

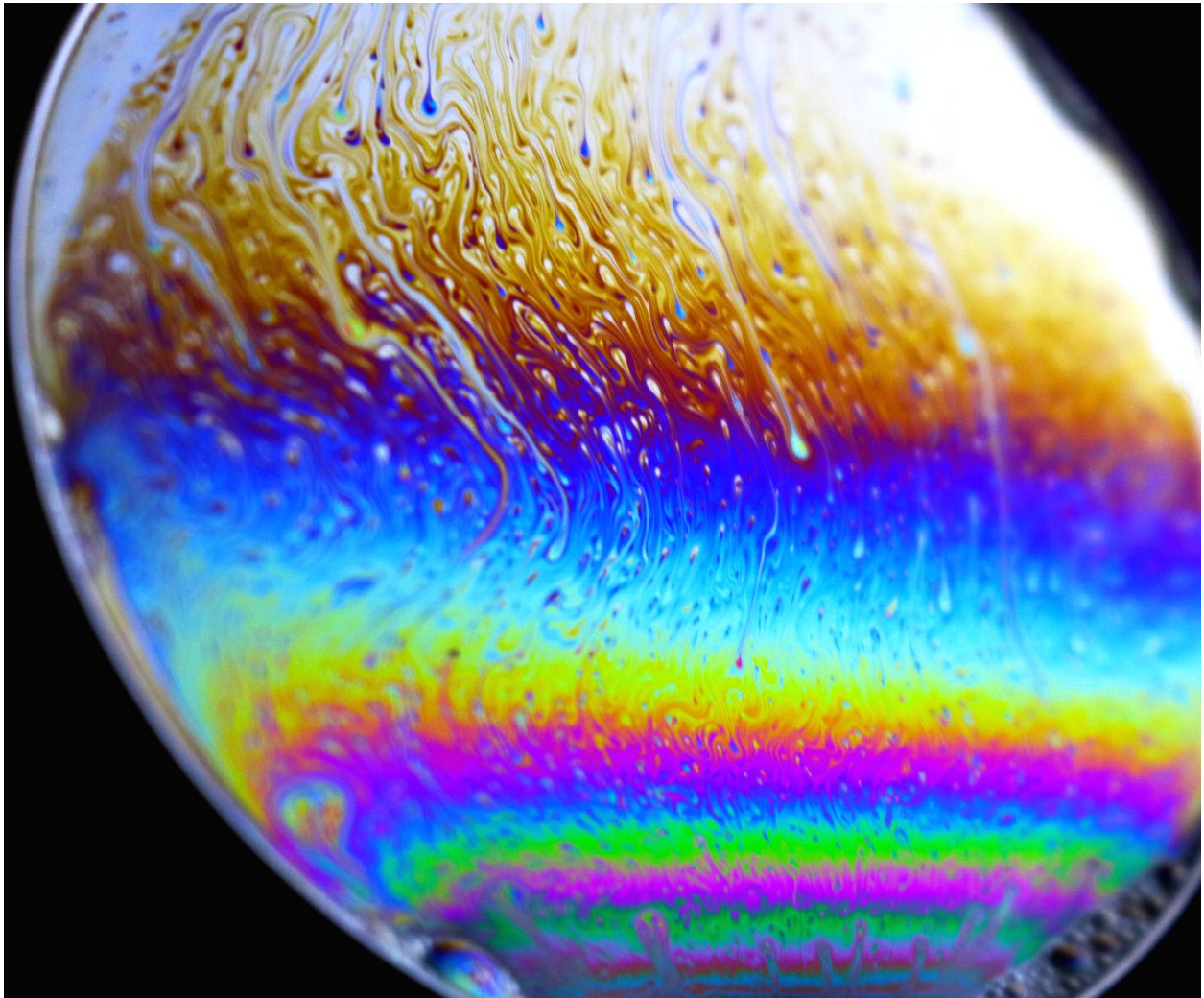
LEDs Reflecting Off a Bubble Film

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Team Third

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Background:

For this assignment, we really wanted to play with light and color. It was something that we tried to capture in our last experiment, with the dry ice bubbles, but it didn't come out as vibrant as I would've liked. We looked back at all the previous posts on the Flow Visualization website and found that just using a basic soap film would create some abstract, beautiful, and colorful images. The LED aspect of it was a happy coincidence, since we were just trying to get a flat white background to shoot against, and they wound up adding some extra colors and dimensions to the image. It took several tries to get the soap mixture right, but in the end, I think it turned out beautifully.

Apparatus:

To create this set up, we first had to create the soap film. Soap films are very simple to create, but making one that would be very vibrant and also stable enough to last long enough to take pictures of was a little more difficult. We began dissolving sugar into the soap and water mixture to make it more viscous, and eventually found a good mix with 5 parts sugar, 4 parts water, and 2 parts dish soap. We went through several iterations of this mixture because this recipe is very very viscous, to the point where one wouldn't assume it would dissolve well. This may have been a boon though, as the not fully dissolved sugar particles made some interesting effects as they moved through the film.

The film is so colorful because of how it reflects and refracts light. Soap films, although they look 2 dimensional, are actually comprised of two layers with some fluid in between them. White light reflects off both layers, but because they're very slightly offset, the two sets of waves that are bounced off are slightly out of sync and create a new perceived color (Woodford). The color gradient in my image is caused by the water in between the soap films obeying gravity, and sliding down to collect at the bottom of the soap sandwich.

Visualization:

The color pattern at the bottom is caused by the LED backlighting. White LEDs are actually comprised of small red, green, and blue LEDs all on at full power, to create the illusion of white light. The red, blue, and green pattern is caused by the soap reflecting the individual elements of each light.

The smaller particles in the pattern of colors are caused by the undissolved sugar granules. They weigh more than the surrounding film, and so travel through it, creating differences in depth and making the light reflect back in different ways.

Camera:

The camera we used had the following settings:

ISO – 400

F Stop – 5.6

Exposure - 1/85 sec

The ISO is relatively low here, because of the bright backlight coming from the LED screen, and the f stop of 5.6 is because the camera was right up next to the film.

Because of the low ISO, the original image came out kind of dark, and I did lots of editing to bring out the colors. I raised the brightness, exposure, and vibrance of the image. I also fussed with the color curves a little bit, making the dark colors darker so the only focus of the image would be the soap film.

Opinion:

Overall, I'm very happy with this image. It was a relatively simple set up that created some truly fascinating results. I can see myself doing it again for fun with my younger cousins. If I were to do it again, I would try to leave out the LED screen. I think it made some interesting effects here, but it's hard to tell if the colors are just from the soap film or if they're from the LED screen, which is a little confusing.

Sources

Woodford, Chris. "Thin-Film Interference | Why Are There Colors in Soap Bubbles?" *Explain That Stuff*, 10 Mar. 2018, www.explainthatstuff.com/thin-film-interference.html.