PROFESSOR: Now, we're ready to look at Fresnel diffraction from circular apertures. The setup is again the same as before. But let me go over it again.

Here, we have a helium neon laser. The beam from the laser gets reflected by this mirror and then gets reflected again by this mirror into this lens. This is a short focal length lens, which is focused into a pinhole-- an adjustable pinhole-- and the light from the pinhole is a spherical wave. And you can see it here on the card, it's a spherical wave. And then we let it hit the screen.

Now, we're ready look at Fresnel diffraction from apertures. We have two apertures for you. And I'm going to place the first one in the beam. So now, if we can look at the screen while I'm adjusting the aperture.

Now, here we are. It's a fixed aperture. It's 1,000 microns in diameter. And as we can see, we see the same kind of Fresnel diffraction pattern as we saw with the slit. We see lots of fringes. They get finer and finer as you approach the center. And, also, the contrast is less and less as you approach the center.

But what I'm going to do now, instead of keeping the distance fix, is vary the distance between the aperture and the light, or the aperture from the pinhole. And I would like you to watch what happens. So now, I'm going to move the aperture very close to the pinhole, and then I'll move away.

And then you can see, first, you see lots of fringes. And then, as I move away, you're seeing fewer and fewer fringes. And if you look in the center, I hope you can see that is a white spot in the center. Now we have a dark spot in the center. And then, now we're getting fewer and fewer fringes until we have only two or three.

Now, let me go back towards the pinhole or towards the lens. You see the increase in the number of fringes. Now, again, this is very interesting. And I'm going to leave it to you to figure out.

Here we are, very close to the lens. And then when we move away [INAUDIBLE] lens. Now, what I'm going to do, I'm going to move to the second aperture, which is 400 microns in diameter. And here we are.

Let me again pick it up. Here we are. Now, this diffraction pattern looks slightly different. And, again, I want you to explain what's going on here. Again, now, I'm going to move this new aperture, 400 micron diameter aperture, as close as possible to the lens. You can see one ring inside, and then now you see the bright dot in the middle, and the bright dot becomes a dark spot in the middle. And now we get a white dot and the brighter dot in the middle.

And here it's almost beginning to look like Fraunhofer diffraction. So here, let me move towards the lens-- towards the focus of the lens. I mean. You can see how the pattern changes. And as we move away, the pattern changes again.

So let me hold it over here. Let you look at it. And I hope you'll be able to figure all this out. Remember, the diameter of this aperture is 400 microns, and in the previous one it was 1,000 microns. And again, the light is, as I say, being focused by a lens onto a small pinhole, and then we had a diverging beam that is impinging on these two apertures.

So, in summary, we've seen a variety of diffraction patterns. We've seen one-dimensional Fraunhofer diffraction pattern. And also, we've seen two dimensional Fraunhofer diffraction patterns. And, finally, we looked at Fresnel diffraction associated with a slit, or an adjustable slit, and also with apertures. And then we saw how the diffraction pattern changes as we move the aperture closer and closer to the focus of the lens.