

Analysis of CT Scans of the Hockey Stick #2
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Report prepared for
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Technical Information for the CT scans
St John Regional Hospital
GE Medical Systems Revolution CT

Date of Acquisition May 19, 2019
Standard convolution kernel
X&Y pixels = 0.695mm
0.625mm slice thickness
512*512 pixel array
helical mode
current - 435mA
140 kVp

- scans done in GE GSI dual energy mode; 70 & 140 kVp calcium(iodine) Std and iodine(calcium) sequences reconstructed
- images presented here are from the 50KEV GIS reconstruction
- the scans were analyzed using ORS^{Si} and Dragon Fly software (<https://www.theobjects.com/index.html>)

Density measurements

Bag of saline

mean = 17.88 Hu

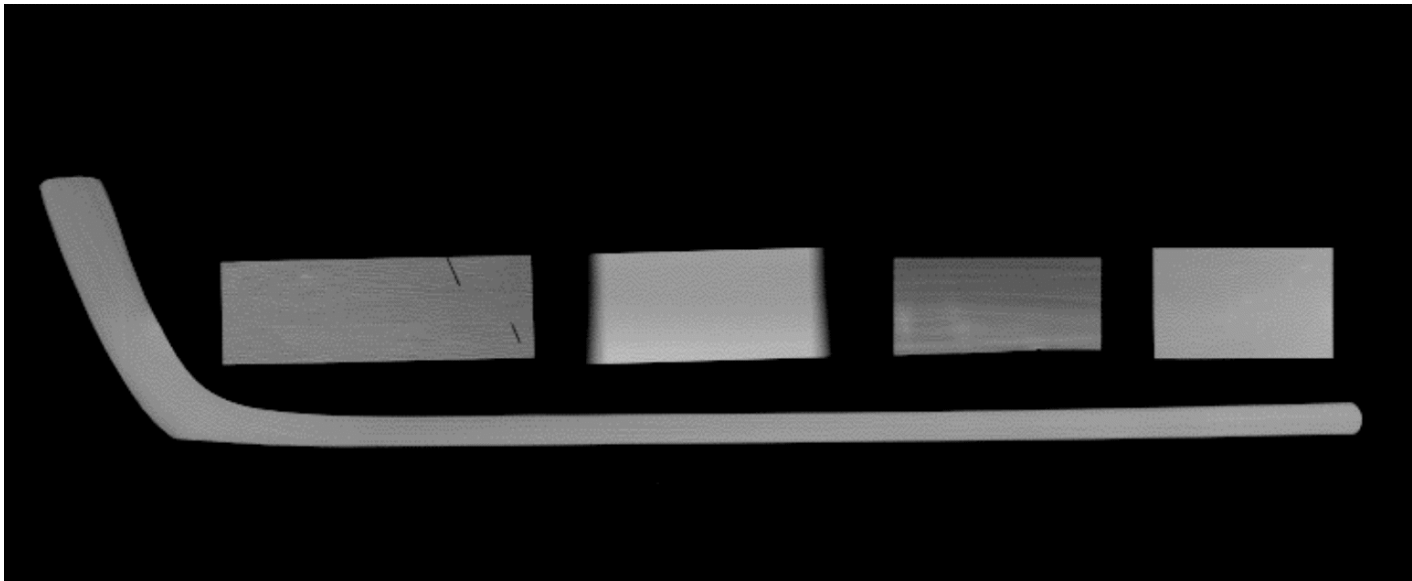
min = -9 Hu

max = 48 Hu

std deviation = 7.54



H value for water should be 0. Saline will be slightly elevated. Therefore, this value is consistent with a well calibrated scanner. (Hu = hounsfield units - units of gray scale used on clinical CT scanners)

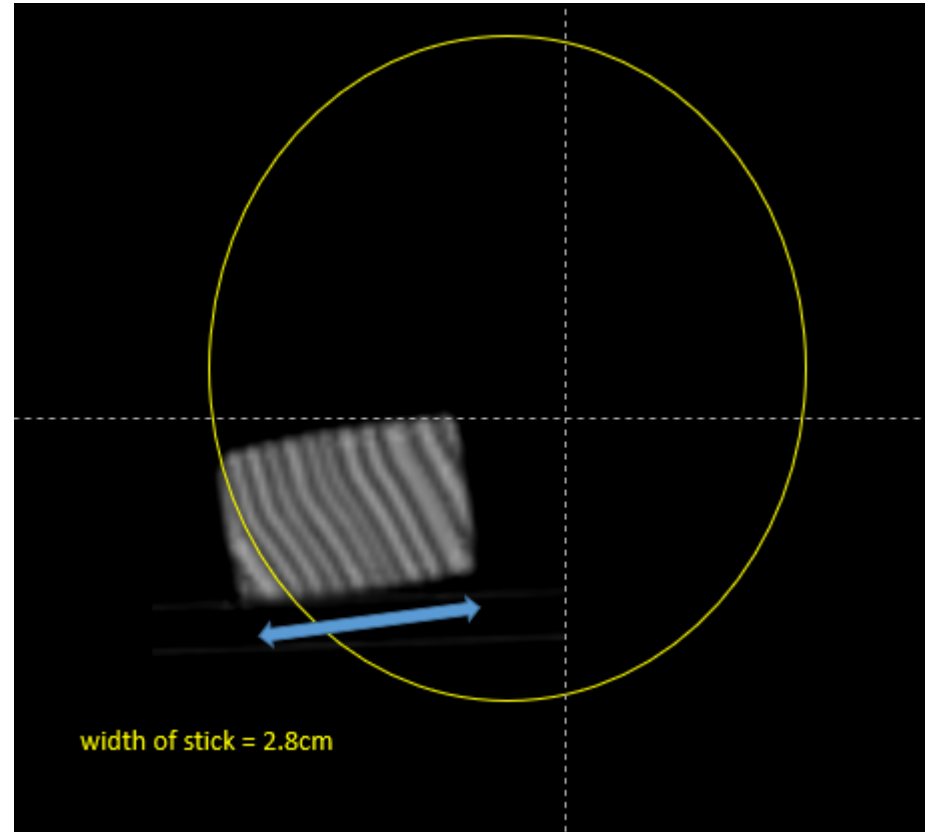


View = average intensity projection 2.5cm thick (similar to a traditional x-ray) demonstrates that there are no metal inclusions in the stick.

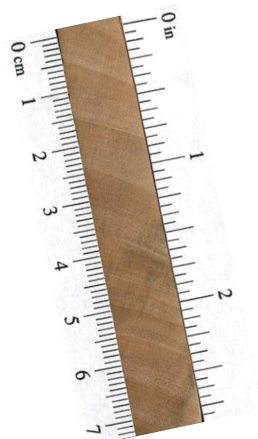
Rings

The rings of the wood on this stick indicate that it was cut from a larger tree than the Jones stick.

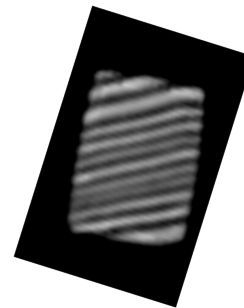
This stick is reported to be made of maple, although no species was identified. Judging from the end grain images at <https://www.wood-database.com/> it would seem to be more like the sugar maple than a silver maple



sugar maple



silver maple



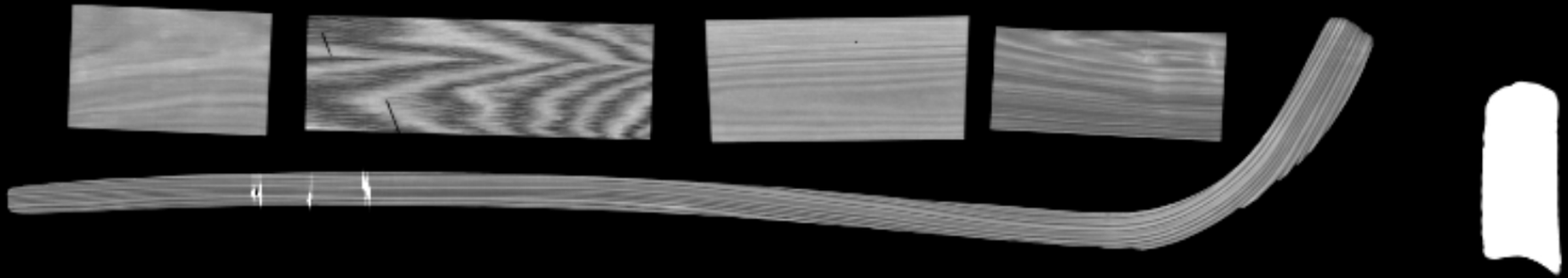
Wood Densities 50 KEV GSI scan May 19, 2019

Maple

Oak

Cherry

American
Black
Walnut



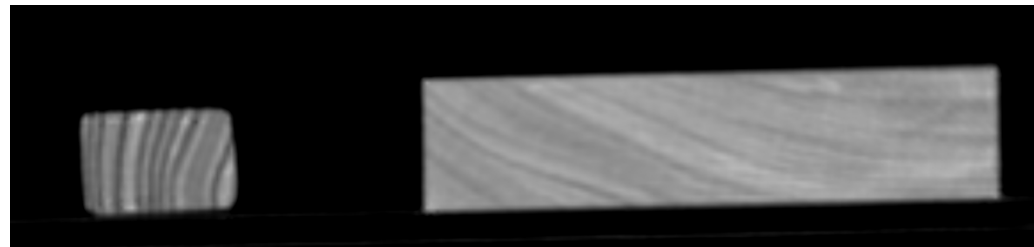
maple density
mean HU ROI ca. 1cm²
= - 350.5 +/- 38.36

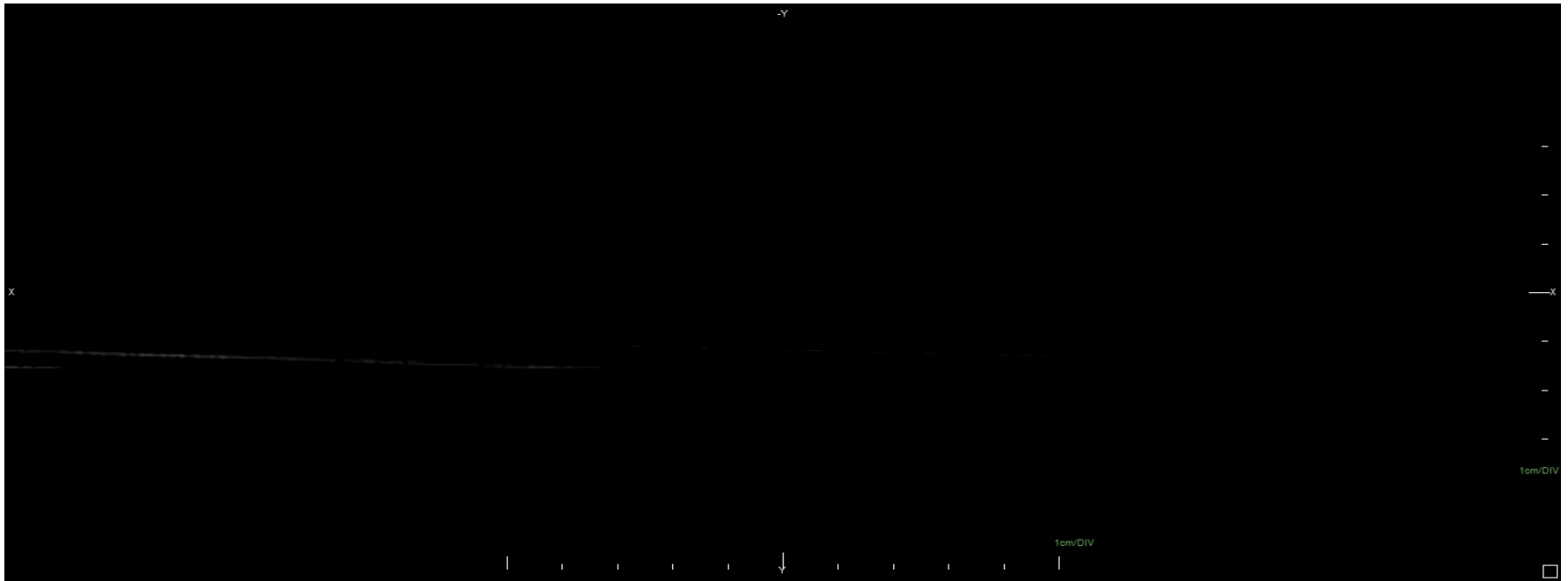
oak density
mean HU ROI ca. 1cm²
= -443.5 +/- 103

cherry density
mean HU ROI ca. 1cm²
= - 374.6 +/- 21.08

American Black Walnut
mean HU ROI ca. 1cm²
= - 496.5 +/- 43.5

stick
mean HU ROI ca. 1cm²
= - 388.2 +/- 70.91
- most similar in density to the
cherry example, but the end
grain structure is distinct





hit play to start video

A scroll down the length of the shaft shows:

- that rings can be followed the length of the stick. This observation is consistent with steam bending to achieve the angle of the blade
- a very thin and uneven “rind” (thin layer of increased density) on the surface of the wood. This is consistent with shellac or varnish that has been partially rubbed off
- the bright flashes on the upper surface of the stick are artifacts of the metal name plate and nails.
- the water bag appears to the right in the video

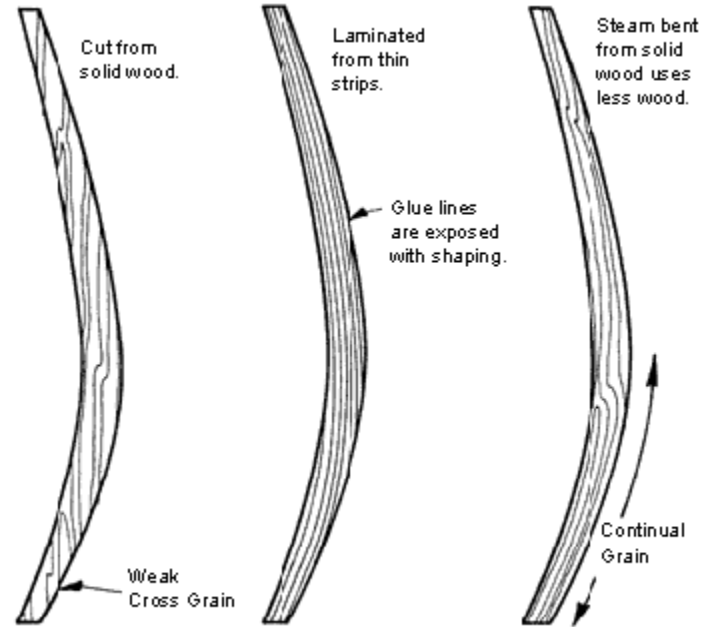
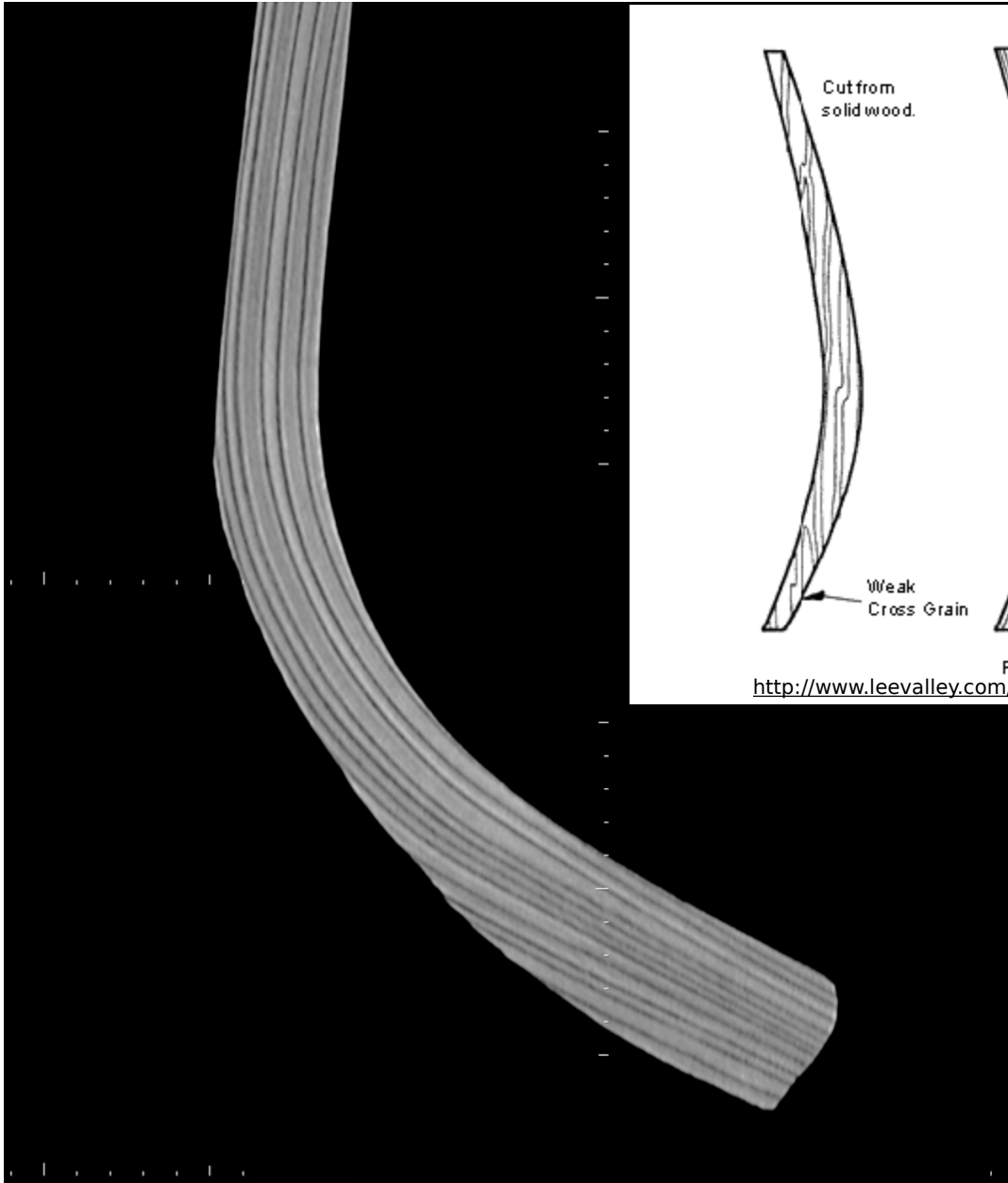
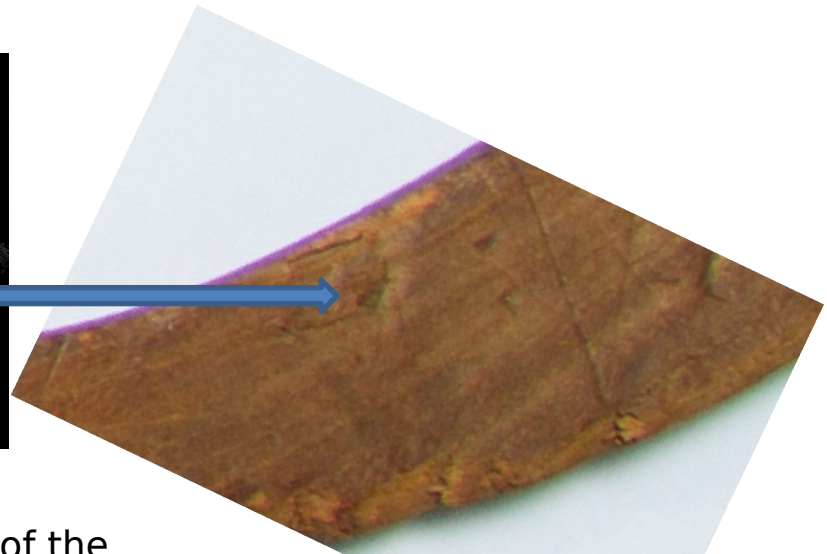
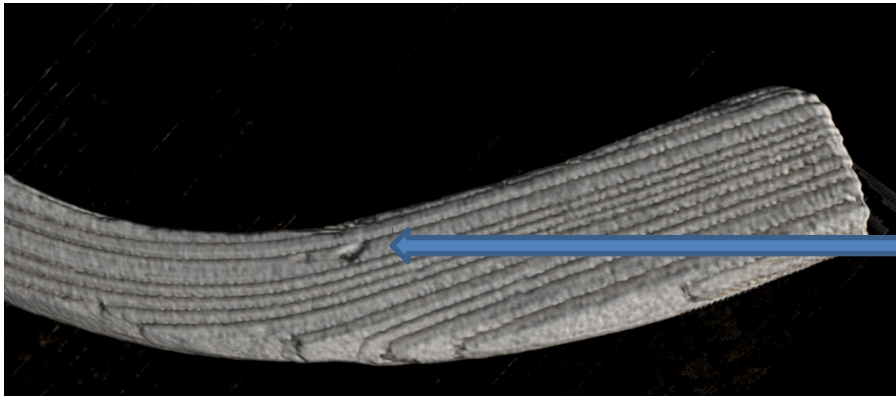
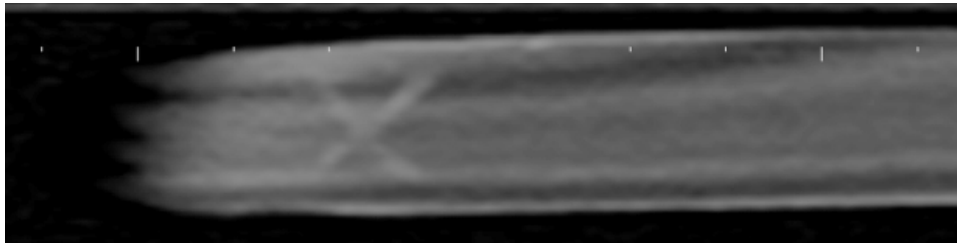


Figure 4

<http://www.leevalley.com/us/wood/page.aspx?p=45869&cat=1,45866,45867>

The continuity of grain along the shaft and around the heel to the blade is consistent with the use of steam to bend the wood.

This image shows the increased density under the owner's X mark. This is caused by slight crushing of the wood matrix, making it appear more dense.



There are several linear features on the blade of the stick, but only one defect that is visible on the scans. That suggests that they were caused by an impact or action less forceful than that which made the X on the handle. There is nothing visible on the photo or on the scan data that would suggest an impact with a hard puck



Cross-section of the defect



hit play to start video