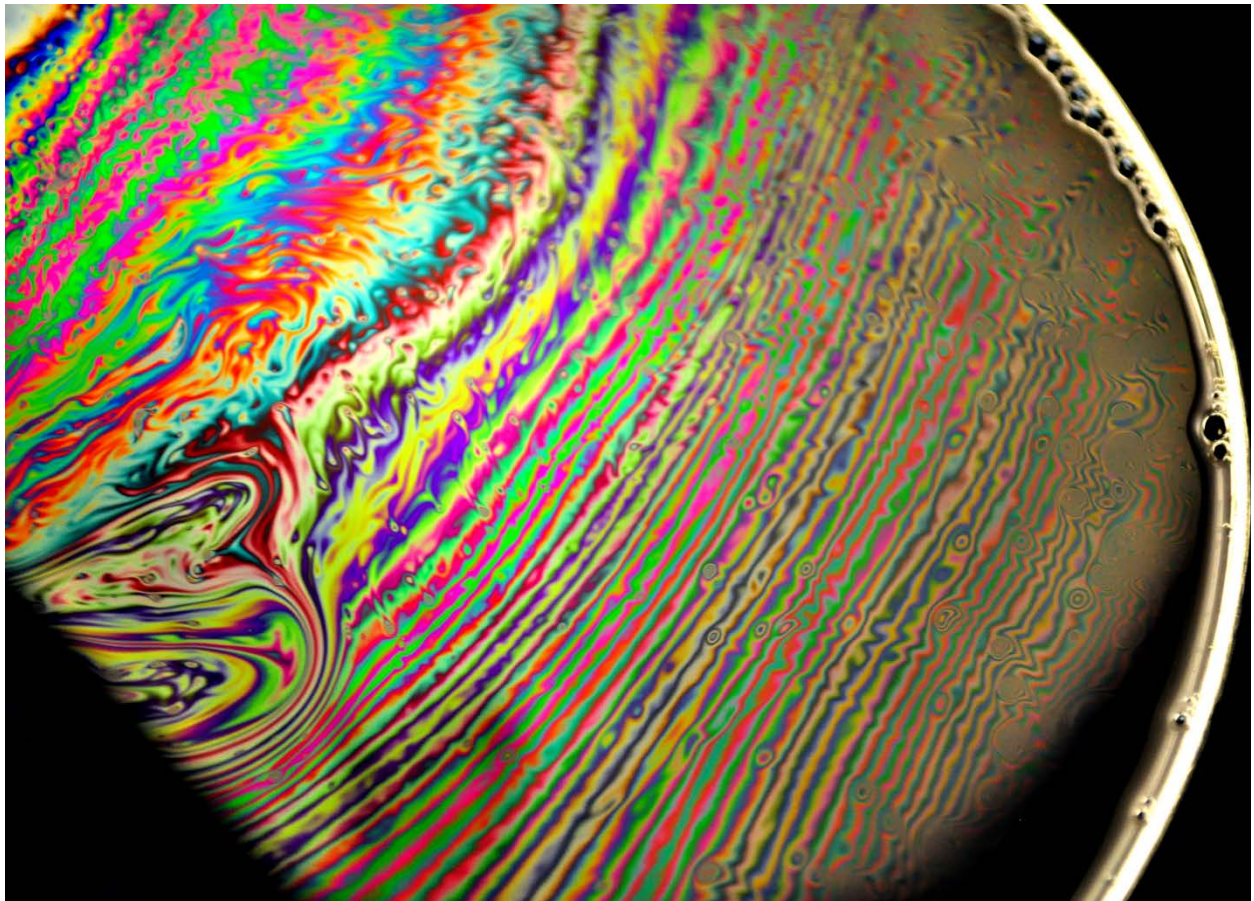


Stefan Schultz

Flow Visualization

Team Project 1: Soap Film



The purpose of this image was to explore the interesting visual properties of common soap film or bubble liquid. We were trying to see and highlight the myriad of striking colors and dynamic patterns present in soap films. The series of images this specific picture was selected from was created with the assistance of both Danny Maguire and Erick Pena.

To produce these images, a wire hoop about 1 inch in diameter was dipped into a soap mixture comprised of about a 1 to 1 to 1 mixture of Ajax dish soap, water, and glycerin. The loop was then moved from the soap mixture to underneath a desk lamp, with its light diffused through a single layer of paper towel taped over the front of bulb. The loop was held at an angle approximately between 45 and 60 degrees from horizontal (about 105 to 120 from lamp face) depending on where we were able to see the most of the colored flow (Figure 1). The films of soap in our loop typically lasted between one and two minutes before popping.

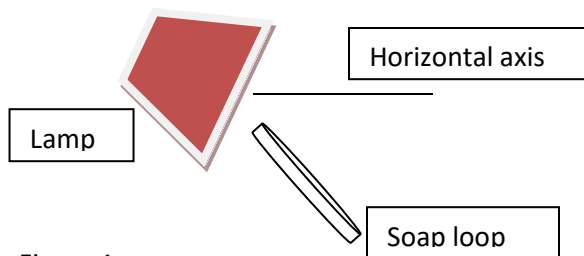
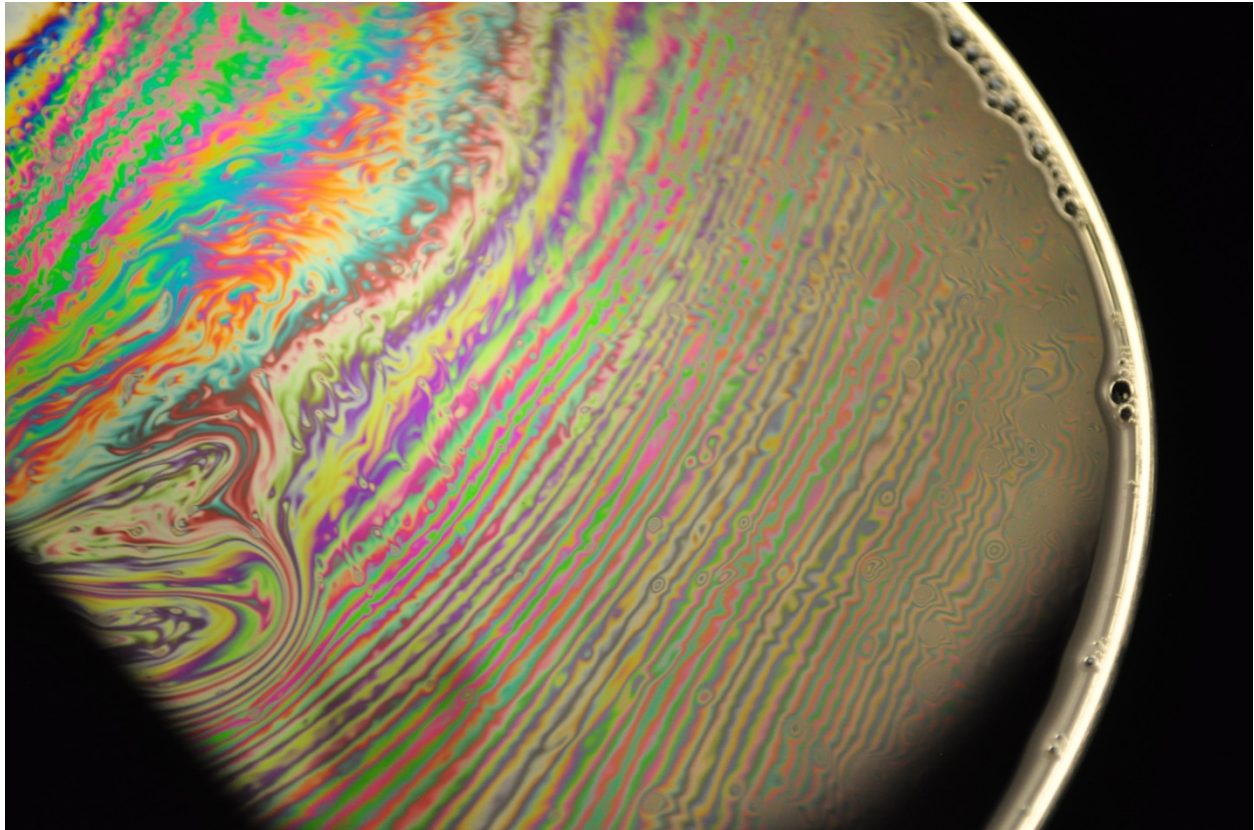


Figure 1.

The colors seen on the film are from the reflection of the light off of varying thicknesses of the film layer. Thinner areas on the film appear more blue or purple whereas thicker areas look more red or orange. The turbulence seen in the image is likely a result of shear forces generated when the loop was move quickly from the soap bath to under the lamp for imaging. The small vortex or bump shapes that appear in the image are from smaller bubbles in the surface of the film or small particles that had fallen into our mixture. Either of these would generate a local variation in film thickness causing the small rings of different colors apparent in the image.

Very little was done in the way of special visualization of this flow other than the lighting setup. The lamp light had to be diffused to avoid bright reflections on the surface of the film. Otherwise, it was simply a matter of orienting the film loop at the appropriate angle so that the largest area of the surface was visibly colored.

This image was taken using a Nikon D90 DSLR camera with a standard lens. This image was taken at about 2-4 inches from the lens to the subject. Since the flow was not moving at a noticeable rate, a relatively slow shutter speed of 1/200 was used. There was also plenty of light available for the image and an ISO of 1000 was used. An aperture of F5.6 and a focal length of 55mm were used. The original unedited image was 4288x2848 pixels in size, shown here:



The final image was cropped to a size of 3452x2848 pixels. In terms of postproduction, the curves were adjusted for contrast and an unsharp mask was applied to sharpen the edges between color layers.

Out of all of the images we took, I liked this image the best. I feel like it looks like some wild gas giant planet with a violent atmospheric chemical composition. I would then compare the large turbulent swirl in the film to a storm similar to Jupiter's. Overall I am very pleased with the variety of features in the film I was able to capture. It is not entirely turbulent or laminar and I believe that adds a little more dimension to the image. I would have like to have been able to crop the image in closer to eliminate some of the dark spots on the surface of the film, but any cropping would also eliminate an area of the actual colored flow as well as the darkness so the loop was left in the image in its entirety. This isn't a major problem, however, I believe that the inclusion of a boundary helps define the flow and the bubbles around the edge are a kind of a cool additional feature. Even with the looseness of our experimental setup, I think that I was able to capture a powerful, interesting image. If I were to try an image like this again, I would scale down the size of the loop holding the film, although that tended to decrease the life of our films, and bring in a macro lens. Hopefully, changing these features would make it easier to capture a film that was entirely lit and colored and eliminate the issues present in this image with dark areas on the film.