



CROSS POLARIZATION

On the Move

Light waves, believe it or not, love to wiggle. Certainly the picture doesn't appear to move or wobble, but the light allowing you to see the picture does wiggle and vibrate. The light bouncing off the poster and going to your eyes vibrates randomly in all directions: up and down, or left and right, or other directions. This is called **unpolarized** light. Some filters, called polarizers, only pass one polarization of light and block all others. After passing through a polarizer, light becomes **polarized**. Some, but not all, sunglasses are made out of polarizers.

Some materials have a property known as **birefringence**. Birefringent objects can rotate or change the polarization of light passing through them without absorbing the light. For example, up-down polarized light hitting a birefringent object may come out left-right polarized. How much the polarization changes depends on lots of things, like the thickness of the birefringent material, the orientation of material relative to the polarization of the light, and even the color of the light passing through the material.

So, how do we get rainbows from plastic cutlery? If you have two polarizers arranged so that the second

polarizer exactly blocks all the polarized light passing through the first, then no light gets through, and we call the pair of filters **crossed polarizers**. However, when you put a birefringent object (such as a piece of clear, plastic cutlery) in between the crossed polarizers, the birefringent object can change the polarization of light so some light can get through the second polarizer. In the picture, the background is black because no light gets through the crossed polarizers, but where there is plastic, you see colors. Different colors indicate different amounts of polarization change caused by the plastic.

If you have a set of crossed polarizers and some clear objects to test, try rotating the objects between the polarizers or even bending them a little. Stress, from bending, is a great way to change the birefringence in an object and change the polarization of the light passing through it.

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