New Thoughts on Old Wood: Differentiation of Mahogany and Its Look-alikes Using Laser-induced Breakdown Spectroscopy

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The expressive grain and rich color of mahogany made it the wood of choice in the 18th– and early 19th-centuries, and a valuable commodity within the Atlantic trade. The three species of the genus Swietenia (interchangeably referred to as mahogany) are indigenous to the Caribbean and South America yet frequently feature in furniture, architectural elements, and sculpture made in North America and Europe. The wood is a potent reminder of the commercial networks and systems of enslaved labor that bolstered European colonial expansion into the New World. Despite its ubiquity in the historical record, the three species cannot be differentiated using traditional microscopy, which has hindered a more robust understanding of the trade and use of mahogany. Historically, scholars of American and English decorative arts categorized all dense and lustrous wood as mahogany. A multi-disciplinary research project initiated by the Yale University Art Gallery, conservators Fallon & Wilkinson, and Yale's Institute for the Preservation of Cultural Heritage marries chemical analysis and archival research to explore the speciation of mahogany and the differentiation of true mahogany from its look-alikes.

 Wood identification through microscopy is typically accomplished using analysis of thin sections to observe salient anatomical features, but it is not desirable and sometimes not feasible to obtain suitable samples for microscopic examination. The goal of this ongoing collaborative project is to develop an in-situ, real-time analysis approach using a handheld laser-induced breakdown spectroscopy (LIBS) instrument and machine learning algorithms to discriminate between mahogany (genus Swietenia) and look-alike wood species. LIBS is a rapid, sensitive micro-analytical technique that simultaneously detects all elements yet leaves a mark that often cannot be seen with the unaided eye. The results of the study of several hundred wood reference samples and over 150 pieces of historic furniture will be presented along with a description of the advantages and limitations of the method for this application. The initial findings recalibrate our understanding of how raw materials traveled between American and European colonial centers, while affirming the practical knowledge cabinetmakers had about the wood in their shops. The findings also contribute to an expanding list of tropical hardwoods used in early furniture—the mahogany look-alikes—which suggest a more complex and global wood trade than has previously been recorded.