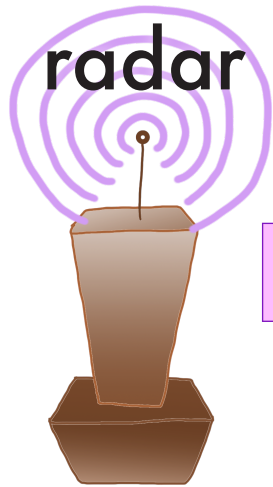


applications



radar

Radar technology can be used to locate objects in the air as many as three hundred miles away by bouncing electromagnetic waves off them! Radar antennas isolate their signals based on frequency and precise polarization.

Studying polarization helps even when no electromagnetic waves are involved!



seismography

Optical scientists inspired seismologists to look at the polarization of a seismic wave. This model of seismic activity gives more accurate measurements and saves lives.

WiFi antennas send out waves in the air that carry information and are picked up by something else, like your laptop or phone. It's a lot like radar that way!



WiFi

In the past, WiFi would send out linearly polarized signals, but signal was lost in rotatable devices like tablets. After that dual polarization, a combination of vertical and horizontal waves, was introduced, making WiFi a lot more versatile!

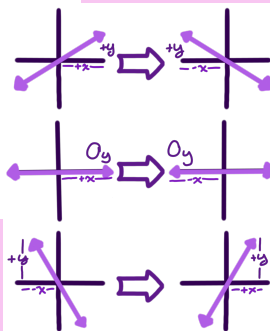
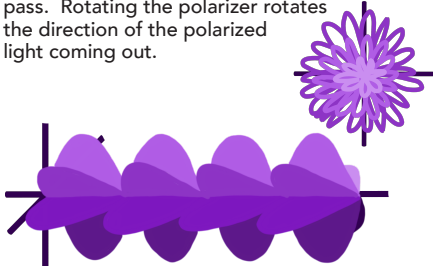
polarization: the shape of light!

Optical polarization describes the shape of an electromagnetic wave in space. It's the hidden gem of optics and electromagnetism: from texting to flying planes, polarizing light has a crucial role in the way we live our lives. Let's see how!

polarizers

The light in a laser beam is initially unpolarized. That means it travels in all directions equally. A polarizer blocks all light that isn't in a certain direction, leaving linearly polarized light.

The polarizer has a grid within it that determines the direction of light that it will let pass. Rotating the polarizer rotates the direction of the polarized light coming out.



Linearly polarized light can be seen as having different components in a coordinate plane - an x-component and a y-component.

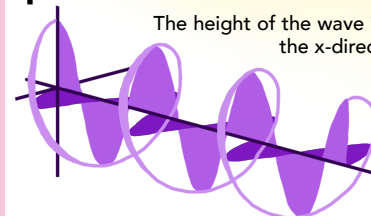
A half-wave plate will cause one component to lag by half the wavelength of the light, so that the light wave which emerges is linear in a different direction.

Creating lag in one component of a wave is called introducing a phase.

half-wave plates

quarter-wave plates

A quarter-wave plate introduces a phase to one component that is a quarter of its wavelength. This has the interesting effect of producing light that is polarized in the shape of an ellipse!



The height of the wave is never zero - as the x-direction is increasing the y-direction is decreasing and vice versa. That's how it ends up being an ellipse.

optical tools

