



This 18th-century Boston Bombé chest by Tom Lee, a graduate of the North Bennet Street School, Boston, Mass., illustrates the excellent color and grain patterns of true mahogany.

Mahogany

Classic-furniture timbers are getting harder to find

by Jon Arno

To build with mahogany is to share a woodworking experience with the skilled 18th- and 19th-century cabinetmakers who created some of the world's most cherished furniture. Unfortunately, fewer woodworkers are able to savor that experience today, because the true mahoganies, what the old cabinetmakers called Cuban and Honduras mahoganies, are in short supply. The trees, often growing more than 100 ft. high and as much as 40 ft. around, are found in ever smaller and more remote groves. Most of the original stands have disappeared; those that remain have been heavily logged. Usually only a few mahogany trees, two or three per acre, constitute a "stand," which makes logging inefficient and expensive. Harvesting is haphazard and often badly managed, with little thought given to ensuring adequate supplies for the future. Attempts to cultivate mahogany haven't been very successful: The tree is slow growing, requiring 60 years to reach economically

viable size, and many immature trees are destroyed by larvae of the widespread pyralid moth and ambrosia beetle. Also, the best of the highly figured lumber is often marked for use as veneer in production furniture shops or for interior decorative work, further depleting the supply. So mahogany, if you can find it, is expensive. For the real thing, cost can range between \$5 and \$10 per bd. ft. for clear, but plain-figured stock.

The true mahoganies come from several species in the genus *Swietenia*, but two species predominate: *Swietenia mahagoni*, the West Indies or island species, often called Cuban mahogany; and *Swietenia macrophylla*, the mainland species, found from east central Mexico to Bolivia, commonly called Honduras mahogany. With less true mahogany available, you're likely to find lumberyards stocked with substitutes, such as African mahogany (khaya) or even totally unrelated timbers, such as lauan, the so-called "Philippine

mahogany" or Australian "Red" mahogany, which is actually a *Eucalyptus*. Some of the substitutes, such as khaya, sapele and andiroba, are members of the mahogany family, which includes about 50 genera and nearly 1,000 species, and are fine cabinetwoods in their own right.

The differences between the substitutes and the real stuff aren't always obvious, even to a practiced eye. It isn't until you begin working with the woods that the real differences become apparant. True mahogany is easily worked and shaped. Its exquisitely Figured grain, hidden beneath the surface of roughsawn lumber, seems to come alive with a soft luster when planed. And stability, a virtue of true mahogany unmatched by any of its alternatives, may not be evident until months or even years after a project has been completed

A historical perspective—The Spaniards must have begun harvesting mahogany almost as soon as they arrived in the New World. It was used in the construction of a cathedral in Santo Domingo begun in 1514. And the Spanish colonists quickly discovered the advantages of mahogany for shipbuilding: Strong, but lighter and more buoyant than oak, mahogany is an ideal ship timber. It also became important for its excellent bending properties, ability to be carved and high resistance to dry rot. Although it is not as impervious to decay and attack by borers as is teak (*Tectona grandis*), the heartwood of true mahogany is a popular choice for ship construction. It is so durable, in fact, that logs cut and left to rot in Santo Domingo in the late 1700s were salvaged more than 50 years later, with the heartwood still sound. The common seamen preferred mahogany, because unlike oak, it was slow to burn and didn't splinter as badly when hit by cannonballs.

Although the English were actively logging the coast of Central America as early as 1638, it wasn't until more than half a century later that mahogany—the English at this time called it "cedar wood"—reached England in quantity. But by 1725, mahogany was the preferred wood, along with walnut and oak, for the finest English furniture. Thomas Chippendale (1718-1779) used mahogany extensively, and his furniture became the leading edge of style. By the late 1700s, mahogany was also flourishing in America: Chippendale's designs were popular with British-trained American cabinetmakers. For the colonials, this style, with its imported look, had status.

Chippendale used high-quality mahogany, but he relied on the

design of his furniture—its shell motif and claw-and-ball carvings—rather than on highly figured wood to achieve the furniture's rich appearance. With the introduction of the Federal style and its emphasis on simpler designs and straight lines, cabinetmakers began embellishing their furniture less and focusing more on the wood itself. Thus, the Federal style favored the more flamboyant and marble-like grain patterns that we now associate with the work of Thomas Sheraton (1751-1806).

Mahogany continued to be the premier cabinetwood in England and America through most of the 1800s. Its highly figured grain remained popular and contributed to the distinctive charm of the work of masters, such as Duncan Phyfe (1768-1854) in New York.

Thus, true mahogany is indispensable for the reproduction of period furniture, and although increasingly scarce, it continues to be the wood of choice for many woodworkers—a small wonder when you consider its characteristics. Few woods have as much going for them as true mahogany: Its durability, stability, structural uniformity and beauty provide a hard-to-beat combination. Because of this appeal, the woods of perhaps 100 or more species belonging to more than a dozen different genera and at least five unrelated botanical families have at one time or another been sold as "mahogany" (see the table at right). Some of them are fine cabinetwoods, similar to true mahogany in color, figure and density, and can sometimes pass as the real thing. But when it comes to true mahogany, pretty close isn't good enough.

Mahogany's characteristics—Among the true mahoganies, not even the closely related Cuban and Honduras species produce woods that are totally interchangeable. Both species vary considerably as a result of growing conditions, and some of the mahogany now coming out of South America differs substantially from that of the same species logged in Central America. The slower-growing island variety is usually a denser, heavier wood with tighter, more finely textured grain structure. But when less than ideal conditions produce slower growth, mainland mahogany, like the island variety, is also dense and finely textured.

Although the density may vary considerably from tree to tree, with specific gravity ranging from as low as 0.40 to more than 0.60 (oven-dry weight to green volume), the wood in a given board will have remarkably uniform density. As a rule, the mainland species density averages about 0.45. This makes it almost 12% lighter than black walnut (0.51) and a little too soft for applications that expose it to heavy wear, but it is surprisingly strong for its weight.

Few commercially important woods are as stable as mahogany: Tests conducted by the U.S. Department of Agriculture's Forest Products Laboratory indicate an average volumetric shrinkage of only 7.8% (green to oven-dry)—only about half the value for most popular domestic hardwoods. Sugar maple, for example, is 14.7%; black walnut, 12.9%; and white oak, 16.3%. Even black cherry, noted for its stability, measures 11.5%. Because shrinkage is small, mahogany dries with less tendency than most woods to check and warp.

Of at least equal importance to a wood's in-use stability is the amount it shrinks tangentially versus radially. When a wood's tangential shrinkage (shrinkage across the flatsawn board, i.e. perpendicular to the radius) is substantially more than its radial shrinkage, warp-producing stresses are magnified. Typically, most woods shrink about twice as much tangentially as they do radially. For example, black cherry has a tangential shrinkage of 7.1% and a radial shrinkage of 3.7%, producing a tangential/radial (T/R) shrinkage ratio of about 1.92. Black walnut is much better in this respect: With a tangential shrinkage of 7.8% and a radial shrinkage of 5.5%, its T/R ratio is only 1.42. But mahogany is even better:

The More Common Mahoganies		
	Common name	Genus
The mahogany family (<i>Meliaceae</i>)	American mahogany	Swietenia
	African mahogany	Khaya
	Sapele	Entandrophragma
	Andiroba (crabwood)	Carapa
	Rose mahogany	Dysoxylum
	Tigerwood	Lovoa
	Spanish cedar	Cedrela
The Lauan family (<i>Dipterocarpaceae</i>)	Philippine mahogany (Lauan Meranti)	Shorea, Parashorea, Pentacme
Mahogany look-alikes		
Family name	Common name	Genus
<i>Myrtaceae</i>	Australian red mahogany	Eucalyptus
<i>Guttiferae</i>	Santa Maria	Calophyllum
<i>Burseraceae</i>	White mahogany	Canarium
<i>Burseraceae</i>	Gaboon (okoume)	Aucoumea

With a tangential shrinkage of 4.1% and a radial shrinkage of 3.0%, its T/R ratio is a low 1.36.

Working with the wood—This tolerance to swelling and shrinkage is of great practical benefit, but from the woodworker's point of view, the real joy of true mahogany is found in its working characteristics. These characteristics are largely attributable to its structure. Mahogany is a diffuse-porous wood and has a very uniform structure. Unlike other diffuse-porous woods, such as maple and birch, however, mahogany's pores are larger. In fact, they are similar in size to those of walnut, but are more evenly distributed, making mahogany more uniformly textured than walnut. Also, unlike walnut, mahogany is still available in long, wide, warp-free boards. Cabinetmakers like this, because they spend less time dressing the lumber and jointing boards to width, making mahogany an ideal choice for large casework. And because of its high stability, mahogany can be worked to close tolerances with little fear of joints working loose over time. Straight-grain mahogany planes smoothly and easily. There is some tendency for the more highly figured woods to tear out, but it's not nearly as pronounced as with, for example, quartersawn cherry. There are harder cabinetwoods that can be easily worked with high-speed power tools, but few are as pleasant to work using handtools as mahogany, yielding fluidly to sharp cutting edges without excessive and tiring effort.

It's difficult to point to any specific characteristic to explain mahogany's special charm, but color is part of it. When freshly sawn, mahogany varies in color from yellow to pinkish red. It rapidly darkens to a warm, brown shade with highlights that vary from rich purple-red, most common in the island species, to amber-gold tints, occasionally seen in some of the lighter-color stock from the mainland. However, even the mainland species sometimes produce wood approaching the color of black walnut.

The island and mainland species produce mostly straight-grain woods, but interlocked, "ribbon" grain is not uncommon. Flamboyantly figured grain, such as fiddleback, blister, swirl, mottle and curly patterns, are available, but rare. Island mahogany generally is more figured, probably resulting from its slower growth. Unlike many woods that owe their unique figure primarily to some single, anatomical attribute, such as the large size of their earlywood pores or the dominance of their rays, the figure of true mahogany is like a composition, a "symphony" of subtle elements, each contributing to the wood's character without drowning out the others. On the tangential surface, the rays appear as short, dark, vertical lines approximately $\frac{1}{8}$ in. long, forming horizontal, wavy bands across the board at $\frac{1}{4}$ -in. to $\frac{1}{2}$ -in. intervals.

The vessels provide another striking component of the wood's figure. These tube-like structures are clogged with deposits that may vary in color from white to black in any given sample. When cut lengthwise, they pepper the tangential surface with vertical lines from about $\frac{1}{4}$ in. to $1\frac{1}{2}$ in. long, depending upon how true to the grain the board has been cut. White vessel markings tend to be more common in the island species, but here again, either species will produce deposits that range from chalk white to carbon black.

Also contributing to the figure in a very subtle way are fine, pencil-thin, white lines that meander across the tangential surface. These are caused by concentric rings of parenchyma cells that form periodically as the tree grows, much like annual rings. This also is an important feature to look for in identifying mahogany, but these rings are not always easy to see once the wood has been finished.

Mahogany stains evenly and is complemented by shellac, varnish, oil or lacquer finishes, but because of the wide variation in color and figure, it's advisable to match woods for a piece carefully. The finish can alter or emphasize color differences between boards, so try the

finish on a sample when selecting woods. Although mahogany will darken over time with exposure to sunlight, the deep hues, often associated with old furniture, result more from the darkening of the finish than from the wood itself. The appearance of true mahogany is enhanced by a certain almost-indescribable surface luster lacking in many of the mahogany pretenders, especially in the so-called Philippine mahoganies or lauans. Because this luster is more pronounced with dense mahogany, it is produced mostly in the island species, but both the island and mainland species finish beautifully. □

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Mahogany look-alikes

The two most common substitutes for true mahogany are African mahogany and the Southeast Asian lauans, which are popularly called Philippine mahogany.

The English began to exploit African mahogany in the mid-1800s when American sources of true mahogany began to dwindle. African mahogany, or more accurately khaya, closely resembles the true mahoganies in most important respects. Khaya is cut from more than one species, but the most important is *K. ivorensis*. The wood comes mainly from West Africa, although subtly different species of khaya are widespread from Portuguese Guinea to Angola and from the Sudan to Mozambique. The colors of these woods span the full mahogany range, from light pinkish tan to reddish brown, but they seldom exhibit the amber-gold highlights found in some of the mainland American timbers. The grain is often interlocked and somewhat more coarsely textured, yielding a striped figure on quartersawn boards. Generally, khaya enjoys the same complex symphony of elements in its figure as the true mahoganies.

Although it is true mahogany's closest substitute, it is not identical. Though highly stable, khaya's average volumetric shrinkage of 8.8% is a full percentage point higher than true mahogany. Its tangential/radial (T/R) shrinkage ratio of 1.41 is also slightly higher, and on average, khaya is a little lighter and softer than true mahogany.

Philippine mahogany, or more accurately lauan, may have been introduced into Europe and America from Southeast Asia at least as early as 1800, but it had little impact on cabinetmaking until the 20th century. Since World War II, its use has skyrocketed, and lauan is now our most important tropical timber. This plentiful mahogany substitute is cut from numerous Southeast Asian species, but they are not at all closely related to the mahogany family, *Meliaceae*.

There are at least 70 subtly different species of lauan, and they produce woods ranging in color from ash gray to deep reddish brown. Many of them have interlocked grain, which gives radially cut (quartersawn) boards a beautiful mahogany-like, ribbon-striped appearance; on flatsawn surfaces, however, they are seldom as figured as true mahogany. The lauans are generally more coarsely textured, far less stable and usually softer than true mahogany. Specific gravity ranges from about 0.30 to as high as 0.70, so lauan can be almost as light and soft as basswood (.28) or heavier and denser than white oak (.60).

The softer woods from the so-called "white lauan" group make good secondary stock for interior components, while the darker "red meranti" (from Malaya) make attractive primary woods. There are a few lauan species that should be avoided: Mayapis (*Shorea squamata*), for example, has a high gum content that clogs sandpaper and prevents finishes from drying. Also, some species in the Balau group are extremely hard and cause cutting edges to dull quickly. For projects where authenticity or historical accuracy is not important, lauan has a lot going for it: It is inexpensive; comes in a variety of colors, densities and grain patterns; and is available in wide, clear boards. Lauan is one of the world's most important timbers, producing more plywood veneer than any other hardwood.

The table at the bottom of the facing page should help in sorting out some of the woods you might come across while in quest of "the real thing."

—J.A.