

Getting to the Heart and Soul of Objects of Reverence

Woods used in Santos: Their meaning and value in interpretation

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There are many questions that come to mind when viewing or studying objects of reverence (santos) that are made from wood. Where did the santos come from? What kind of wood is it made of? Why was this type of wood used? What is the tradition, with respect to wood use, of the culture producing the santos? Many of these questions can sometimes be answered by a microscopic examination of cellular structure of the wood. However, there are times when microscopic wood identification generates more questions than it answers.

Microscopic wood anatomy is a scientific endeavor with a long, famous history. One of the earliest materials used for microscopic observation by Antony van Leeuwenhoek (1632-1723) was bark from a tree. The most famous use of wood anatomy and identification in forensics was the work of Arthur Koehler at Forest Products Laboratory, whose analysis of a ladder used in the Lindbergh Kidnapping led to the apprehension and conviction of Bruno Hauptman in "The Crime of the Century" in the 1930's. A popular current use of microscopic wood anatomy and identification is to help authenticate antiques, as seen on Antiques Road Show.

Microscopic wood identification, when done properly, also has a firm basis in science. But wood identification, in general, can have an artistic facet, depending on; 1) the person doing the analysis, with respect to their background and experience (novice to expert and assumptions made), 2) level of detail noted (by eye, with the aid of a hand lens or a microscope), and 3) the size of the sample taken (hand size to the size of a match head).

Answering Questions

Why would anyone want to know what type of wood has been used in an object?

1. General Curiosity (what wood is that?)
2. Academic Studies
 - a. Authentication/Assigning Provenance (where it came from)
 - b. Cultural Traditions of Use and Trade (where was it made/where did it end up & why)
 - c. Replacement of Broken/Damaged areas/parts (conservation/restoration)
 - d. Forensic knowledge for Crime Solving (where it came from & comparing it to crime scene trace evidence)
3. Monetary Gain (Fine Arts Dealers)

- a. Authentication
- b. Provenance relates to Value

Limitations (Levels of Determination)

Microscopic wood identification and analysis from objects d'art have limitations not always apparent to conservators, curators, art historians and collectors. These limitations are based on many factors, including the size of the sample, the level that one looks at the sample (i.e. microscopic) and the evolutionary conservative nature of wood with respect to species determination. The hierarchy of plants is based on a taxonomic system developed by Carl Linnaeus (1707-1778), where each specific type of plant is given a binomial ("two-names") the genus (like our family names, e.g. Smith) and a species name (like our first names, e.g. John). The binomial is italicized, with the genus first and the species epithet second (e.g. Eastern White Pine is *Pinus strobus*). When one refers to an unknown species the term "sp." is used and when one is referring to more than one species in a genus, the plural "spp." is used. Similar genera are grouped into Families (ending in –aceae), similar families into Orders, similar orders into Classes, and similar classes into Divisions.

Determination of Genus

When people think of types of wood, they generally are thinking in terms Pine, Oak, Maple, Spruce, etc., which describe genera of trees (*Pinus*, *Quercus*, *Acer* and *Picea*, respectively). Even with small samples, identification of wood to the genus level is usually very accurate.

Species Groups

Species groups are groups of species, within a genus, which have anatomical similarity. For instance, the Pines (*Pinus* spp.) can be grouped into the Red Pine Group, White Pine Group and Yellow Pine Group. The Oaks (*Quercus* spp.) contain the Red (Erythrobalanus) and White (Leucobalanus) Groups and the Maples (*Acer* spp.) have species that separate into the Hard and Soft Groups.

Species Determinations

The microscopical determination of wood to the species level is usually not possible. These limitations are based on the evolutionary conservative nature of wood. Species of wood (trees, and plants in general) have been determined in the past from the number, size, shape and orientation of external features, such as reproductive structures (flowers, fruits, cones), foliar structures (leaves or needles) or other parts of the plant like bark or branch morphology. These characters are rarely present in objects made of wood. Current, molecular techniques of DNA analysis are moot because of the paucity or lack of DNA in wood.

Species determinations are empirically (straight from the anatomical characters, without assumptions) possible for a few taxa. In the Walnut/Butternut Group (*Juglans* spp. Juglandaceae), American Black Walnut (*J. nigra*) can be separated from English/European/Persian Walnut (*J. regia*) by the presence of short chains (1-5) of calcium oxalate crystals in the axial parenchyma and irregular spiral thickenings

in the vessels termed "gashes". Some empirical species separations are conditional in nature. For example, in True Mahogany (*Swietenia* spp. Meliaceae), if the specific gravity (density) of the wood is above 0.65, then the wood is Cuban Mahogany (*S. mahogani*) and not Honduran Mahogany (*S. macrophylla*). If the specific gravity is below 0.65, either species may be present.

Some species determinations are deductive through geography (and other ways). In the genus *Liriodendron* (Magnoliaceae), there are two species worldwide, Tulip Poplar (*L. tulipifera*), native to the United States and Chinese Tulip Tree (*L. chinensis*), native to China. If the wood in question is in a colonial American object, then it is deduced to be Tulip Poplar. The True Hickories would exemplify a chronological deduction. This genus had a distribution across the northern hemisphere prior to the Pleistocene (Ice Age), but afterward was restricted to eastern Asia and North America. Its presence in colonial objects is deduced as being American.

Provenance Determination

The assignment of provenance (where the object came from) based solely on microscopical wood identification is, empirically (without making any assumptions) close to impossible, because of the limitations supplied above. Most groups (genera, species groups) show cosmopolitan distributions, i.e., there are species on both sides of the Atlantic or Pacific. However, a few genera or species have very limited natural distributions and are good "indicator" woods. For example, Capá Blanco (*Petitia* spp. Verbenaceae) is composed of only one species, native to the Caribbean Islands. Its presence in an object would indicate that it originated in the Caribbean.

Wood identification does not, by itself, determine provenance of objects, but is an element used along with constructional and stylistic features. The determination of provenance of objects d'art has many other complicating factors.

Complicating Factors

Common Names

Most times, woods are referred to by their common names; Pines for the genus *Pinus*, Oaks for the genus *Quercus*, etc. In general, this scheme works well, but there are also many times when confusion can occur with the use of common names. For example, the name "sycamore" is the genus *Platanus* in the US, but in England and Europe it is a species of Maple (*Acer pseudoplatanus*). Also the term "poplar" can represent the Tulip Poplar (*Liriodendron tulipifera*), a wood common in colonial furniture or the True Poplars (*Populus* spp.), a wood that appears in European furniture.

The Linnaean binomial is the preferred term used when conversing about wood, unless a well accepted trade name (the most common "common name") is assumed. In addition to the above confusion, some individual species of plants, trees or woods can have numerous common names, while a particular common name can have numerous species associated with it. For example, there are at least 135 common names for "rosewood", 446 common names for "mahogany" and 475 common names for "cedar". A reasonable estimate of the total number of recognized common names for wood approaches 170,000.

Commercial vs. All Woods

Another complicating factor of wood identification is that most texts and computer software include only "commercial" species and neglect species with limited distributions or have woods that are produced in low volumes for commercial markets. This may be well and good for identification of lumber, but many ethnographic or "primitive" objects as well as those of small size may be composed of local trees or shrubs that do not appear in commercial markets. For example, there are about two dozen commercial woods used in colonial furniture, whereas for "primitive" furniture or ethnographic objects of unknown origin, any of the 27,000+ species of trees and shrubs could have been used.

Species Introductions

Since the 16th Century, trees have been imported into the British Isles and elsewhere as novel horticultural species and as plantation crops. For example, Eastern White Pine (*Pinus strobus*) was imported to England in the mid 16th Century as a horticultural curiosity, while American Black Walnut (*Juglans nigra*) and Persian Walnut (*Juglans regia*) were imported in the 17th century as food crops. *Juglans regia* later became known as English Walnut, but is originally from the Middle East (Persia).

Importation of Wood

During the past, many fragile objects that were transported across the oceans by boat were packed in wooden crates. Upon arrival at their destination, the crate wood must have been reused for other objects, rather than as firewood. Thus something like Scots Pine (*Pinus sylvestris* – Red Pine Group), an indicator of English/European provenance, may have ended up in American furniture. Also, during the colonial period, the British Navy exclusively used whole trees of Eastern White Pine (*Pinus strobus*) as ship masts. When these masts were damaged, the wood may have been used in objects (large and small) made in England. In addition, tropical woods (True Mahogany, Rosewood, Pauduk, etc.) were imported into Europe by the Dutch (Dutch East India Company) and English as early as the 17th Century.

Accuracy of Publications

A final complicating factor is the accuracy of publications on wood use and of museum catalogs. Some publications rely on anecdotal information or from guesses by "experts" whose identifications were done by eye or through "connoisseurship", or "what it should be" based on accumulated experience or bias, as opposed to what it really is, based on a thorough microscopic examination. Generally, if wood analysis was done using a compound microscope, it will be noted in the forward or acknowledgement sections of most catalogs.

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