

Identification of Sarcophagus Wood Species

by

Chris Byrne, Ph.D., P.E.
Professor of Mechanical Engineering
Western Kentucky University
Bowling Green, KY 42104
(270)745-6286
chris.byrne@wku.edu

Submitted to:

Rhonda Williamson
Sandra Staebell
Kentucky Museum, WKU

December 14, 2011

Summary

A student investigating the background of a wooden Sarcophagus housed at the Kentucky Museum of Western Kentucky University became curious about the type of wood that it was made from. This question was brought about by a limited knowledge regarding the authenticity of the artifact as it had been only traced back to a time in the early 1900's when many forgeries were known to be produced.

After discussions between Rhonda Williamson (WKU student) and Chris Byrne it was decided that an evaluation of the wood species might help determine the authenticity of the Sarcophagus. This was done by research into the types of wood known to be used in such ancient artifacts, and through anatomical evaluation of a wood splinter from the Sarcophagus. The conclusion is that the wood is *Ficus Sycomorus* (sycomore fig) and this type of wood is known to have been used in the Bronze Age and is native to the Nile River –Mediterranean region and other parts of Africa. The size of the wood used in the Sarcophagus and the state of degradation of the splinter evaluated suggests that the wood is very old, yet reasonably well preserved. No Carbon dating was available for determining the age of the wood.

Results

A splinter of approximately 2 mm radial, 10 mm tangential and 25 mm axial was available for microscopic evaluation. From it thin sections were taken such that anatomical features could be studied using a light microscope. Producing a quality section was hindered by the fragility of the wood. Nevertheless, adequate samples were made so that the major features could be determined. The use of a simple magnifying glass indicated a diffuse porous structure with large, widely spaced vessels in the section available. Owing to the thinness of the radial dimension, no growth rings could be identified, if they were apparent. Also revealed was the multitude of rays of medium size and high density.



Figure 1. Photograph of Sarcophagus housed at the Kentucky Museum, Bowling Green, Kentucky. (picture provided by Rhonda Williamson)

The microscopic evaluation results are indicated in the figures that follow. Figure captions are used to reveal the essence of the information that each image is intended to demonstrate. The relatively large vessel elements that take up a large portion of the space between rays are typical of *Ficus Sycomorus*. The wide rays are also readily associated with that species. Moreover, the two distinct widths of rays is also an indicator. These are factors that rapidly indicate this species.

Additional anatomical features include the presence of small, simple pits between ray cells and between parenchyma. The presence of captured prismatic crystals is also reported for *Ficus Sycomorus*. The axial parenchyma and the fiber cell wall thicknesses are consistent with this species as well. The above described features, and absence of many other features all point toward *Ficus Sycomorus*.

The wood evaluated had deteriorated such that fibers were readily pulled apart. The degradation of lignin in the middle lamella is the cause for this fragility. Typically in wood, white rot fungi degrade the lignin leaving a fibrous, white appearance that leads to its name. However, this type of degradation was not evident in this wood. Studies have been done to identify other factors that could cause delignification and many lead to the presence of salts and alkali compounds leaching into the wood and breaking down the lignin over long periods of time [3]. That has been reported to be the case in some ancient wood artifacts and appears to be the situation with this wood. No signs of white rot were evident. In fact, if the wood is about 3000 years old it is in remarkably good condition.



Figure 2. Axial section showing vessel representative of the diffuse porous structure. Typical vessel width is greater than half of space between rays, yet wider than the rays.

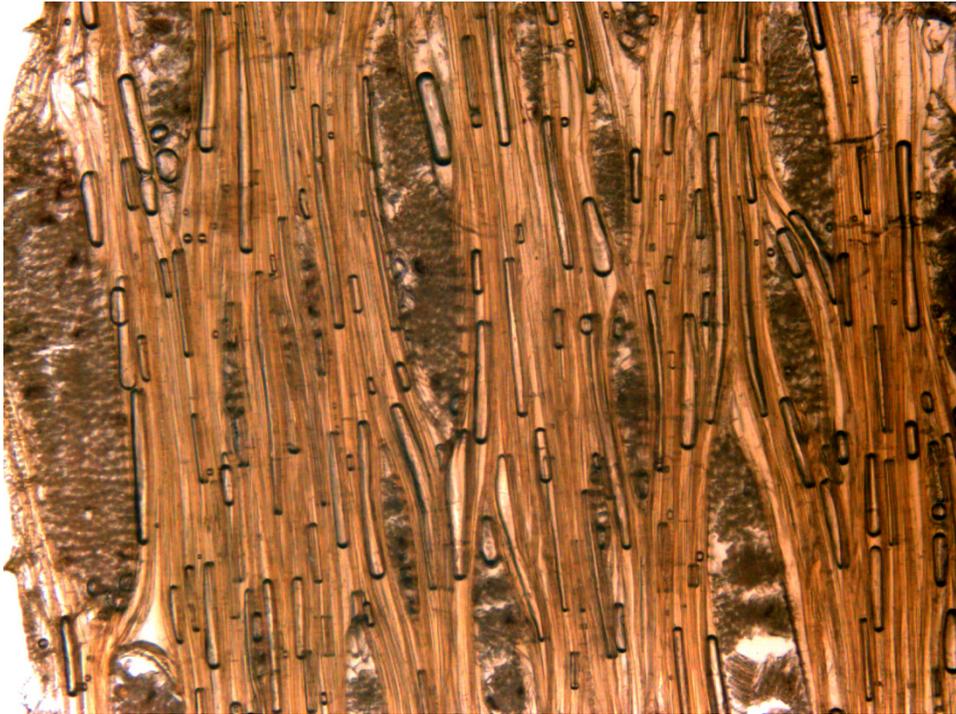


Figure 3. Tangential section showing two distinct widths of rays, some 1-4 seriate, others 5-14 seriate.

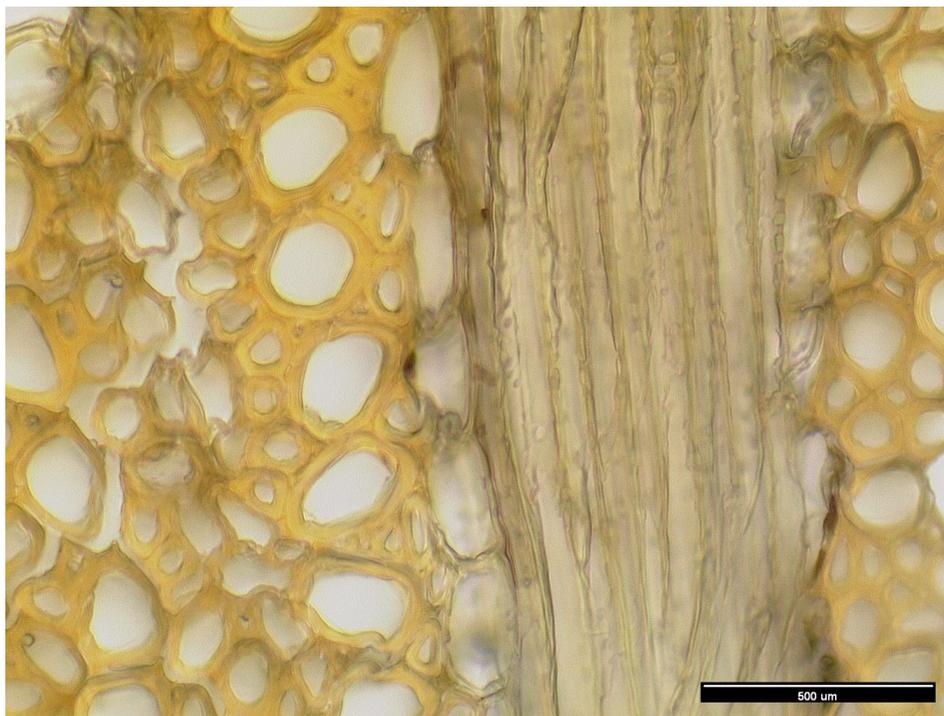


Figure 4. Axial section demonstrating fracture through degraded middle lamella. Fusiform parenchyma bordering rays.

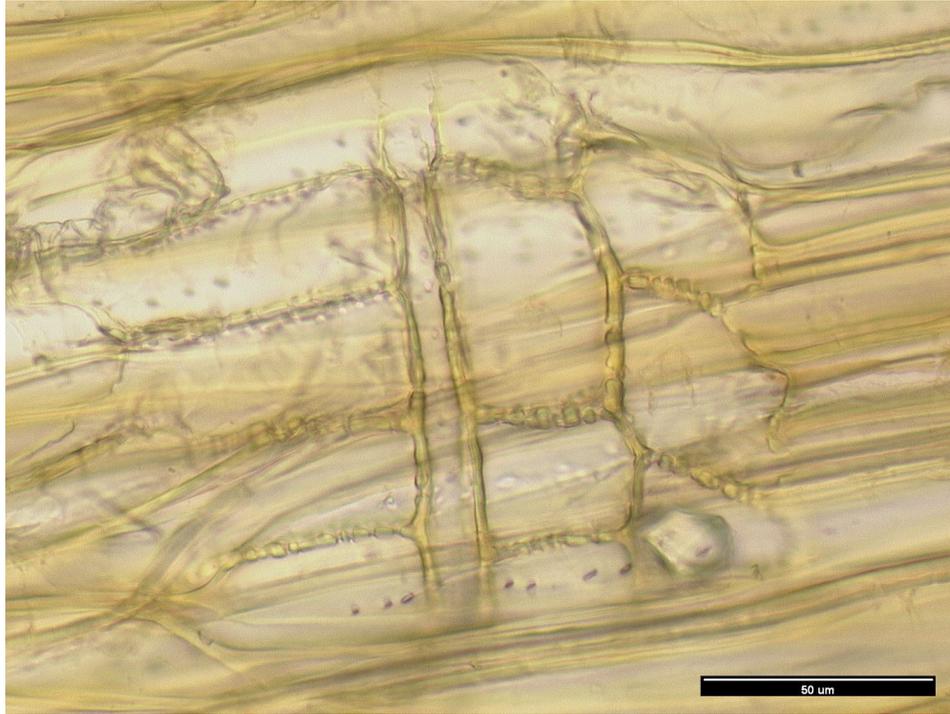


Figure 5. Simple pits and prismatic crystal.

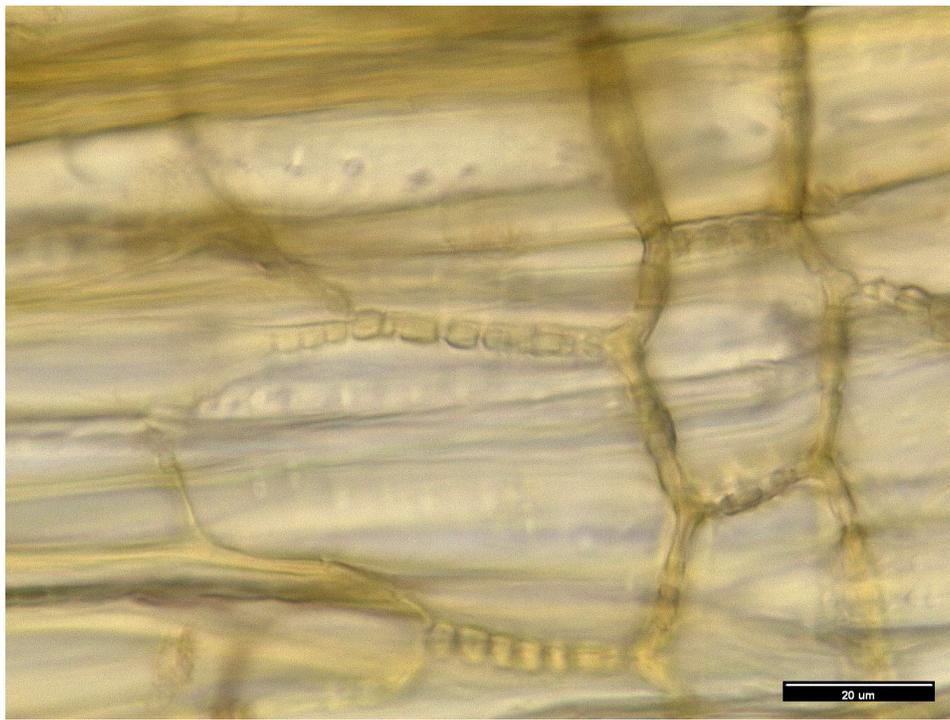


Figure 6. Closer view of simple pits.

While more anatomical features could be identified with further efforts, it appears clear that the Sarcophagus is made from this “typical” ancient wood. The wood is old, but an accurate evaluation of its age would require a carbon-14 dating and that equipment is not available at WKU. The wood is *Ficus Sycomorus* (sycamore fig). It is a fig tree from the Moraceae family and is unrelated to the European or North American sycamore tree.

References

1. Cartwright, C. and Middleton, A., “Scientific Aspects of Ancient Faces: Mummy Portraits from Egypt”, *Technical Research Bulletin, The British Museum*, Vol. 2, pp. 59-66, 2008.
2. Cartwright, C., “The Bronze Age Wooden Tomb Furniture From Jericho: The Microscopical Reconstruction of a Distinctive Carpentry Tradition,” *Palestine Exploration Quarterly*, 137, 2 (2005), 99-138.
3. Blanchette, R.A., “Deterioration in Historic and Archaeological Woods from Terrestrial Sites,” *Art, Biology, and Conservation: Biodeterioration of Works of Art*, The Metropolitan Museum of Art, New York, 2003, pp. 328-347.