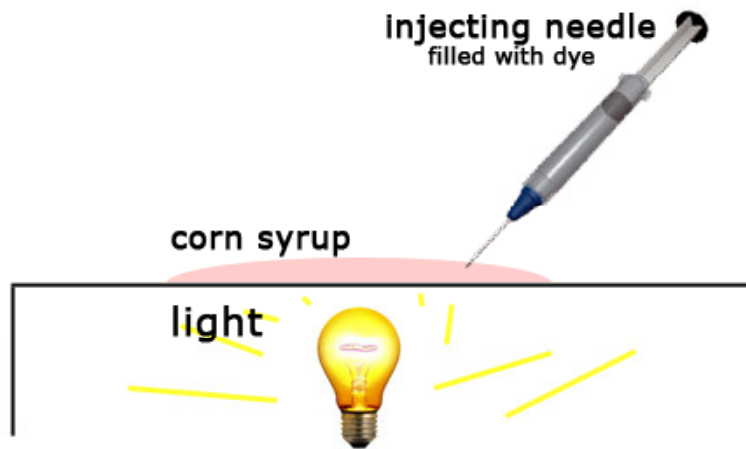


Initially, group Beta discussed and proposed two ideas. Our first thought was to create an artificial landscape using dyes in water and oil. This idea was originally practiced by one of our group members with vegetable oil that had been used to cook with, which attained properties that made the oil just dense enough to form a bubble around drops of dye and then sink in layers to the bottom of the layer of water while still holding it's shape. When we tried to reproduce this effect with vegetable oil that hadn't been used for cooking, it didn't work. When the drops of dye went through the oil and hit the water, it dispersed. We couldn't control where the dye went. Our other idea was to use the pulse laser in the laboratory to capture the fluid flow of stage fog, but we couldn't use the laser. We finally decided to use the Hele Shaw cell table to show the Saffman-Taylor instability, and after experimenting we decided the instability could be shown better using only the light table without the piece of glass on top.

The light table we used was set up like this:



The light table was approximately two feet by one foot, and the drops of corn syrup we injected into were approximately 1.5 inches in diameter. To create our final image, we injected a mixture of food coloring dye and water into the middle of the pool of syrup. As it dispersed, we then added another color of dye, let that settle, and then continued to alternate between red and blue dye/water mixtures. We photographed it after letting the dye settle for approximately 2 minutes. The lighting technique we used was two 120 watt light bulbs underneath the plexiglass table. No flash was used.

This photo was taken with a Canon EOS Digital Rebel with a macro lens. The shutter speed was  $1/60^{\text{th}}$  of a second, at an aperture of f6.3. The focal length was 50 mm and the ISO was 400. This photo was not edited. The final image is 2048 x 1360 pixels.

The image reveals the Saffman-Taylor instability, which is the fingering effect seen on the edges of each ring of dye. We watered down the dye to give it less of a concentration, thereby more completely dispersing inside the dense corn syrup. I love the colors of this image; the bright blue, burnt orange, and deep red make the fingering mesmerizing. I also like the angle of this specific image, as it shows the dimensions of the corn syrup. I wish for the lighting we had used a white light, because I feel that would

have looked a lot cleaner than the yellowish tint of the image. All my questions were answered by the wonderful engineering students in my group, and in this process I learned a lot about surface tension, density of liquids, and about the Saffman-Taylor instability. I would love to do this experiment on a bigger scale, and feel that at a larger size this has the potential to be even more beautiful. I would love to use more colors as well.