

## RESEARCH REPORT

# DENDROCHRONOLOGICAL DATING OF THE LUND-SPATHELF HOUSE, ANN ARBOR, MICHIGAN, USA

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### ABSTRACT

The Lund-Spathelf House is located at 1526 Pontiac Trail in Ann Arbor, Michigan. During a recent renovation, the owner sought information regarding the construction of the house by searching through numerous written records. Despite an extensive history of the land on which the house currently sits, neither a construction year nor general period of construction could be obtained. Therefore, four samples of oak (*Quercus* spp.) were extracted from floor boards throughout the house for dendrochronological dating. The four samples crossdated conclusively with each other both visually and statistically and were used to build a floating 126-year tree-ring chronology. We used COFECHA to statistically evaluate the absolute temporal placement of this chronology against a nearby regional chronology (MI005.CRN) from the Cranbrook Institute, Michigan. The Lund-Spathelf House chronology was anchored in time with the regional chronology from A.D. 1720 to 1845 with a correlation coefficient of 0.62 ( $p < 0.0001$ ,  $t < 8.76$ ,  $n = 126$ ). All four oak samples provided conclusive cutting dates of A.D. 1845, indicating the year the Lund-Spathelf House was constructed.

*Keywords:* Tree rings, dendrochronology, construction history, Michigan, US Midwest.

### INTRODUCTION

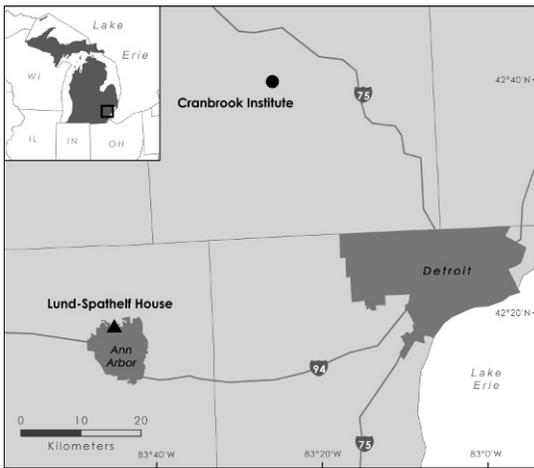
The urban development of Ann Arbor, Michigan, is like most other cities in the United States with older neighborhoods surrounding a central commercial district and each neighborhood possessing a distinct architectural style. Consistent growth of the built environment has made restoring historic structures increasingly popular (Reade and Wineberg 1992). Establishing a construction date for a restored structure is important to homeowners who wish to authenticate the structure's historical significance or place it on the National Park Service's National Register of Historic Places. Usually, a construction date can be obtained by searching through deeds, census data, wills, or maps at local municipal offices or libraries. However, if searching the documentary records fails, other techniques, such as dendrochronology,

can be used (Grissino-Mayer and van de Gevel 2007; Grissino-Mayer 2009).

Dendroarchaeology, the study of historic and prehistoric structures or objects using techniques of dendrochronology, has increased in recent decades (Grissino-Mayer 2009; Towner 2002). In the United States, the majority of dendroarchaeological research has been conducted in the Southwest (Douglass 1921; Dean 1978; Bekker and Heath 2007; Towner *et al.* 2009) and the Southeast (Stahle 1979; Bortolot *et al.* 2001; Grissino-Mayer and van de Gevel 2007; van de Gevel *et al.* 2009). Relatively few dendroarchaeological studies have been conducted in the Midwestern US at either prehistoric sites (Hawley-Senter 1938; Bell 1951) or on historic era structures (Grissino-Mayer 2000; Lehmann *et al.* 2006; Fuerner and Taylor 2008).

The Lund-Spathelf House is located in Ann Arbor, Michigan (Figure 1). During a recent renovation, the owner sought information regard-

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**Figure 1.** Locations of the Lund-Spathelf House in Ann Arbor, Michigan, and the reference chronology developed at the Cranbrook Institute, Michigan.

ing the construction of the house by searching through numerous documentary records. Despite an extensive history of the land on which the Lund-Spathelf House currently sits, neither a construction year nor general period of construction could be obtained. Making the search more intriguing, the owner discovered an engraving in the basement that read: “P.H.H. April 2[?], 186[?].” The initials P.H.H. refer to Philip Henry Howland, a relative of the Lund Family, suggesting that the house was there some time during the family’s ownership of the land during the 1860s. When documentary records proved unsuccessful in providing a construction date, oak (*Quercus* spp.) samples were extracted from several floor boards and submitted for dendrochronological dating. The objective of our study was to determine in which year the Lund-Spathelf House was constructed by identifying the year in which the logs were cut to construct the beams used under the floor boards.

## HOUSE AND SITE DESCRIPTION

The Lund-Spathelf House is located at 1526 Pontiac Trail in Ann Arbor, Michigan (Figure 2). The property lies in an area considered to be within Ann Arbor’s original township, just north of the Huron River. Ann Arbor was founded by Elisha Walker Rumsey and John Allen in A.D.



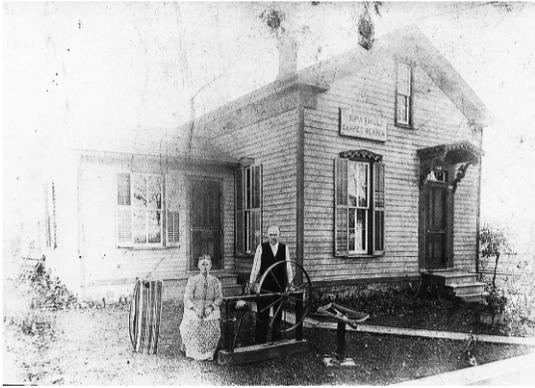
**Figure 2.** The house located at 1526 Pontiac Trail, Ann Arbor, Michigan as it looks today.

1824, the same year the property on which the house currently sits was purchased from the US Government by Timothy C. Strong and was located primarily in Section 21 of Township 2 South, Range 6 East. Originally over 32 ha in size, the property was part of a larger parcel of land held by multiple owners before any structures were built. From A.D. 1822 to 1840, the land was bought and sold numerous times and several other homes were built in the area, leading to the speculation that the house was built between A.D. 1830 and 1840, but no documentary evidence was found that supported this period of construction. In 1845, the property was purchased by Jonathan H. and Sarah A. Lund, and by 1847 they completed construction of their large Greek Revival home on the south end of the property. Known today as the Jonathan Lund House, it is one of the finest examples of historic Greek Revival architecture in the Ann Arbor area (Reade and Wineberg 1992). The smaller Lund-Spathelf House (Figure 3) analyzed in this study is located in close proximity to the Jonathan Lund House, and is also described as a Greek Revival design that possesses distinctive architectural similarities to other nearby houses built in the 1840s.

## METHODS

### Data Processing

We analyzed four oak samples extracted from floor boards of the Lund-Spathelf House (Fig-

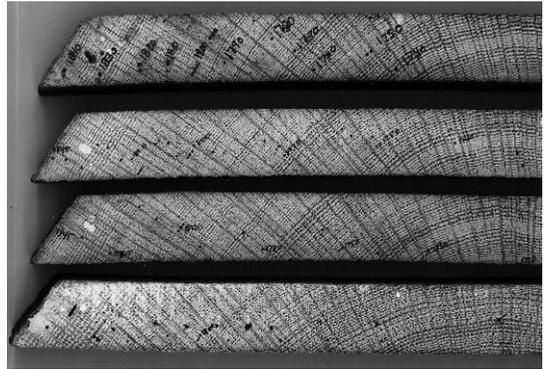


**Figure 3.** The Lund-Spathelf House ca. A.D. 1870. During their occupation of the house, George and Catherena Spathelf operated a weaving business. The sign on the front reads “Spathelf Carpet Weavers.”

ure 4). The samples represent oak in the white oak group (most likely *Quercus alba* L.). This ring-porous, hardwood genus is found commonly throughout the eastern United States and was a popular building material for early settlement homes (Grissino-Mayer 2009). The samples were labeled MH1A; MH1B; MH1C; and MH1D. The sections were sanded on a 4" × 24" Makita belt sander using progressively finer sandpaper, beginning with ANSI 100-grit (125–149 μm) and ending with ANSI 400-grit (20.6–23.6 μm) (Orvis and Grissino-Mayer 2002). Using a microscope, the innermost complete ring on each sample was assigned the relative year “1” and each subsequent 10<sup>th</sup> ring was marked with an “X” with a mechanical pencil. The ring widths from all four samples were measured to the nearest 0.001 mm using a Velmex measuring stage coupled with MEASURE J2X software.

### Internal and External Crossdating

To help assign an absolute date to all samples, we used COFECHA, a computer program that uses segmented time-series correlation techniques to assist in crossdating of undated tree-ring time series (Grissino-Mayer 2001). When using COFECHA, researchers should not rely solely on the program because considerable visual and graphical assessments must also be made to support the temporal placement for each series



**Figure 4.** The four oak samples we extracted from floor boards of the Lund-Spathelf House.

suggested by COFECHA (Holmes 1983). The final suggested temporal placement made by the program had to be convincing graphically (similar temporal patterns in the wide and narrow rings) and statistically (correlation coefficients significant at  $p < 0.0001$ ) (Holmes 1983; Grissino-Mayer 2001). We used COFECHA to crossdate the undated tree-ring sequences against an independent chronology created from a site just north of Ann Arbor, Michigan. The reference white oak chronology was developed at the Cranbrook Institute, Michigan (42°40'N, 83°25'W) by Dr. Edward R. Cook of the Tree-Ring Laboratory, Lamont-Doherty Earth Observatory at Columbia University (ITRDB chronology MI005.CRN).

## RESULTS

All 40-year segments on each of the four measured series demonstrated a high level of correspondence indicated by the statistically significant correlation coefficients in all comparisons (Table 1). The average interseries correlation for our oak samples was 0.63 and the average mean sensitivity was 0.18 (Table 1). Of the 39 total 40-year segments (lagged 10 years) tested by COFECHA, four (10.3%) were flagged as possible dating errors (Table 2). A more meticulous inspection of these four segments indicated statistically significant ( $p < 0.01$ ), but nonetheless lower correlations at the current dated position, while the one alternative placement suggested by COFECHA was untenable. Three of the four flagged segments had no alternative placement, indicating that the

**Table 1.** Descriptive statistics and results from the segment testing conducted in COFECHA for the four measured series.

| Series         | Begin Year | End Year | Length | No. Segments Tested | No. Flagged Segments | Correlation with Master | Mean Sensitivity |
|----------------|------------|----------|--------|---------------------|----------------------|-------------------------|------------------|
| MH1A           | 1723       | 1845     | 123    | 10                  | 3                    | 0.418                   | 0.215            |
| MH1B           | 1720       | 1845     | 126    | 10                  | 0                    | 0.717                   | 0.134            |
| MH1C           | 1738       | 1845     | 108    | 9                   | 1                    | 0.683                   | 0.194            |
| MH1D           | 1727       | 1845     | 119    | 10                  | 0                    | 0.710                   | 0.185            |
| Total or mean: |            |          | 119    | 39                  | 4                    | 0.629                   | 0.181            |

flag was not from a dating error, but rather a portion of the segment where the growth in that tree did not correspond with the others. A residual chronology created from the Lund-Spathelf House samples was anchored against the reference chronology (Cranbrook Insitute-MI005.CRN) from 1720 to 1845 with a correlation coefficient of 0.62 ( $p < 0.0001$ ,  $t < 8.76$ ,  $n = 126$ ). Furthermore, a graphical comparison of the two chronologies displayed a convincing match (Figure 5).

## DISCUSSION

The trees from which the oak samples derive were cut in A.D. 1845, suggesting that the Lund-Spathelf House was constructed the same year, or soon after. This depends on whether the logs were used immediately after cutting as it was common for early settlers to incorporate harvested logs almost immediately into their structures (Grissino-Mayer 2009). The cutting date of 1845 was based on several factors including the clustering of the dates, the consistency of the outermost ring along the available circumference of each sample, and the presence of bark on sample MH1D. By combining the data acquired from the documen-

tary records for the Jonathan Lund House with the results from the dated oak samples, the historical placement of the Lund-Spathelf House became apparent. When Jonathan and Sarah Lund purchased the land in 1845, they first built the structure known today as the Lund-Spathelf House. This house served as a temporary family residence until their much larger Jonathan Lund House was completed. Furthermore, the 1845 construction date is congruous with the year the Lund Family purchased the land, and the basement inscription by Philip Henry Howland lends additional support because the inscription must postdate the cutting dates on the samples. This study represents one of the few examples on the use of dendrochronological techniques to date a historic structure in the Midwest region of the United States. Additionally, it further illustrates the efficacy of using dendrochronological techniques when documentary records fail to provide an exact construction date of a structure.

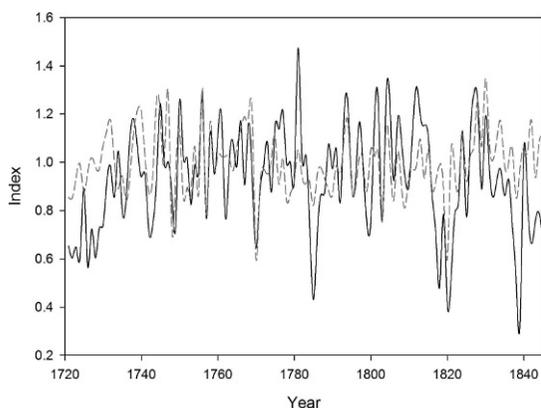
## ACKNOWLEDGMENTS

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**Table 2.** Internal correlation testing of the Lund-Spathelf House tree-ring measurement series using 40-year segments lagged 10 years. Values are correlation coefficients.

|         | 1720 | 1730 | 1740 | 1750 | 1760  | 1770  | 1780  | 1790 | 1800 | 1810 |
|---------|------|------|------|------|-------|-------|-------|------|------|------|
|         | 1759 | 1769 | 1779 | 1789 | 1799* | 1809* | 1819* | 1829 | 1839 | 1849 |
| MH1A    | 0.75 | 0.85 | 0.72 | 0.42 | 0.32A | 0.30B | 0.32A | 0.61 | 0.64 | 0.66 |
| MH1B    | 0.75 | 0.86 | 0.81 | 0.61 | 0.57  | 0.57  | 0.59  | 0.90 | 0.80 | 0.76 |
| MH1C    |      | 0.75 | 0.76 | 0.66 | 0.52  | 0.43  | 0.25A | 0.67 | 0.77 | 0.79 |
| MH1D    | 0.73 | 0.79 | 0.66 | 0.55 | 0.54  | 0.43  | 0.37  | 0.39 | 0.49 | 0.51 |
| Average | 0.74 | 0.81 | 0.74 | 0.56 | 0.49  | 0.43  | 0.38  | 0.64 | 0.67 | 0.68 |

\* "A" or "B" in these columns indicates a 40-year segment flagged by COFECHA.



**Figure 5.** Crossdating between the Cranbrook Insitute Residual chronology (solid black) and the Residual chronology (dashed grey) created from the four Lund-Spathelf House samples ( $r = 0.62$ ,  $p < 0.0001$ ,  $t = 8.76$ ,  $n = 126$ ).

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