PROFESSOR: Now, I'm going to show another way of reducing fringe contrast. This one has to do with the polarization of the light coming out from each arm of the interferometer. The setup is the same as we had before, except that I've added a polarizer here to clean up the polarization before we enter the interferometer.

So first, let's check on the polarization coming out of each arm the interferometer in the present setup. And I'll do this by putting a polarizer out here. And then I'm going to block each arm and check on the polarization.

Now, as we can see on the screen, when the arrow of the polarizer or the transmission axis of the polarizer is along the horizontal, I have a lot of light. And when the arrow is vertical, I've extinguished the light. Which means that the light coming out from this arm of the interferometer is plane polarized in the horizontal direction. That's for this arm.

Now, I'll check on the beam coming out from the other arm-- from this arm here. And, again, there's a lot of light when the arrow is horizontal, and it's extinguished when the arrow is vertical. Which says that the polarization of the light coming out of the two arms is the same in the horizontal direction.

Now, I'm going to rotate the plane of polarization of the light coming out from this arm by using this quarter-wave plate, which I will insert in this arm. Now, as we know, light going through a quarter-wave plate, twice its polarization will be rotated, as we'll see. So now I want to show that the light from this arm, going through this polarizer here, onto the screen, it's going to have its plane of polarization changed as I rotate the alignment of this quarter-wave plate.

So with the arrow over here, we can see we have a lot of light. And as I rotate the quarter-wave plate, I see that I can extinguish the light. Which means now, the polarization of the light coming out from this arm, is orthogonal to the transmission axis of the polarizer. So good. So, in this way, then I can rotate the plane of polarization from 0 to 90 degrees by simply rotating the quarter-wave plate.

Now, I'm ready to look at the effect of polarization rotation on the fringe contrast. And what I'll do first, I will take out the polarizer. So now I have, then, two beams coming out from the interferometer. One has polarization in the horizontal plane. This one here, I can change the state of polarization anywhere from horizontal to vertical.

So let's look at the screen. And we see that we have good contrast in this position. Then, as I rotate the plane of a polarization of this arm by 90 degrees, you can see that the fringe contrast disappears. And, in fact, in this position, you don't even see any fringes at all.

If I go back to the original position, you can see that the contrast comes back. And we go back again, watch how the fringes, because the polarizations are orthogonal. And just to show you that, indeed, I'm not hiding anything, I'm going to show that there's still light coming out from each arm-- light coming out from this arm and light coming off of this arm. But when I superimpose them, there's no interference. Now, let me put it back to the position where the polarizations are equal. And, indeed, we get the good contrast back again.

So, in conclusion, we've shown that orthogonally polarized light does not interfere, and that's why we get very low contrast fringes when we try to interfere orthogonally polarized light. So then, in any interferometer experiment, you have to make sure that the polarization is the same coming out from each arm of the interferometer. The question I want to leave with you is why orthogonally polarized light does not interfere.