

Through the Looking Glass

Eisner Prize-winning artist Susannah Hays creates photograms (light drawings) by passing light through antique bottles. The resulting images show fine, complex patterns, patterns that aren't visible on the bottles' glass surfaces. Hays wanted to know the physical basis behind the formation of her photograms. What process was at work, bending light through the bottles to produce these complex and beautiful images? Recently, the *BSR* arranged for Hays, Assistant Professor John Corzine, O.D. of the School of Optometry, and Vision Science graduate student Scott Fitz, O.D., to meet and discuss the scientific how and whys of Hays' work. Excerpts from their discussions follow.



The focus of the discussion is the photogram shown above (and on our cover). The bottle, which dates back to the Depression era, is made of clear glass embossed with a simple pattern of closely-packed circles. During the course of the discussion, the participants carried out a simple experiment: They passed a beam of light through the bottle used to make the photogram, creating a projection on a tabletop.

Susannah Hays: Just so you know how I made this image: the bottle was put directly into contact with the photographic paper, and then an enlarging light source was refracted through the glass. An enlarger in photography is what we usually use to enlarge negatives in, so it almost looks like a microscope. . . . In photography, this image is called a photogram, because there's no camera involved. It's a light drawing. The image was captured on photographic paper with a quick fifteen-second exposure of light through the glass.

John Corzine: And the glass was clean?

SH: Yes, in all these images, everything—totally empty bottles.

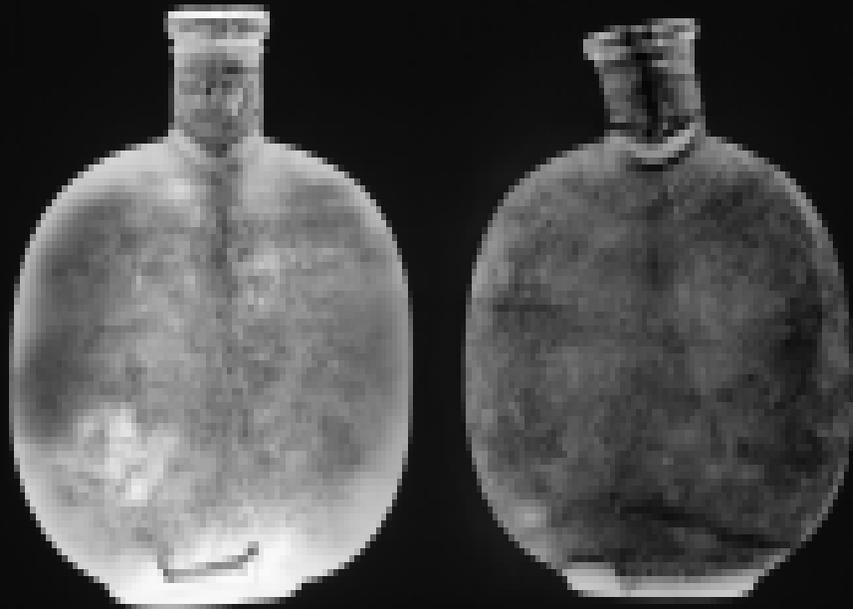
BSR: Why do you think the pattern in the image looks hexagonal, given that the bottle itself has a circular pattern?

Scott Fitz: The circles on the bottle are convex on the outside, concave on the inside. If you sliced them out, they'd be like little lenses.

JC: But I wonder about the space between the circles. Is it acting to create the hexagonal pattern? Because really, the honeycomb could be refracted light from the space between the circles. The spaces between the circles do form hexagonal patterns.

SH: So you're saying that it's recording the shape around the circles?

JC: Yes. And the centers of the hexagons...these little splotchy, dark spots, are the light coming through the center part of each circle. Then these dark lines [forming the honeycomb pattern] are coming from the spaces in between the circles. Somehow those spaces are focusing the light into hexagonal patterns.





SH: So that's the honeycomb form, but are we seeing salts and silica and other things that the glass is made of in the fine patterning itself?

JC: I think that refraction creates the gross pattern, but there is lots of fine detail in there—all the little radial striations.

SH: All of this dotting suggests there's something in there that we can't see, something that is actually opaque, something that blocks the light, creating the white spots.

JC: Well, it doesn't have to be an opacity; it could be refractory. The light is being bent away from some areas of the glass.

SH: So there's some unevenness in the surface of the glass bottle?

JC: Right, and the light gets shifted away. Have you ever seen a water strider—those little insects that glide on water? They leave a shadow on the water because their foot is causing an indentation on the surface of the water, so that light gets bent away. They're changing the shape of the water right there, so light is getting bent. These light shadows don't necessarily mean there's something opaque that's blocking the light from getting through. It could just be that the light is getting bent away from those areas. My suspicion is that most of this patterning is, on a gross level, refractive. It has to do with surface shape—and how light is getting through it—rather than picking up some molecular or atomic qualities of the material itself.

JC begins the experiment, shining a light through the bottle and creating an image on the table below.

JC: If I hold the light close to the bottle, then we can just see one surface of the bottle. And now as the light is moved further from the bottle, we're getting the upper level coming in; now we have two levels. But let's just look at one of the surfaces.

BSR: In the photogram, you do see some of the circles from the bottom surface of the bottle.

SH: Right, and that would be because the bottle is in direct contact with the paper; some circles are directly recorded, whereas others are diffuse. They come out like a kiwi or sort of like a fruit with lines.

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Facing page:

SF: Does this bottle have any particular pattern on the surface?

SH: No. It's an old wine bottle, the kind that maybe had raffia around the bottom, that people use to hold candles. The glass is totally smooth.

BSR: Could it be some kind of film that's causing the pattern?

SF: I don't think any of these patterns is created by the bottles' not being clean enough. I think, no matter what, we're looking at some kind of structural explanation.

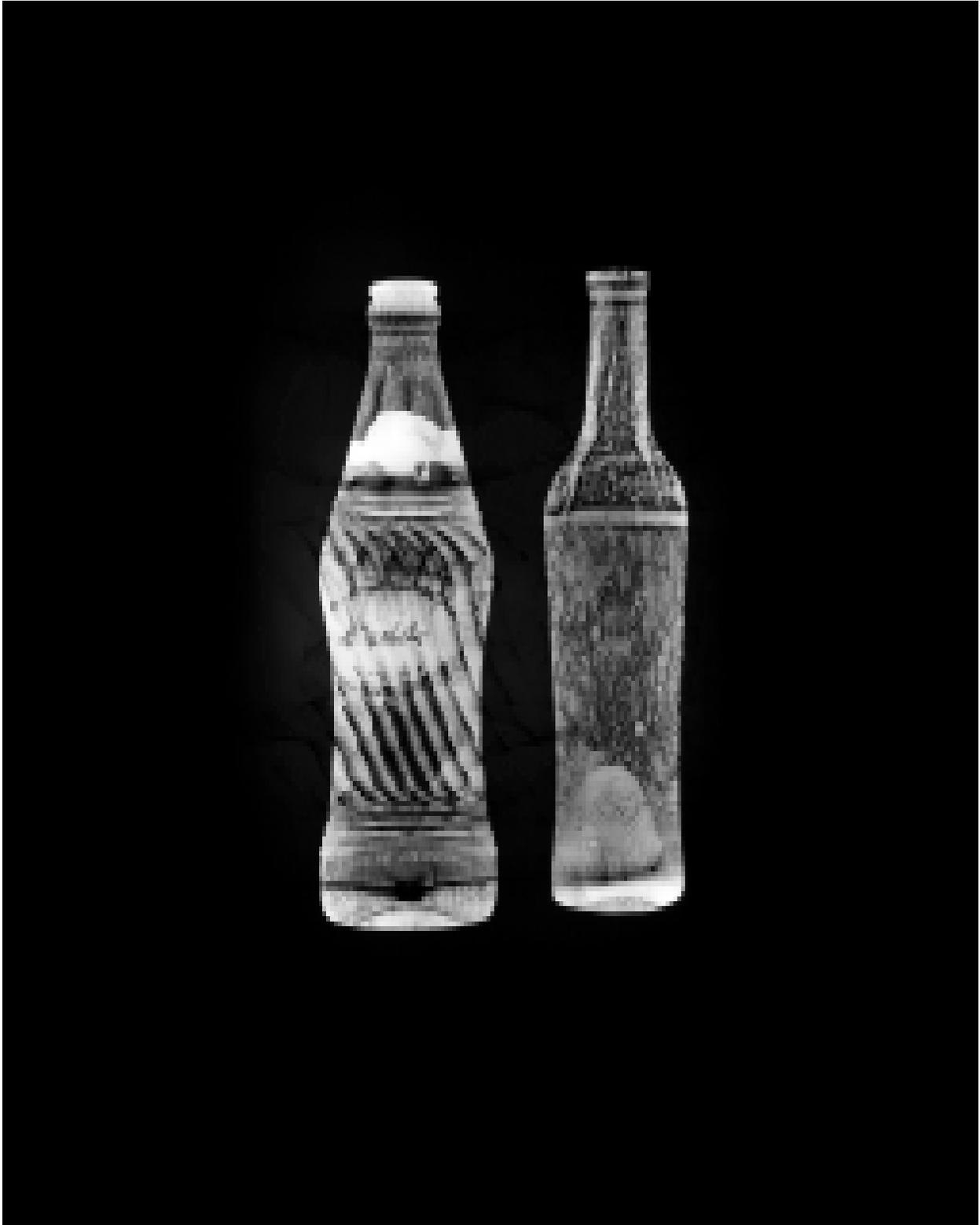
Notice the vertical bar running along the length of the bottle; this results from the seam of the bottle, which is thick and therefore transmits little light.



Above:

SH: These are Ball Atlas jars used for canning. The letters are on the top surface of the bottle, so they appear diffuse. And all of this dotting suggests that there's something in there that we can't see that is actually opaque, something that blocks the light, creating the white spots.

JC: Well, it doesn't have to be an opacity. It could be refractory. The light is being bent away from some areas of the glass.



SF: You think these are all clear bottles, but they've got these amazing differential patterns. I'd be interested in what an ophthalmic lens—a high quality lens—looks like, as opposed to cheap glass in a coke bottle.



These photograms are negative images; the dark areas received the most light and the bright areas received the least. Raised patterns on the glass (such as those spelling the word “water”) form cylindrical lenses that focus light into bars or lines. In this image, the dark edges inside the letters are the focal lines of the cylindrical lenses, where intense light was focused onto the photo paper.



SF: Now I see that when you have the light directly over one of the circle lenses and you're focusing its image on the table, you get a nice spherical image. And the neighboring circles are just wiped out.

BSR: So that splotchy pattern inside the honeycomb is just the distortion of those little circle lenses?

JC: Yes, the light is getting bent away. If you have these rays that are all coming through this complex surface, they're all going in different skewed directions. And depending on where you put your screen or photographic paper, you're going to catch different patterns of rays.

SH: I'm always interested in what this material is that's causing these refractive patterns. We should try and say something about this. The idea that an artist would never have a scientific explanation, largely for what's occurring, interests me. I like the poetry of all that, and how we can begin to explain phenomena. It is almost enough that it's beautiful. . . but so many people wonder, and have questions about it.

JC: Understanding the process by which the images are generated could help, in terms of thinking of new things to try. But you're right, you don't have to understand it to appreciate it.

SH: It sort of shows a character, like if a bottle could speak. I haven't done any thing to manipulate it. I want to see how much the bottle can say about itself.

JC: It's the way light plays through it. . . it's like light is the voice for it. ■

Facing page:

A dirty bottle, left, is accompanied by a clean cousin at right.

SH: Here's an example where the bottle on the right was completely clean and smooth, but it shows all kinds of patterns.

SF: To us, it's just glass, but when it's heated and molded you get these funny things, these patterns that show up in the photograms.

SH: Yes, and the dirtier the bottle, the more clear the image.

SF: That's because dirt causes light to scatter. So the film beneath the dirty bottle is more uniformly exposed.

In the Artist's Words:

The process of my engagement is investigative and involves looking for the essential qualities of specific "things," seeing the immediacy of their potential, and the relationships between essence and form.

Without use of a camera, the photogram process allows the object to be recorded in and of itself, through the introduction of light. This way of working often *volunteers* a deeper point of reference to my question concerning the primordial nature of things. In the *Empty Bottle Series*, the photograms revealed details of visible and invisible, formed and formless matter, challenging my initial, superficial understanding of these objects as a whole.

One of the intriguing aspects of working with glass is that it appears to have a direct affinity with what we call Photography or *Light Drawing*. When the bottles are brought into direct contact with the photographic paper, a short light exposure makes visible how light refracts around the inherent qualities of salt, water and silica—the physical materials glass is made of. These elements give both the vessels and the photograms their perfect form, and are poetically mirrors to one another. Through the capture of chemical and physical processes, the basis of the poetic is revealed. The bottle's "soul" and body appear simultaneously.

Susannah Hays received her MFA in photography from the San Francisco Art Institute and is currently represented by Scott Nichols Gallery. She is an artist-in-residence at Landmark, a site in the Sunnyside district of San Francisco, and is completing her thesis, "Between Cedar & Vine," in Visual Studies at the College of Environmental Design, UC Berkeley.

All images appear courtesy of:
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