



# Turning the Lens on Chemistry

**Interview with Felice Frankel,  
at Harvard University Science Photographer**

*By Christen Brownlee*

***What does chemistry look like? Is it a jumble of old test tubes, a plain Jane phase diagram, or a ball-and-stick model of a molecule? With the right eye, those concepts you read about in textbooks can be seen in a different way—and they can look more exciting and vivid than you can imagine.***

***For almost two decades, Felice Frankel has been taking photographs of scientific phenomena, with a particular focus on chemistry. She helps scientists come up with new and better ways to visually communicate their findings, and she helps nonscientists to see—literally—how fascinating chemistry can be. I spoke to Frankel to find out what it takes to tell the story of science in pictures.***

I love what I do now, but I had no idea this was an option back then.

***Why did you decide to focus your pictures on science?***

In 1991, I received a fellowship at the Harvard Graduate School of Design. For a year, I lived on the Harvard campus and was given stipend to audit any class I wanted. I decided that I was desperately missing the science world, so I sat in on as many science classes as I could. Someone recommended that I'd like a particular class for freshmen because the professor was very visual in the way he taught molecular biology. That professor happened to be a renowned chemist named George Whitesides.

After one of his lectures, I introduced myself to him, so he invited me to come by his lab. He was just beginning to work on a new

## ***How did you get into photography?***

It was pretty much an accident. When my husband returned from the Vietnam War in 1968, he brought me a gift: a very fine camera. That was one of the first pieces of luck that got me into my career. The camera worked very well, and it turned out that I had some talent in composing and seeing images that made good pictures. I started volunteering at a local public television station to make images of their productions.

One day, an architect who was designing a new building for the station asked me if I could take some architectural photos for him. I started taking pictures of the building and its interior. That experience led me to working for various landscape architectural firms, taking pictures of gardens and landscapes. I just enjoyed creating space on film!

## ***Do you have a science background?***

Yes, I majored in biology and worked in a research lab after graduating from college. When I was in elementary school, I told everyone that I wanted to be a chemist. Even at that

age, I was always curious about why things are the way they are—which is all about chemistry. I took a lot of science classes in high school, and I loved all my science classes in college. I knew I was on the right track for my career, but I didn't think I was smart enough to go to graduate school. I think it's important to know that even people who are not brilliant from the beginning can contribute later in life.





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chemical process called soft lithography that controls the nature of surfaces. The technique involves creating a small stamp out of a soft, stretchy material. Chemists use the technique to create hydrophilic and hydrophobic patterns on surfaces, that is, patterns that absorb and repel water, respectively.

Whitesides and scientists from his team had taken pictures to illustrate this phenomenon, but it was hard to see what the pictures were trying to show. I said, “I think I can improve these images—let me give it a shot!” Before Whitesides and his colleagues placed water onto the surface, I decide to put dye in two vials of water, one green and one blue. With a syringe, I plopped water from each of the vials on the surface in different areas. The water wet the surface, but stopped at the hydrophobic area. It was much easier to see what was happening by using different colors—the pictures we took tell the story very well.

I started going into other scientists’ labs to help them visually communicate about their work. Eventually I got a position at the Massachusetts Institute of Technology and worked there for three years. Now, I am at Harvard directing a program called Envisioning Science and helping scientists visually explain their findings through pictures.

### **Why is chemistry your main focus?**

What gets me going as a photographer is paying attention to what I see around me. Right now, as I’m talking to you, I’m seeing the reflection of a glass on a metal table. You might say, what does this have to do with chemistry? Well, a lot. There’s the structure of the glass, the optics of reflection—these things make the image what it is.

One of the biggest problems in chemistry is that chemists have not done a good job of showing people that chemistry is everywhere. The things we see are about phenomena that can be explained, and chemistry gives us an inkling about why something is the way it is.

### **How do you come up with ideas for your pictures?**

Sometimes, scientists ask me to help improve the images they have already taken. Other times, I get to play! It is a process of discovery where one idea leads to another. That’s what happened for one picture that I took of a ferrofluid. It is a fluid that has magnetite suspended in it. It’s pretty ugly on its own—just black and not terribly appealing.

Whitesides suggested that I play with it, and he gave me some magnets. I started out with three magnets under the slide holding the fluid, and I kept adding more magnets. With seven magnets underneath, the fluid began to take on the shape of a flower. I thought color would help make a compelling image, so I put a yellow Post-It note under the slide and a green card above for the fluid to reflect back. Playing around is one of the best parts of where I am now!

### **How important are images to science?**

Very important! Images are essential for scientists and for the rest of us. I peek around while scientists are getting their journals

in the mail, and the first thing they do is flip through the pages looking at figures. I don’t understand why figures are one of the last things most scientists send when they submit a paper!

In my opinion, it’s so important that thinking visually about their ideas should be part of the scientific process from the beginning. Also, one of the most important parts of my work is encouraging people to be more interested in science and chemistry. If I make an image of a chemical phenomenon so engaging that it makes people ask questions, that’s when I feel successful. That engagement is the first step to understanding.

### **What advice would you give to students who are interested in making scientific images?**

Start practicing taking pictures if you like to. Or, if you don’t have a camera, try drawing—drawing makes you pay attention, and it’s very good training at learning how to see things in a different way. You can also practice going through your science textbooks, looking at an image, and really dissecting it. I bet that you can come up with a better way of expressing the ideas in each figure!

Honestly, I never imagined that I could contribute to science—I didn’t think I was smart enough. But this world takes all kinds of smarts. It’s not always about memorizing everything or having the best grades, though those can be important. But it’s also about paying attention to what happens around you and asking questions—being curious. I don’t think I’m doing anything that’s terribly special, but what’s driving me is my extraordinary curiosity about the world. ▲



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