PROFESSOR: In the next set of demonstrations, we're going to illustrate some of the very classic phenomena associated with the diffraction of light. I hope that there will be educational but also a lot of fun to see these effects. We'll start first with the Fraunhofer diffraction, both in one dimension and two dimensions. And then we'll go to Fresnel diffraction.

So let's start first with Fraunhofer diffraction associated with a single slit. The setup is, over here we have helium-neon laser, and here is the beam from the laser. We reflect it by this mirror here, and then we reflect it again by this mirror here onto the slit.

This slit is an adjustable slit. By turning this knob here, I can adjust the slit. But in order to see that indeed this is a slit, I'm going to put a screen over here, so that when I adjust the jaws of the slit here, you can see that, indeed, I am varying the spacing between the jaws. Of course, when it gets very small, it's difficult to see. So here's our adjustable slit, and here's the laser beam going through the slit. And then the diffracted light then falls on the screen over there, which is about 200 centimeters from the slit.

So, now, we're ready to look at the diffraction pattern. So if we have a close-up then of the screen, we see the diffraction pattern for the slit separation that I have over here. Now, the wavelength of the light, that of the helium-neon laser 6328 angstroms-- so I gave you the separation between the slit and the screen, which is 200 centimeters, so now you should be able to calculate the slit width from the diffraction pattern.

Now, to help you do this calculation, we have, on the screen, markers. And the separation between these markers is 5 centimeters. So there are 5 centimeters markers on the screen. So now you have all the tools to calculate the slit width as I adjust the slit separation.

So let me start with a very narrow slit where the central lobe is-- you can make it almost 5 centimeters or so. And you see the other lobes, the weaker one. And maybe if we can overexpose a little bit, we can see that, indeed, there are lots of lobes.

But if we expose for all of them, then the central one is going to get way overexposed. So, in general, we'll be looking just at a few of them. So, now, let's go back to where we were before. And then we'll start again at a slit width so that the central lobe is about a few centimeters wide. And then I will now make the spacing-- whoops-- wider. And you can see the central lobe now will get smaller and smaller.

And now, you can even see the spacing between the jaws. And here we are. You can see it gets-- the intensity is so high in the central lobe, that we are saturating. But I think this is a pretty good illustration of the Fraunhofer diffraction pattern of a single slit.

Now that we've seen Fraunhofer diffraction pattern associated with a single slit, we're going to make life a little bit more complicated. We're going to look at the diffraction pattern of two slits.