Some of you might want to present what happens over time with your photographs.

Other than creating a video, it's usually quite compelling when watching a dynamic phenomena that's true.

And if you think about it, all of science is ultimately dynamic, right?

Things change over time.

We generally assume one has to watch a moving image to see that change.

So here, for example, you are seeing something called the Belousov-Zhabotinsky reaction.

It's a complicated oscillating reaction that we're observing within a Petri dish.

But it's not a video, in the sense that it wasn't taken with a video camera.

You're seeing a series of still images that I made and I was privileged to make in professor Zhabotinsky's lab at Brandeis.

I took the images 11 seconds apart over a period of five minutes.

By the way, I made the images in film, which became slide formats, as you might remember-- or then again, maybe you don't!

And you're seeing digital scans of those individual frames.

We're seeing the spiral waves forming.

A color indicator allows us to see the reaction.

So what we're really seeing is a series of still images, one right after the other.

That is in fact what a moving image is, isn't it?

So that looks pretty interesting.

But in my opinion, just as interesting, is seeing the individual images lined up in a grid, so that we can compare one image to the other, and note two changes that occur.

I am convinced there is a place for this kind of presentation.

Here's another example.

You're looking at a one centimeter across circular "sandwich", let's call it, of two pieces of glass.

The glass contains, within this "sandwich", material called block copolymers in a solvent.

And over time, the solvent evaporates around the edges so that over time the block copolymers self assemble in different orientations.

And that change is visually translated into changes in color.

And so again, we're seeing a series of stills, one right after the other, viewing it as a moving image.

But here too, looking at each side by side can clarify exactly what is going on.

I just want you to think a little bit about seeing a series of stills instead of only an animation.

By the way, here is that still image in the journal.

Let's talk a little bit about showing scale in your presentations.

My purpose here is to nudge you to think a little differently from perpetuating the standard approach to showing scale within an image.

Instead of for example showing that overused coin side by side with your device, how about making the composition ever so slightly more interesting.

You could also think about showing your device on top of something other than a coin, for example, something more recognizable and more interesting in structure.

In this case, I use a compact disk, which might not be familiar from years to come, but I'm trying in here anyway.

I hope you still know what it is!

And in the caption we can get more information about the size of the device or the material.

And here we're seeing an image of a structure, giving the reader both a sense of scale and property.

The presence of the coins suggests the scale of the small objects, but we're also seeing that the structure itself can collapse and then bounce back, which is in fact the important part of what this is about.

In this image, which we'll see again in week six, you're seeing a syringe needle, which I used to place some colored water onto a surface.

It's a suggestion of the scale of the square drops of water.

It isn't quantitative.

But just a hint of a size, if you know the size of the syringe needle.

And another way you might present an idea of scale is to show something from various points of view as we zoom into the material.

So here is that old computer memory core we saw before.

Something I'll bet most of you haven't seen before this class.

And in the next image, I made the picture with a 105 lens getting closer to the material.

And again, here I'm coming even closer with another tool, something called a stereo microscope.

Once again, even getting closer with a compound microscope.

And finally, I made an image with a scanning electron microscope, which I've colored.

So yes, it's true.

I'm not exactly showing you the exact size of the material, but I'm taking you sort of through a sense of scale and maybe sort of telling a scale story.

The same with this morpho butterfly wing.

As we zoom into this structure, first taken with a camera and lens.

Then getting closer to the material, looking with a colored scanning electron micrograph, we see more detail.

And even getting more enlarged, seeing it with another scanning electron micrograph, which I colored.

Now it appears blue initially, but there's no blue dye present.

The color is due to the structure of the wing, which is what we're seeing.

And it's an interesting story, which I suggest you look into.

Here's another idea.

Instead of always placing a scale bar either in the lower right hand corner or the lower left hand corner, how about if we place the scale bar within the image in a more designed approach.

You just did see an example of this.

And here's another example.

I've placed and labeled the scale bar within the image.

The full design of the image works better.

The information is there, but doesn't compromise the aesthetics of the image.

The scale bar works with it.

And the same with this image, which you've also seen before.

The bar doesn't always have to be on the bottom right or left, unless of course the journal insists on that.

There is no reason why it has to be placed in that format.

That's one of those perpetuated rules that, in my opinion, have no logic to it.

For our book On The Surface of Things, we wanted to suggest a comparative sense of scale when looking at all of the images in the book.

We used the head of a pin, which measures about between one to two millimeters, as a reference point.

Next to each image, you see a blue outline of a pinhead made relative to the size of what's in the photograph.

So for example, looking at this image of ferrofluid, the pinhead appears around this size.

Note the blue circle.

But when we have to zoom way down to the nano scale level in order to see the indentations of this compact disk, the pinhead circle almost becomes a straight line.

We hardly see the curvature.

Because the indented areas are so small, we cannot use photons to image that surface.

We have to use electrons with a scanning electron microscope.

So just imagine traveling down to that nano scale.

Well the pin head enlarges as you pass it by.

I think it worked quite well for the book.

I hope you do.