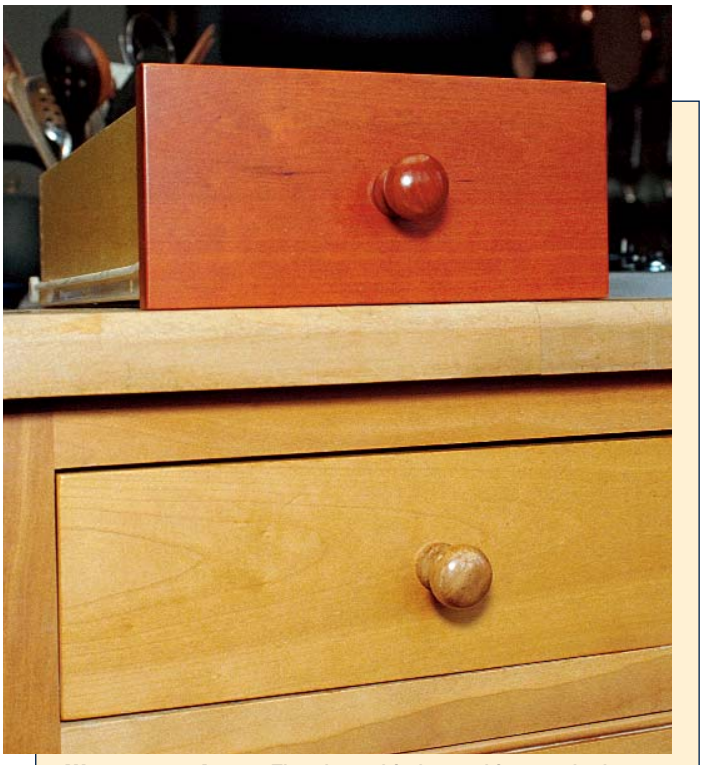
What Woodworkers Need to Know about Light

Use or avoid its effects to your advantage

BY JEFF JEWITT



Way too much sun. *The cherry kitchen cabinet at the bottom has been bleached from 12 years of direct sunlight through a window facing south. The drawer on top is from another cabinet facing north. The ambient indirect light has given it the deep red patina usually found on the surface of cherry.*

For woodworkers, light is a mixed blessing. On one hand, it energizes water, carbon dioxide and chlorophyll to produce the nutrients that make trees grow, providing us with raw material. After a tree succumbs to the chainsaw and the wood has been cut, shaped and finished, light combined with oxygen changes the color of the wood to the patina so sought after by woodworkers and antique dealers. But light can also destroy (see the photo above). Left unchecked, it can split, warp and bleach wood and ruin most finishes. To improve the life span of your projects, you need to know how to deal with the beneficial and the destructive aspects of light.

Pigments resist sunlight better than dyes do. *The right sample of each of these two pairs of stain-color samples was exposed in a laboratory to the equivalent of two years of sunlight in Florida. Dye stains (left) did not fare as well as the earth-tone pigment stains (right).*

What light is and what it does

To understand what light does to wood, you have to understand just a little bit about light. Light is a form of radiant energy expressed or measured by its wavelength. Those forms of energy that have long wavelengths—radio waves and microwaves—don't seem to pose any problems with wood and finishes. But the concentrated energy in the shorter wavelengths of infrared (heat), visible light and ultraviolet (UV) light can severely affect the surface of wood and most finishes applied to it. This higher energy disrupts the way the molecules of wood and finishes are held together. In combination with oxygen (photo-oxidation), light causes chemical reactions that fade stains, turn finishes yellow and trigger cracks in the finishes as they degrade.

It is the visible light that causes color shifts in wood, making light-colored woods turn yellow or brown, and dark-colored woods turn slightly lighter. Some woods, such as cherry, mahogany, padauk, purpleheart and teak, change dramatically. Cherry and mahogany turn from a light pink to deeper red and brown tones. Padauk and purpleheart start out as bright red and purple before they shift to a

more muted brown. Teak goes from light brown to an orange color. Some of these changes brought on by exposure to light are not necessarily unwanted and may take a long time to occur. By learning to anticipate changes and to minimize the more harmful ones, you can better preserve the fruits of your hard work.

Reduce the exposure

Avoid harsh lighting conditions by keeping furniture away from large windows, especially those that face southwest. If wood is exposed to strong UV light for long enough, it will eventually become bleached. On woods that change color quickly, avoid leaving objects that partially cover the surface for long periods of time. Place tablecloths on large horizontal surfaces such as dining tables, and cover windows with drapes and curtains that will filter out some of the light. Glass and Plexiglas are good at blocking certain longer wavelengths of light, but they are less effective at screening out the damaging shorter wavelengths. You can buy glass treated with chemicals that block the shorter wavelengths by absorbing them. You can also install treated film (see the photo below) over existing glass to minimize damage to furniture. Blue films work best at absorbing the most harmful UV light. (Look in the yellow pages under "Glass Coating and Tinting.")

Choose more durable finish materials

Dye stains are particularly sensitive to strong light (see the bottom left photo on the facing page). Dye stains that are called *fugitive* are not lightfast, and they will fade even when exposed to the relatively low levels of light found indoors under fluorescent bulbs. Lightfast (also called *metallized*) dye stains can withstand extended doses of interior exposure without visible fading, but there are no dye stains rated for exterior use. While lightfast dye stains are certainly appropriate for most interior woodwork, I'd avoid using them on stationary items, such as window trim, or on cabinets and furniture that will get a great deal of exposure.

Where strong sunlight may be present, it's always better to use a pigment stain (see the bottom right photo on the facing page). Pigment stains resist fading, and the class of pigments called iron oxides (or earth colors) are extremely stable. In addition to being lightfast, a surface stain made of these pigments will protect the wood because it reflects and dissipates the energy in UV light. Because iron-oxide pigments naturally appear as red, brown or yellow, they make good wood and deck stains. You can apply a pigment stain over a dye stain on wood to get the benefits of both.

Some finishes are more prone than others to turning yellow and cracking after prolonged exposure to sunlight. Linseed oil and linseed-oil-based varnishes, phenolic resin varnishes (marine and spar varnish), nitrocellulose lacquer and oil-based polyurethane all fit that category. To minimize the effect of yellowing, you can substitute tung oil for linseed oil. Also, varnishes made with safflower oil or soybean oil will not turn yellow as much as those made with linseed oil. A good substitute for nitrocellulose lacquer is cellulose-acetate-butyrate (CAB) acrylic lacquer or butyrate lacquer, which do not turn yellow. Acrylics are also found in water-based finishes, usually combined with nonyellowing polyurethane resin. Most water-based finishes made of these resins will not turn yellow. Catalyzed lacquers and varnishes that incorporate nonyellowing amino and alkyd resins also work well, but catalyzed lacquers that contain nitrocellulose resin and oil-modified alkyds will turn yellow with exposure to sunlight.

Blue shades are best. *The color of the tinted film in these pull-down shades shields interiors against the most harmful and damaging UV light.*

Sunlight alters the color of wood

Indoors, a moderate amount of sunlight will affect different woods in different ways. Some finishes retard this process better than others. Extreme exposures of sunlight have the effect of bleaching most woods.

WOOD	EFFECT
Ash	Yellow
Birch	Yellow
Cherry	Deep red
Mahogany	Deep red
Maple	Yellow
Padauk	Dark brown
Pine	Yellow
Purpleheart	Dark brown
Red oak	Dark pink
Teak	Orange
Walnut	Lighter brown
White oak	Darker yellow-brown

Can you really prevent wood from changing color?

You can stall or minimize the change in color, but eventually the wood will change. Lighter woods such as ash, birch and maple all tend to develop a strong yellow color with exposure to light and oxygen. Darker woods develop yellow hues, too, but the effect is not as noticeable—it simply adds a warmer tone to the overall appearance of the wood.

If you want to keep a light wood light, consider bleaching it with a two-part peroxide bleach. If you want to keep any wood dark, use a lightfast stain to color it. So, in summary, there are two things you can do to stabilize the color of your projects as long as possible: Limit their exposure to strong light, and use a finish with acrylic in it. A third thing you could do is displace the oxygen in the room with argon, but I doubt your houseguests would appreciate that. □

Jeff Jewitt writes frequently for Fine Woodworking *on finishing topics.*

Photos: William Duckworth