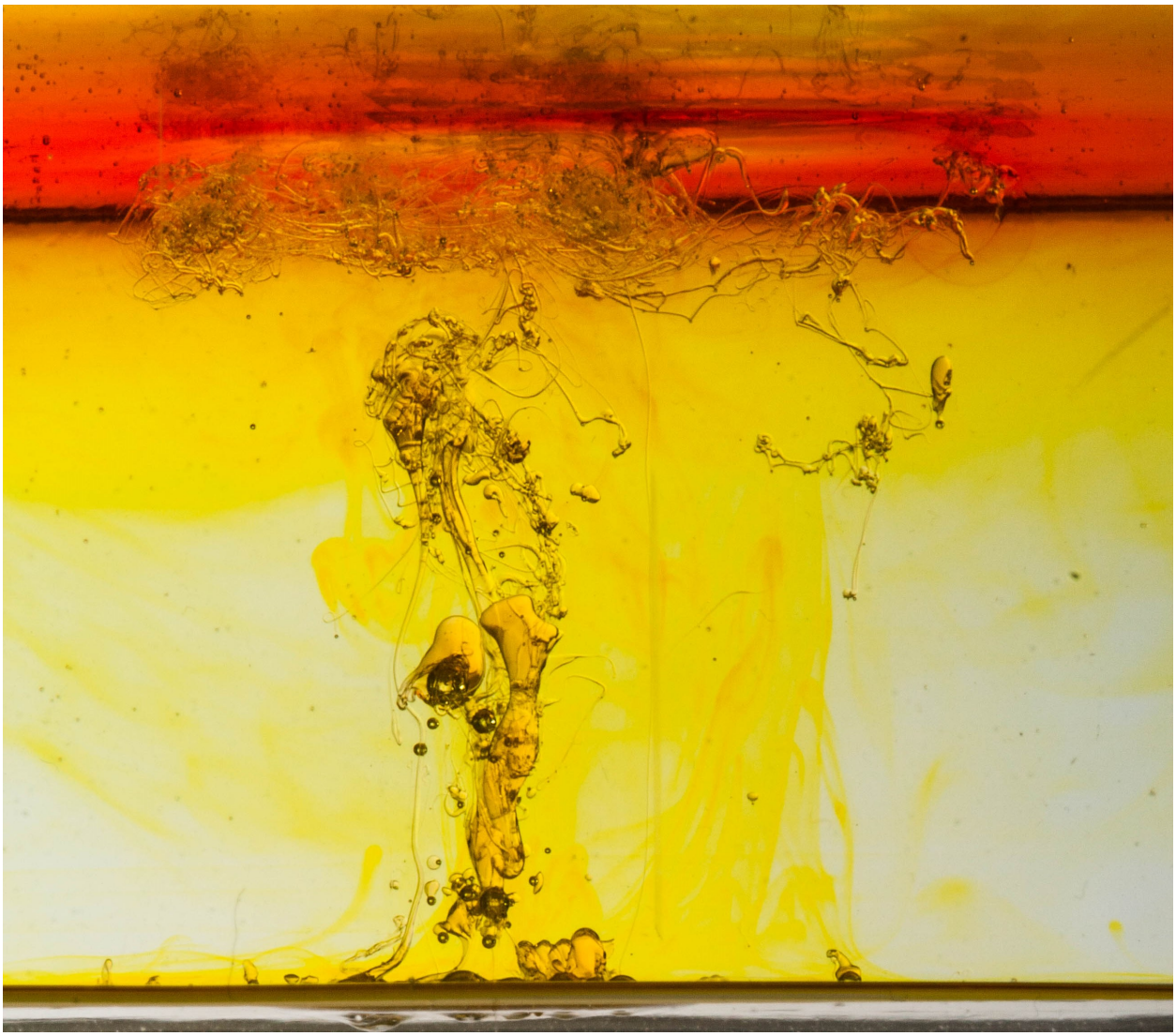
Shutter Speed (s)	1/3200
Aperture (f/#)	2.8
ISO	1600

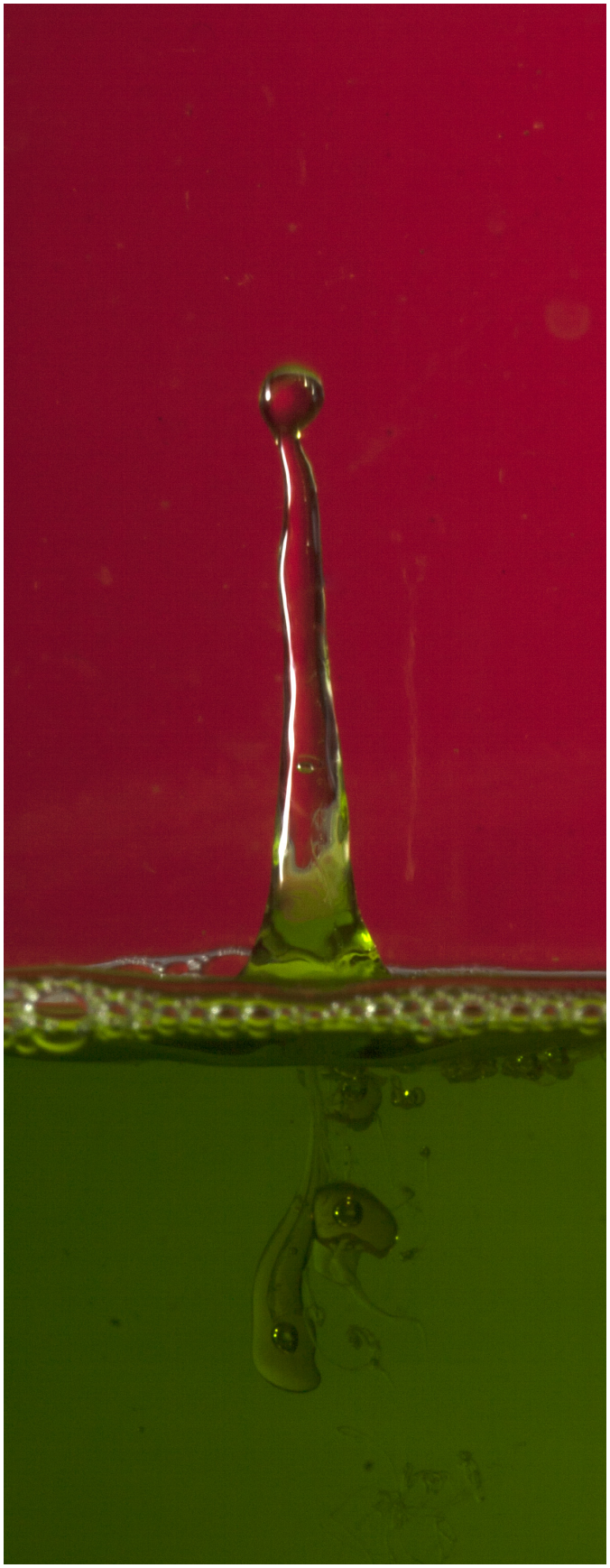
I ended up using the TriggerTrap [7] cable and app as a remote shutter and experimented with the timer and sound sensing capabilities, but eventually decided it was more reliable to time it myself. Had I been working with something louder than single drops of water and food coloring, it would have been more useful. The flash setup in the picture below was what I used for most of my photographs. One strobe lit the background, and one or two lit the tank from the side.



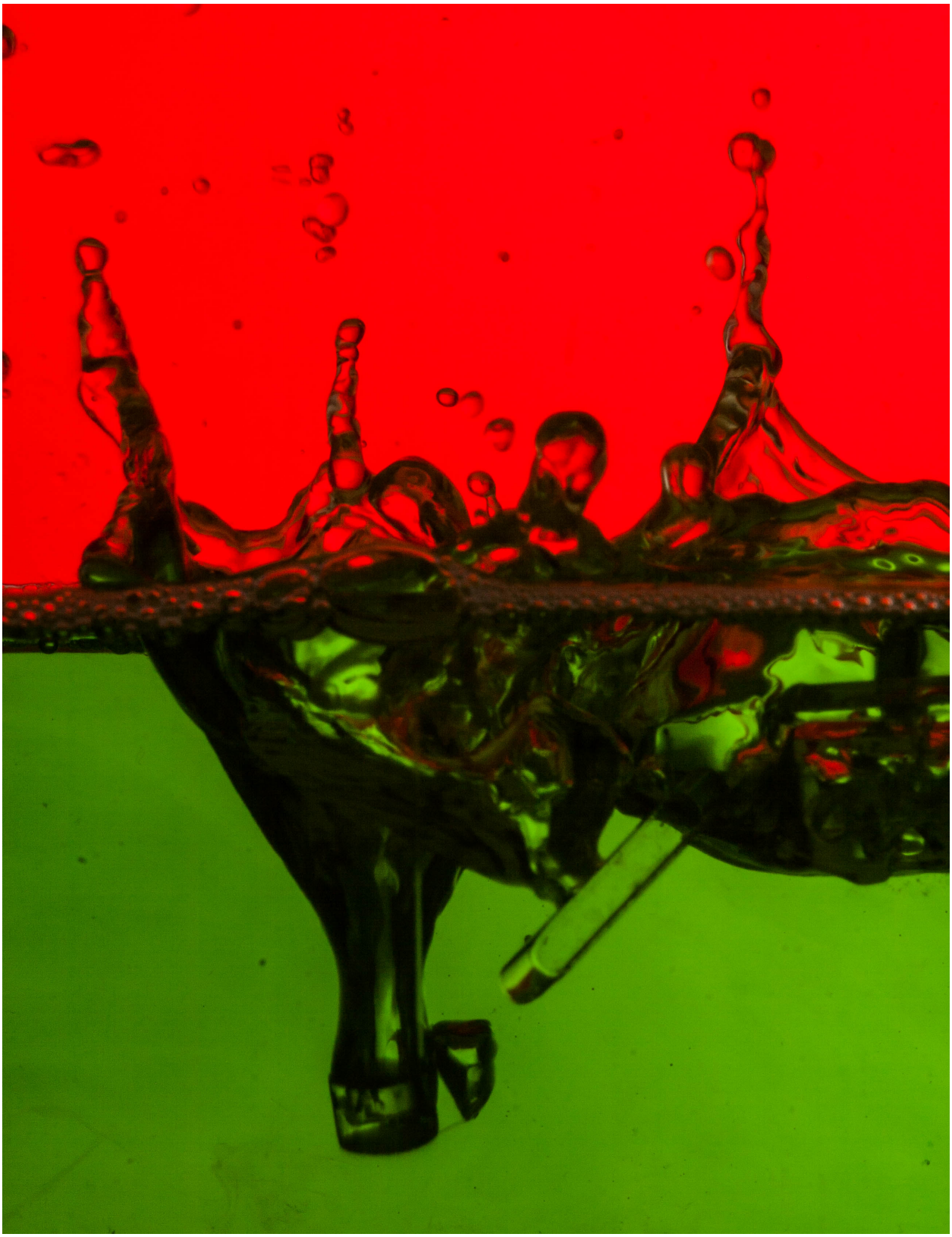
Simple things can make a big difference; the thing that really made the difference in this project was a clear plastic container. This allowed me to explore the differences between how liquids behave above and below the surface of the water. A lot of my best photos from this project play on that duality, where most high speed photos of liquids I have seen only focus on one or the other [1] [6].

The other thing that made a big difference was using the gels I borrowed from Mike Maloney—not on the flashes, but taped to the back of the container. This gave much-needed color to my scenes.



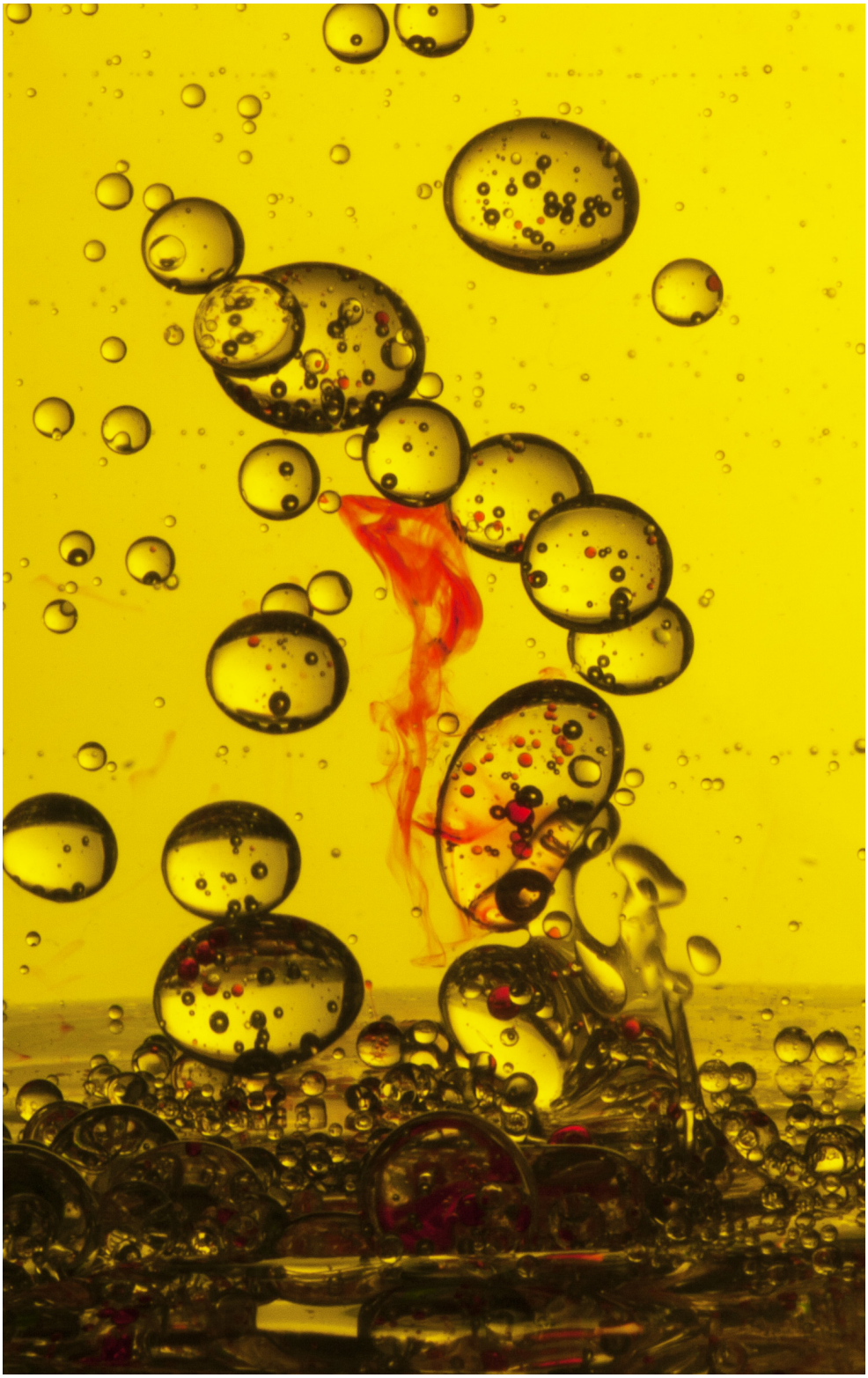


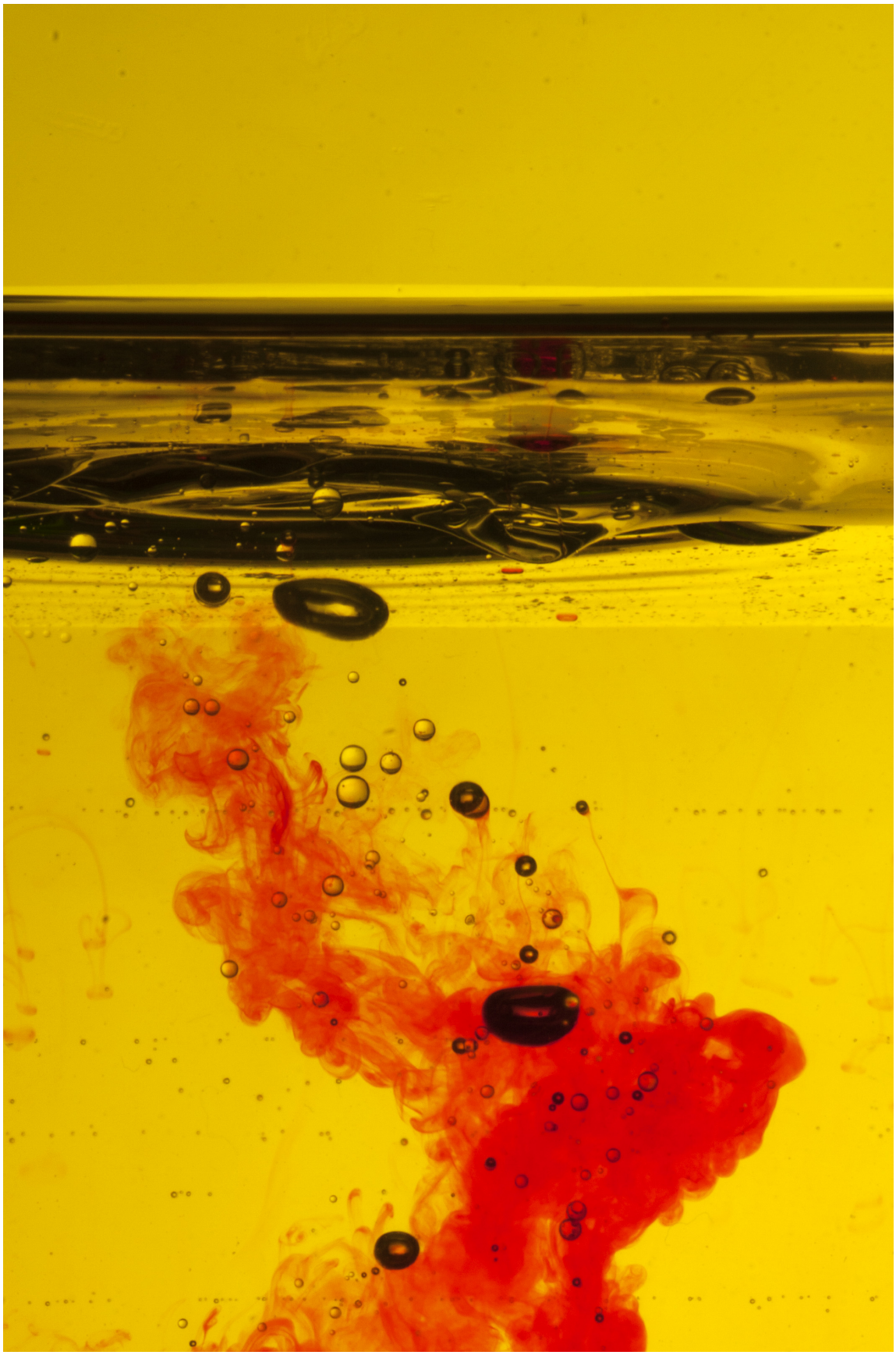
Shutter Speed (s)	1/4
Aperture (f/#)	32
ISO	100

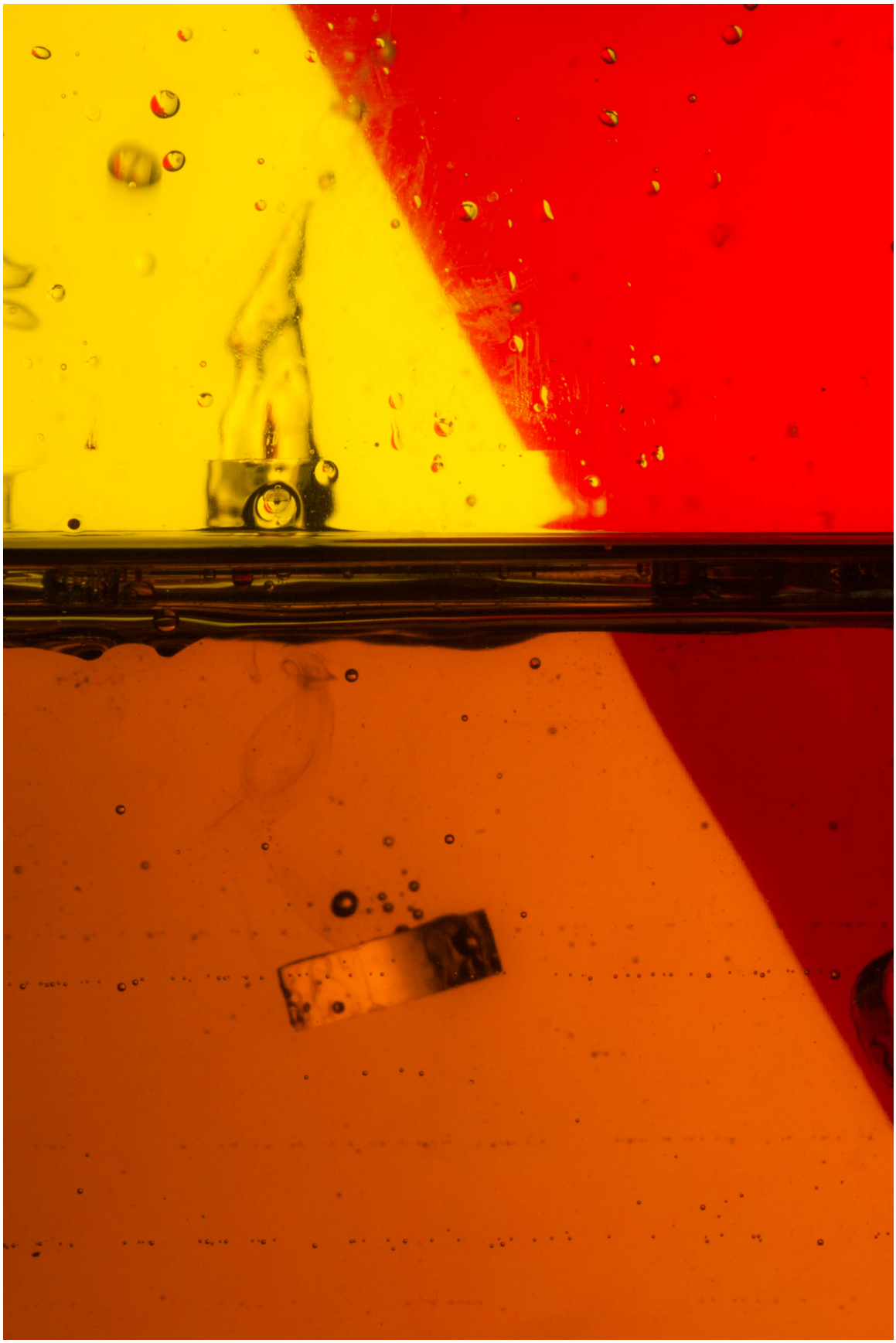


Shutter Speed (s)	1/4
Aperture (f/#)	25
ISO	100

Thus far I had only used water, food coloring and some acrylic pieces in my photos. I decided to experiment with different materials, specifically oil and soap. The interactions of the oil with the food coloring were very interesting, as it allowed me to visualize in more detail the interactions between oil and water (food coloring is basically water). After talking to Mike, I experimented with angling the camera up to see more of the surface from the underside. This allowed me to create the "landscapes" in some of the photos below by turning them upside down.



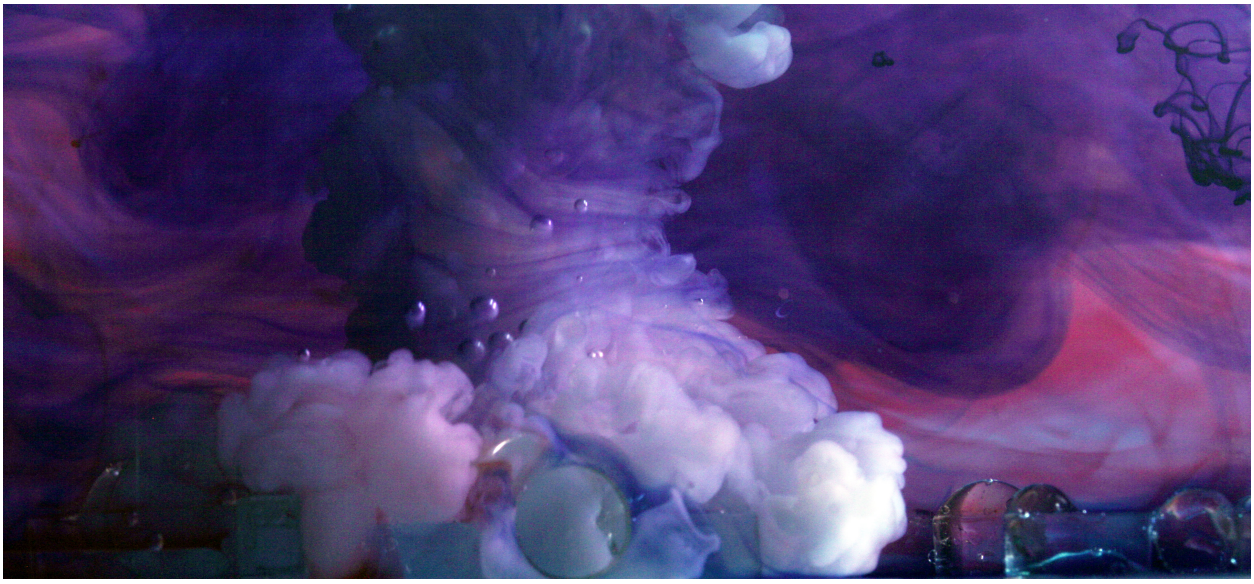




Shutter Speed (s)	1/30
Aperture (f/#)	32
ISO	100

In the next shoot, I was using a slower strobe than the one used to take the previous photos. I tried capturing some of the slower "high speed" phenomena (like food coloring diffusing into water). I also experimented with milk, which gave the second two photos their ethereal qualities.

Shutter Speed (s)	1/50
Aperture (f/#)	20
ISO	400



Shutter Speed (s)	1/200
Aperture (f/#)	13
ISO	400

I was unable to resist taking a few macro still life photos in the process.

References

[1] http://markusreugels.de/

[2] http://edgerton-digital-collections.org/

[3] MIT Museum, "Images of Discovery" 2015
http://web.mit.edu/museum/exhibitions/imagesofdiscovery.html

[4] http://www.cognisys-inc.com/how-to/stopshot/water-drops/water_drops.php

[5] Dalton, Stephen. Split Second. Salem: Salem House, 1983. Print.

[6] Alberto Seveso, "2 Colori Disastro Medicina" 2013
http://www.burdu976.com/phs/portfolio/2-colori-disatro-medicina/

[7] http://triggertrap.com/