Dendrarchaeological Dating of the Robertson Store, Halifax, Nova Scotia

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MAD Lab Report 2011-07

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Abstract

This research project was carried out to determine the date of construction of the Robertson Store located in Halifax, Nova Scotia, by means of dendroarchaeological analysis. Cut dates were secured for timbers from different parts of the building. Construction of the buildings usually occurs in the same year as the cut date of the wood, or 1-2 years after. Results of the cut dates from wood are as follows: 1828-29 for the first and second floor and 1808 for the third floor.

Acknowledgments

We wish to thank the following groups and persons for their contribution to this work:

-The Maritime Museum of the Atlantic, especially Dan Conlin, curator of Marine History. The museum provided partial funding for the project.
-Jim Ehrman, SEM operator of the Mount Allison Digital Microscopy Facility.
-NSERC provided partial funding through the MAD Lab.

Introduction

The Maritime Museum of the Atlantic is located in a building in Halifax at 1675 Lower Water Street, in the heart of the historic waterfront. Part of the museum incorporates the William Robertson & Son Store, a four story brick building with wood interior from the 19th century. The age of the building was thought to be around the 1880s, but the older core could be as old as the 1840s. The museum wished to have a better age assessment of the structure and heard of the Mount Allison Dendrochronology Laboratory (MAD Lab) while the lab was conducting sampling to date the Morris House in Halifax using dendrochronological methods (Robichaud *et al*., 2011). Moreover, the Robertson Store was in the process of being restored which is a unique opportunity to have the wood frame exposed and therefore allowed easy access for sampling of the beams. Therefore, a dendroarchaeological analysis was requested.

Dendroarchaeology is the application of tree-ring analysis to the dating of old wooden buildings and has two great advantages over other methods of inquiry: 1) it causes little damage to the structure, and 2) it yields a date with a precision of one year. The technique is well known world-wide but has been employed only recently in the Atlantic provinces of Canada, and almost exclusively by the Mount Allison Dendrochronology Laboratory.

Fieldwork and Laboratory Methods

Sampling of the building was carried out on May 28th 2010. We took core samples using manual increment borers on nine selected beams from different locations designated to us by the curator. Collected samples were placed in plastic straws, labeled, and their position in the structure was also noted. The samples were then transported back to the MAD Lab for analysis. Several samples were damaged or in bad shape, but only one was discarded (10DS007) while the rest was salvaged to the best of our abilities.

In the lab, the eight retained cores were glued onto grooved wooden mounting canes to facilitate sanding of the samples. Mounted cores were then progressively sanded with increasingly finer grained sandpaper to expose the annual ring-growth patterns. The annual rings were measured using a 24 inch movable Velmex stage connected to a digital encoder which gave the measurements an accuracy of 1/1000 mm. Raw data was captured by J2X software and put into standard tree-ring decadal format. It was also standardized with the use of ARSTAN software (Holmes *et al*., 1986). Ring-width series were crossdated with each other to form a mean standardized floating chronology from the building and then with regional reference chronologies developed from earlier work in the region using the software COFECHA (Holmes *et al.*, 1986). We also visually tested pattern matching of line graphs of all series with the graphic software DeltaGraph®.

During the mounting process, excess portions of two core samples were used for wood identification using a scanning electron microscope (SEM) available at the Mount Allison Digital Microscopy Facility. The SEM procedure enables precise wood identification through the recognition of species-specific cell features and structures. The identification of the wood is important because different species have different growing reactions to climatic variables. When the species of a historic piece of wood is known, it then allows us to crossdate the samples with the proper reference chronology with more accurate and reliable results.

It is important to note that the dates presented here correspond to the felling of trees (cut dates) and not a construction date. The end of the construction of a building can possibly be the same year as the cut date but it also could be a year or two later depending on specific construction procedures. The samples that didn't have the last growth ring (i.e., wood was deteriorated, beam was completely squared, etc.) do not represent a cut date. However, they are valuable because they help corroborate the whole dendrochronological assessment of the timeframe of the structure.

Results and Discussion

Wood identification revealed that seven out of nine samples were spruce, while one was white pine (Figure 1, 2 and 3). The badly damaged sample was not identified. From this information, we performed our analysis with reference chronologies of spruce and white pine from Nova Scotia sites.

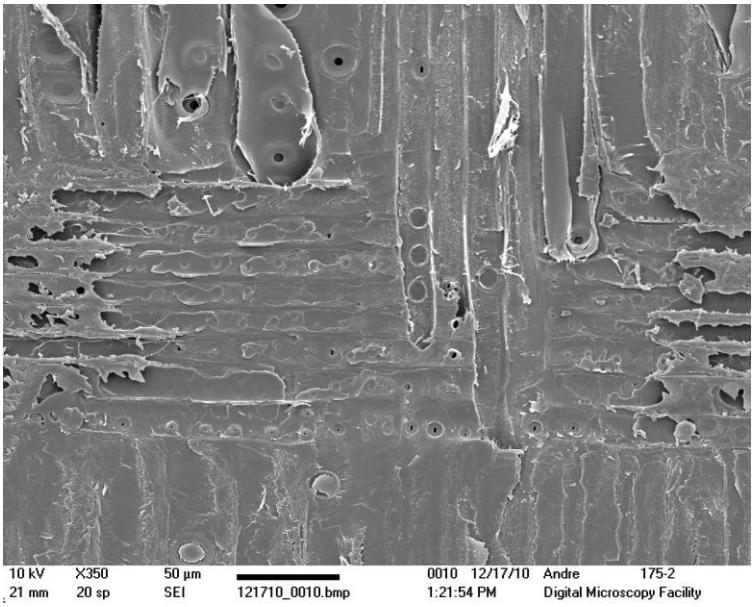

Figure 1: SEM micrograph from sample 10DS002. This transverse section illustrates a ray with piceoid pits and transverse tracheids characteristic of spruce.

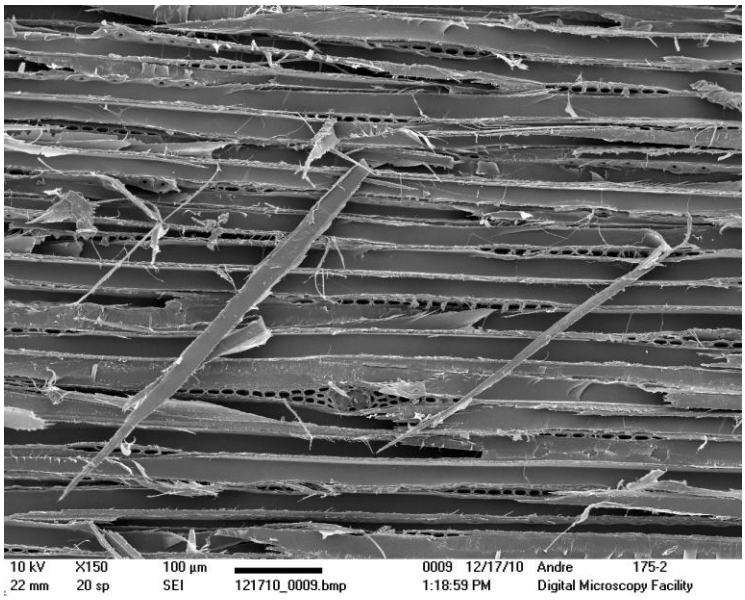

Figure 2: SEM micrograph from sample 10DS002. This tangential section illustrates rays and a resin duct typical of spruce species.

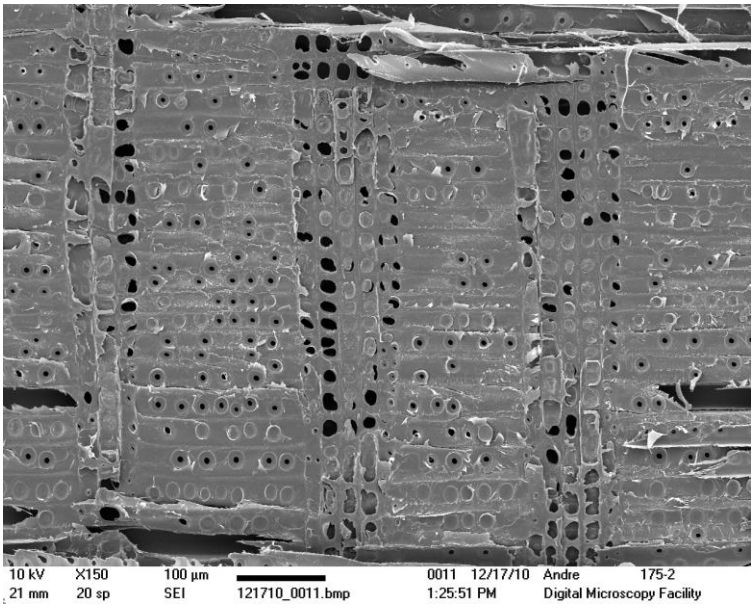

Figure 3: SEM micrograph from sample 10DS003. This transverse section illustrates a ray with the pinoid pits characteristic of white pine.

The best crossdating results were obtained with two Nova Scotia local chronologies: Port Medway (white pine) and Bear River (spruce) (O'Neill *et al*., 2006a and 2006b). Figures 4 to 6 illustrate pattern matching between the house series and the mean standardized curve with the reference chronologies. Table 1 summarizes the results.

Out of the nine samples taken from the building, eight were crossdated from which three had the crucial last growth ring giving the desired cut date. Additionally, two others were thought to have only one or two missing rings from the last growth ring. Figure 4 shows a mean standardized curve combining all the spruce series crossdated between each other (001, 002, 004, 005, 006, 008, and 009) and the Bear River local spruce chronology. Spruce samples with cut dates are 002 (1828), 005 (1829) and 009 (1808). Sample 001 has an end date of 1827 and has one or two missing rings.

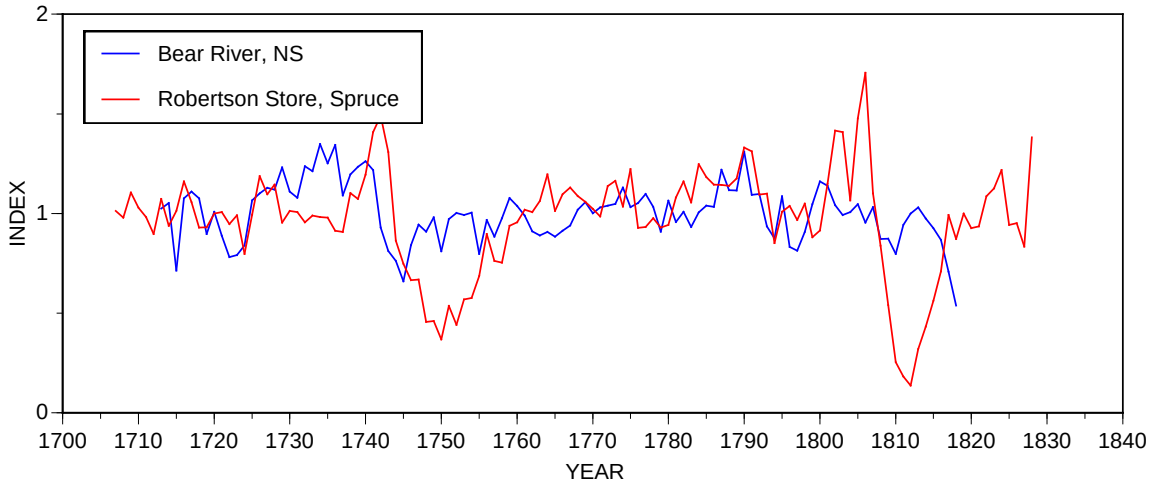

Figure 4: The Robertson Store mean standardized chronology pattern matched to the Bear River chronology. The last year of the Robertson Store curve is 1829.

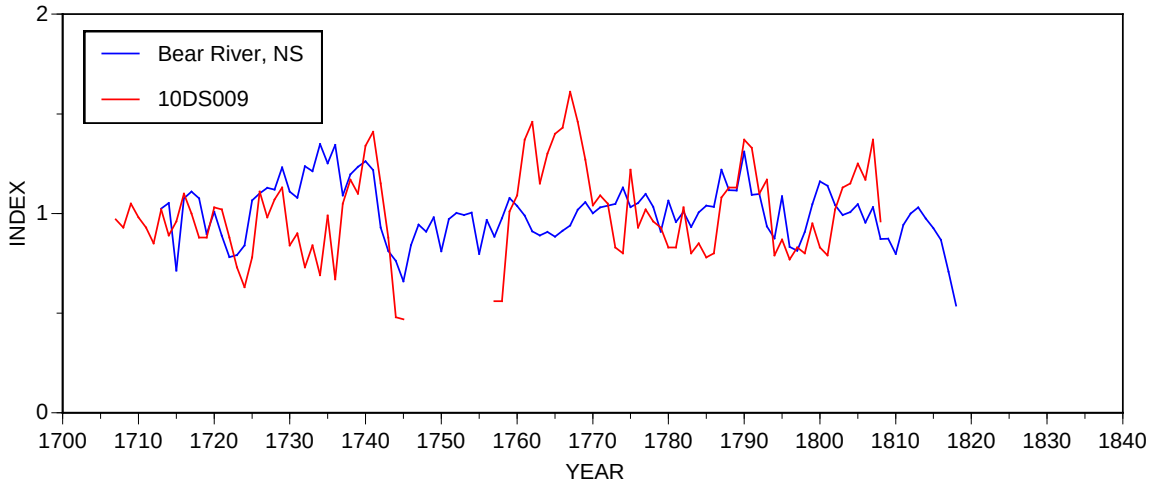

Figure 5: The Robertson Store standardized series 10DS009 pattern matched to the Bear River spruce chronology. The cut date of the sample is 1808. A section of the core was damaged and could not be measured as is apparent here with the broken red curve.

Sample 10DS003 is from a beam made of white pine and was therefore crossdated to a white pine chronology. Results indicate an end date of 1827 (Figure 6); the cut date is probably 1828 or 1829 given the fact that one or two rings were missing at the end of the core.

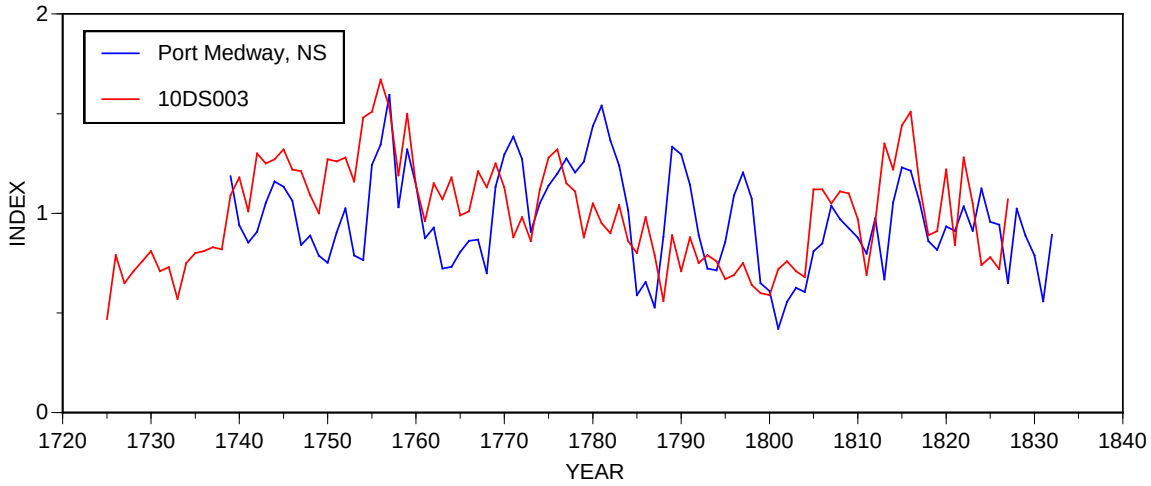

Figure 6: The Robertson Store standardized series 10DS003 pattern matched to the Port Medway white pine chronology. The end date of the sample is 1827.

Table 1: Tree-ring analysis and crossdating results.

Sample ID	species	Sample location	Last growth ring	Date of last ring	Cut date
FIRST FLOOR					
10DS001	Spruce	ceiling, shop	no but close	1827	(1828-29)
10DS002	Spruce	ceiling, shop	yes	1828	1828
SECOND FLOOR					
10DS003	White pine	meeting room, shop	no but close	1827	(1828-29)
10DS004	Spruce	bathroom, shop	no	1824	
10DS005	Spruce	meetin room, shop	yes	1829	1829
10DS006	Spruce	phone room, shop	no	1805	
THIRD FLOOR					
10DS007		main beam, museum	yes	not dated	
10DS008	Spruce	washroom, storage	no but close	1799	
10DS009	Spruce	office area, storage	yes	1808	1808

Table 1 above displays the cut dates from different locations of the building. It is obvious that samples from the first and second floors date from the end of the 1820s. However, the third floor has older dates: 10DS009 is 1808 and another is slightly younger than 1799 (10DS008; date is unknown, because it is not clear exactly how many rings are missing but it is probably be fewer than ten).

Conclusion

The results of the tree-ring analysis conducted on the Robertson Store indicate that it was constructed around 1829 according to samples from the first and second floors. Two samples from the third floor are older (1808), but they could be from recycled timber. Interpretation of these results should be replaced in the historical context of the building.

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