

Tree-Ring Dating of the Abraham Hasbrouck House in New Paltz, New York

By

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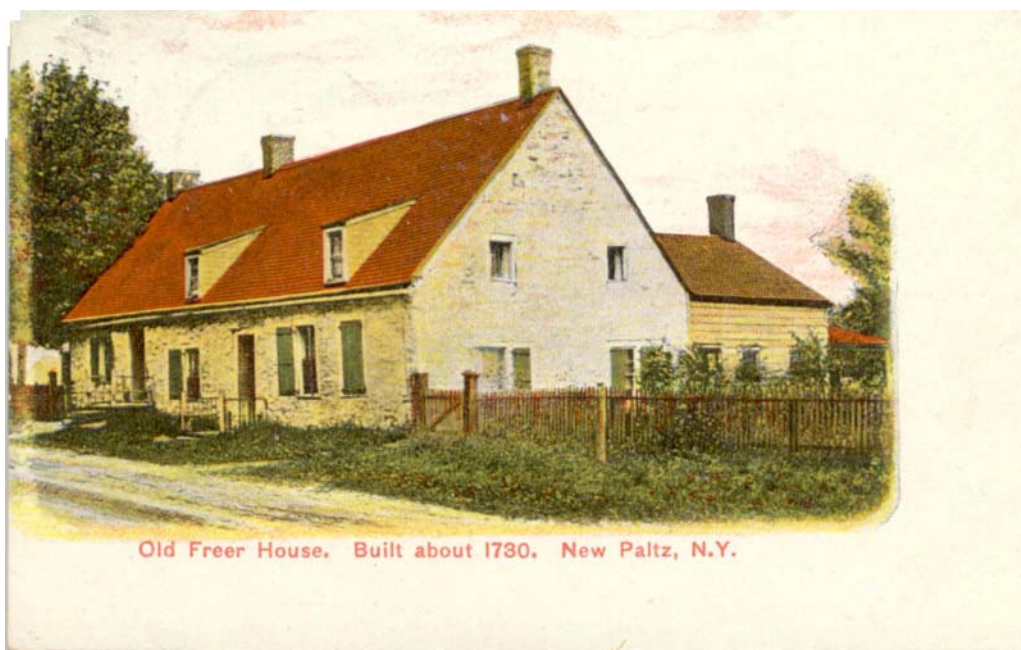


Introduction

The Abraham Hasbrouck House is considered one of the original houses built by the Hasbrouck family that founded the Village of New Paltz in 1677. It is one of six early colonial houses owned and operated as historic house museums by the Huguenot Historical Society, also located in New Paltz. The construction of the "Abraham House" is thought to have begun as early as 1692-94, with its current configuration finished by 1712. From the Hasbrouck family website <http://www.hasbrouckfamily.org/houses.htm>, the oldest part of the house has been thought to be the north room and cellar kitchen with a 1692 construction date. The rest of the house is thought to have been completed by 1712. In contrast, recent investigations of the Abraham House, described on the Huguenot Historical Society web site http://www.hhs-newpaltz.net/tours_education/tour_ahasbrouck.htm, indicate that the center portion of the house is probably the oldest part, although it is unclear by how much.

Obviously, there is considerable ambiguity concerning the actual construction history of the house. Architecturally speaking there is evidence for 3 early building phases, nominally referred to here as the north, center, and south sections. None of these structural units have well constrained construction dates however. In addition, there have been some substantial renovations to the house, especially in the attic/roof area, with clear evidence for reused timbers and the replacement of roof beams with small timbers from different tree species (see <http://www.hasbrouckfamily.org/abrahamhouse.htm>). While we did take some samples from attic timbers and a window frame, none of the results obtained from there proved to be of any use in determining the construction history of the house.

The ambiguity of construction described above is reflected in postcard images of the Abraham House that are displayed on the New Paltz Public Library website <http://lib.newpaltz.edu/banner/archives/html/index.html>. In one postcard, the Abraham House is referred to as the "Old Freer House" (see below) and is given a construction date of 1730. A comparison of this image with that on the cover of this report clearly shows that the Abraham House and the Freer House are one in the same.



Another postcard image (shown below) from the same website indicates that the construction date of the now "Abraham Hasbrouck House" was 1772. Since none of the historical documentation associated with the construction of the Abraham House can definitively determine the precise construction history of the house, Jack Braunlein of the Huguenot Historical Society arranged for Edward R. Cook, Paul J. Krusic, and William J. Callahan to conduct a dendrochronological study of the Abraham House in order to establish a more precise construction history. This report describes the results of that study.



Methods

Dendrochronology is the science of dating and analyzing annual growth rings in trees. Its first significant application was in the archaeological dating of the ancient Indian pueblos of the southwestern United States (Douglass 1921, 1929). Andrew E. Douglass is considered the "father" of dendrochronology, and his numerous early publications concentrated on the application of tree-ring data for archaeological dating. Douglass established the connection between annual ring width variability and annual climate variability, which is responsible for the establishment of precisely dated wood material (Douglass 1909, 1920, 1928; Stokes and Smiley 1968; Fritts 1976; Cook and Kariukstis 1990). Since 1921, dendrochronological methods, first developed by Douglass, have been perfected and employed throughout North America, Europe, and much of the temperate forest zones of the globe (Edwards 1982; Heikkinen and Edwards 1983; Holmes 1983; Stahle and Wolfman 1985; Krusic and Cook 2001). In Europe, where the dating of buildings and artifacts is as much a profession as a science, the history of tree-ring dating is tremendous (Baillie 1982; Eckstein 1978; Eckstein 1984).

During the Spring/Summer of 2002, Edward R. Cook, Paul J. Krusic, and William J. Callahan visited the Abraham Hasbrouck House and conducted the dendrochronological sampling that is the basis of this report. The procedures we followed were identical to those used to successfully date the Jean Hasbrouck House. A total of 15 oak cores and 2 maple cores were collected from the hardwood timbers in the house, with the most coming from

the basement (see **Figure A1.2**). The basement was given the highest priority because it was the only location where large oak timbers could be found that represented the three major structural units (north, center, and south) of the Abraham House. Even so, only the north basement kitchen fireplace lintel provided oak to sample. The oak beams in the center and south portions of the basement were similar in dimension to those in the basement of the Jean Hasbrouck House, which dated out extremely well, and likewise had many edges available for sampling. This of course is important for providing the exact cutting dates of the trees used for construction. However, unlike Jean House beams, which were in an extremely good state of preservation, the Abraham House beams were in very poor condition, with most of the sapwood lost due to rot. Relative to the Jean House basement, the Abraham House basement must have been much damper over the years for there to be such a difference in the level of wood degradation. We also sampled oak at two other locations in the Abraham House: a door frame on the west wall of the center section of the house (see **Figure A1.3**) and in the south attic (no **Figure**). These latter cases produced some dates, but the lack of many edges did not provide the cutting dates that we were looking for. We also sampled several large pine beams in north cellar and ground floor locations of the house. As was the case with the Jean House, we were unable to cross-date any of the pine tree-ring series with any dating masters at our disposal. Therefore, we will emphasize the results from the basement samples in our interpretations.

The wood core samples were processed following well-established methods of dendrochronology. They were taken to our Tree-Ring Lab where they were carefully glued onto grooved mounting sticks. The wood cores were then sanded to a high polish to reveal the annual tree rings clearly. The rings were then measured to a precision of ± 0.001 mm. The actual cross-dating procedure involved the use of a computer program called COFECHA (Holmes 1983), which uses a sliding correlation method to identify probable cross-dates between tree-ring series. Experience has shown that this method of cross-dating is superior to that based on the skeleton plot method (Stokes and Smiley 1968) for oaks growing in the northeastern United States. It is also very similar to the highly successful CROS program used by Irish dendrochronologists to cross-date European oak tree-ring series (Baillie 1982).

We used COFECHA to first establish internal or relative cross-dating among the house timbers. This step is critically important because it locks in the relative positions of the timbers with each other and indicates whether or not the dates of those specimens with outer bark rings are consistent. Having done this, we compared the internally cross-dated series with independently established tree-ring chronologies from old living trees and historical tree-ring material. All of the "dating masters" used are completely independent of the samples taken from the Abraham House.

Results

The results of the dendrochronological dating of the oak cellar timbers are summarized in **Figure A1.1** contained in the **Appendix A1** of this report, with their exact locations shown in **Figures A1.2** and **A1.3** and details on the dating of each timber given in **Table A1**. These results are emphasized here because they provide the most definitive tree-ring dates. The more tenuous, but somewhat supporting, results of the sampled pines are included in **Appendix 2**.

A. North Cellar Kitchen Oak

As stated earlier, the north cellar kitchen lintel provided the only oak sample from this part of the house. Two samples were collected: one from the western end and one from the eastern end of the lintel (see **Figure A1.2**). In each case, there "appeared" to be some suggestion of a waxy edge or sapwood, although no bark was present. The two

samples dated well against a number of historical masters, with the west and east samples having outer dates of 1721 and 1728, respectively. Clearly, the fireplace lintel could not have been put in any earlier than 1728. Assuming that it is not a replacement, this puts a hard minimum date on the construction of the north cellar kitchen. It is not possible to tell how many rings might yet be missing from this sample. However, it definitely contains sapwood and is likely to be close to the true cutting date.

B. Center and South Cellar Oak

As described earlier, the beams there are in a very poor state of preservation. Yet most did in fact have clear evidence of bark and waxy edges. Therefore, we made every effort to obtain complete tree-ring samples with waxy edges. This effort was reasonably successful. Of the six sampled cellar beams, three produced unequivocal cutting dates. The first, 4AH04, is located under the center portion of the house (see **Figure A1.2**). It produced a cutting date of 1721. The second, 4AH03, is located under the south portion of the house. It produced a cutting date of 1731. The third, 4AH01, is also under the south portion of the house and is part of the fireplace cradle at the far southern end. It produced a cutting date of 1735. The three remaining cellar beams produced dates in their respective center and south house locations that are consistent with a certain number of lost sapwood rings relative to the 1721 and 1731 dates.

C. Other Oak Samples

Table A1 indicates that three more oak samples were successfully dated: 2AH01 (1564-1673), 2AH02 (1622-1702), and 6AH04 (1616-1681). The 2AH01 and 2AH02 samples are from an old door frame on the central west groundfloor wall of the house. See **Figure A1.3** for their exact locations. The 6AH04 sample is from an attic window frame on the southwest corner of the house. None of these samples included any clear evidence of waxy edges, or even sapwood for that matter, and the number of lost rings due to milling is indeterminate. Therefore, the early outer dates provided by these specimens *must not* be interpreted as cutting dates.

D. Pine Samples

Pine joists in the north cellar kitchen and ground floor rooms of the Abraham House were also sampled. The locations of these samples are shown in **Figures A1.2** and **A1.3**. **Table A2** provides an identification list of the sampled pine joists with dating results. None of the joists had unequivocal waxy edges, although some did have rounded corners that appeared similar to a bark surface. The analyses of the sampled pine timbers produced results qualitatively similar to those of the Jean House. Relative cross-dating between several of the joists could be established, but no absolute tree-ring dating with any established tree-ring master could be determined. Even so, it was possible to establish firm cross-dating between the Abraham House and Jean House floating pine chronologies (see **Figure A2.1**). This enabled us to use the relative alignments of the pine data in our interpretations given below.

Synthesis and Interpretation

Figure A1.1 shows the degree of cross-dating between the Abraham House oak tree rings and a Jean House oak historical dating master. The two series have an overlap of 207 years (1515-1721) and a cross-correlation of 0.77. This is an exceptionally high correlation that unequivocally confirms the overall dating of the Abraham House oak tree-ring series relative to the Jean House (and six other oak historical dating masters for that matter).

This high correlation indicates that the trees used for constructing both the Jean and Abraham Hasbrouck houses came almost certainly from the same general woodlot. It is also intriguing that the earliest confirmed cutting date in the Abraham House (1721 in the center basement section) is identical to the cutting dates of most of the basement oak timbers used to construct the Jean House. This result indicates that the center portion of the Abraham House and effectively all of the Jean House were constructed at the same time shortly after the oak trees were felled in 1721.

After 1721, at least one more construction phase is indicated for the Abraham House. The south cellar section was probably constructed shortly after the trees were cut in 1731. This date is remarkably close to the 1730 date noted on the postcard of the "Freer House" shown above. In the north cellar kitchen section, the lintel date is 1728. This could mean that the two sections were constructed roughly 3 years apart. However, we can not say for sure that the outermost ring of the lintel is a cutting date because of the lack of an unequivocal wany edge. Consequently, it is possible that 3 years are missing thus allowing the kitchen to have been constructed at the same time as the south cellar section or perhaps even later. We are not sure how to interpret the 1735 date of the fireplace cradle timber on the south end of the basement other than to suggest that it was put in place 4 years after the south cellar was constructed.

Figure A2.1 shows the degree of cross-dating between the Abraham House floating pine tree-ring chronology and that from the Jean House. The two series have an overlap of 173 years and a cross-correlation of 0.58. While not as strong as the oak results (**Figure A1.1**), it is clear that the pines came from same (probably local) region. The outermost relative dates of the two series have an offset of 8 years. The Jean House chronology also contains samples from two attic plates with definite wany edges. Given that the Jean House oak timbers have a firm felling date of 1721, it is reasonable to assume that the Jean House pine chronology also has an outer date of 1721. Therefore, the 8 year offset in the two pine chronologies provides a probable outer date of 1729 for the Abraham House. However, this date does not include any pine samples with known wany edges. Therefore, the 1729 date must be regarded as a minimum outer date for the Abraham House pine chronology.

The 10 year offset between the construction of the central (1721) and south (1731) cellars based on the firmly dated oak samples is remarkably close to the 8 year offset in the floating pine tree-ring chronologies from the Abraham and Jean Houses. Given that we can not be certain that any of the Abraham House pine timbers had wany edges, the 2 year difference in offsets (10 years vs. 8 years) is probably an artifact of lost outer rings. We also note that the sampled Abraham House pine timber with the most recent relative outer date is 5AH01 (see **Table A2**) from the north ground floor room (see **Figure A1.3**). The interpreted outer date is 1729. From the oak dating results, we know that the fireplace lintel in the north cellar kitchen has a firm outer date of 1728. This is an offset of 7 years from the date of the central cellar and the Jean House (both 1721). If we assume that the trees used for construction of the north section of the house were cut in the same year, this places its actual construction sometime after 1729, which is close to the 1731 date from the south cellar. Given the stated uncertainties concerning lack of wany edges in the samples from the north section of the house, we suggest that the north and south sections of the Abraham House were probably constructed at the same time shortly after 1731.

Appendix A1

ABRAHAM HASBROUCK HOUSE, NEW PALTZ, NY TREE-RING DATING RESULTS

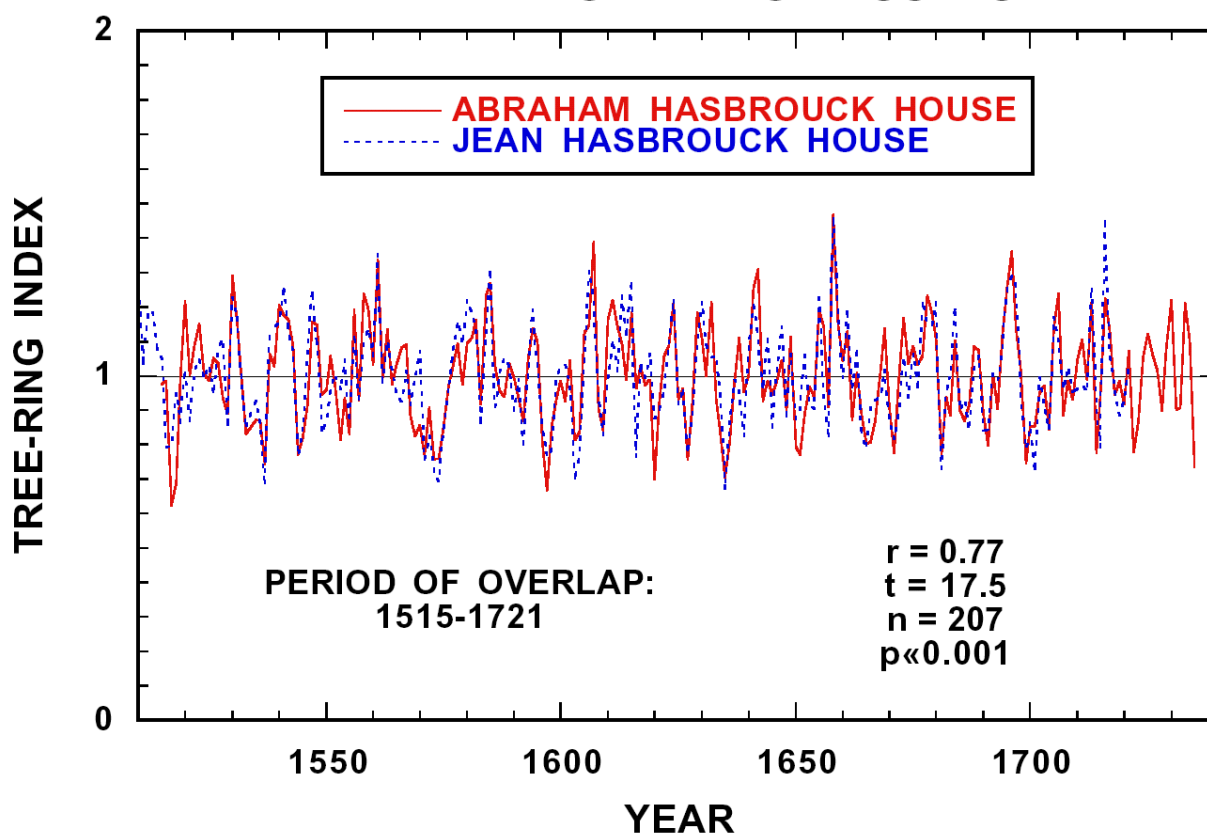


Figure A1.1. Comparison of the Abraham Hasbrouck (AH) House historical oak chronology with an Jean Hasbrouck (JH) House oak master. The JH master was independently dated against a regional oak master. The two oak series have an extremely high correlation that is significant at much less than the 0.001 level, or 1 in 1000 of being wrong. Six other independent regional oak dating masters produced the same dating of the AH samples with a significance <0.001 as well. With a correlation of 0.77 between the two houses, it is almost certain that the trees came from the same woodlot.

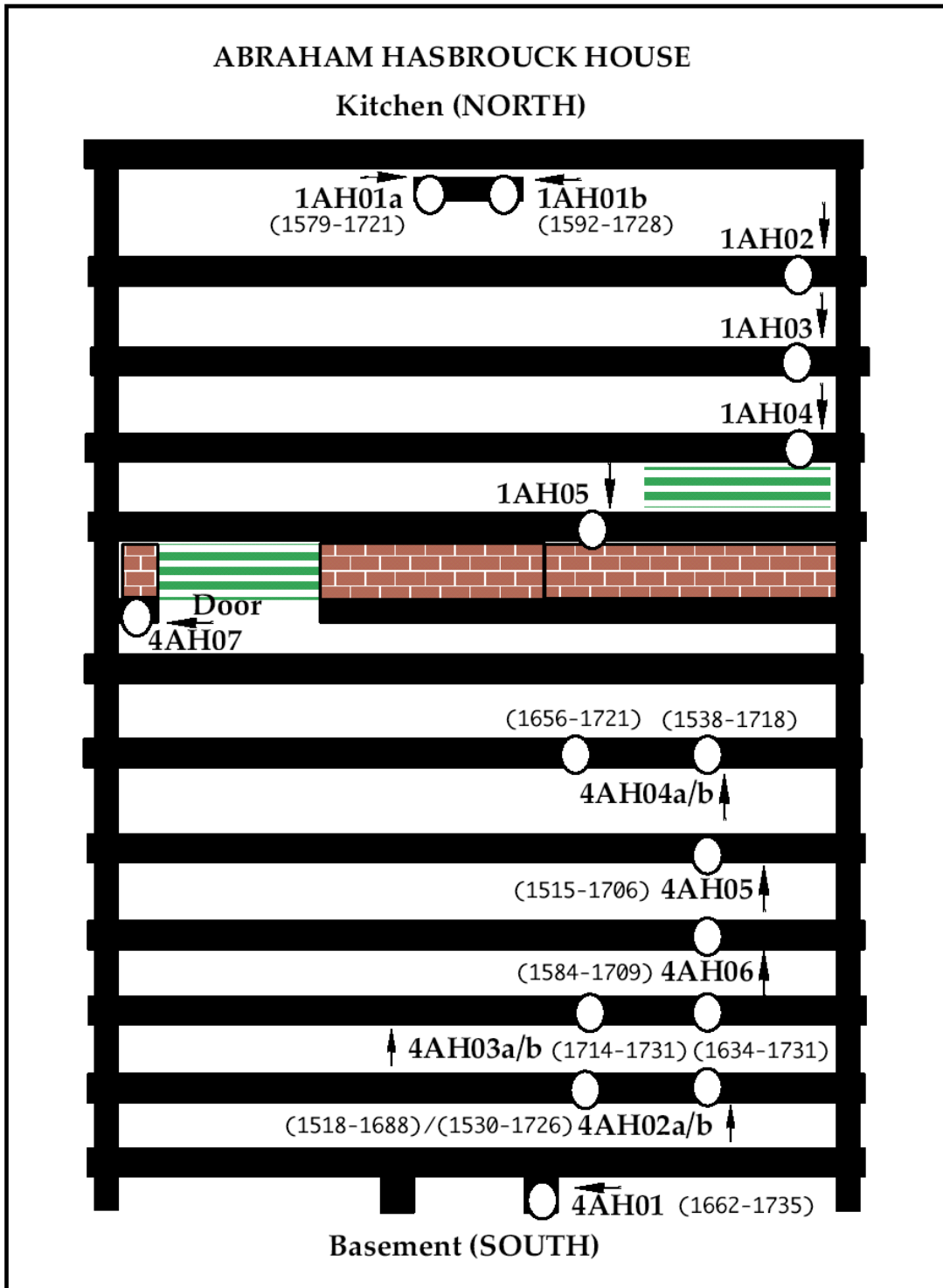


Figure A1.2. The sampling locations of the timbers in the basement of the Abraham Hasbrouck House in New Paltz, New York (not drawn to scale). Dates are included for those timbers that were successfully dated using tree-ring analysis.

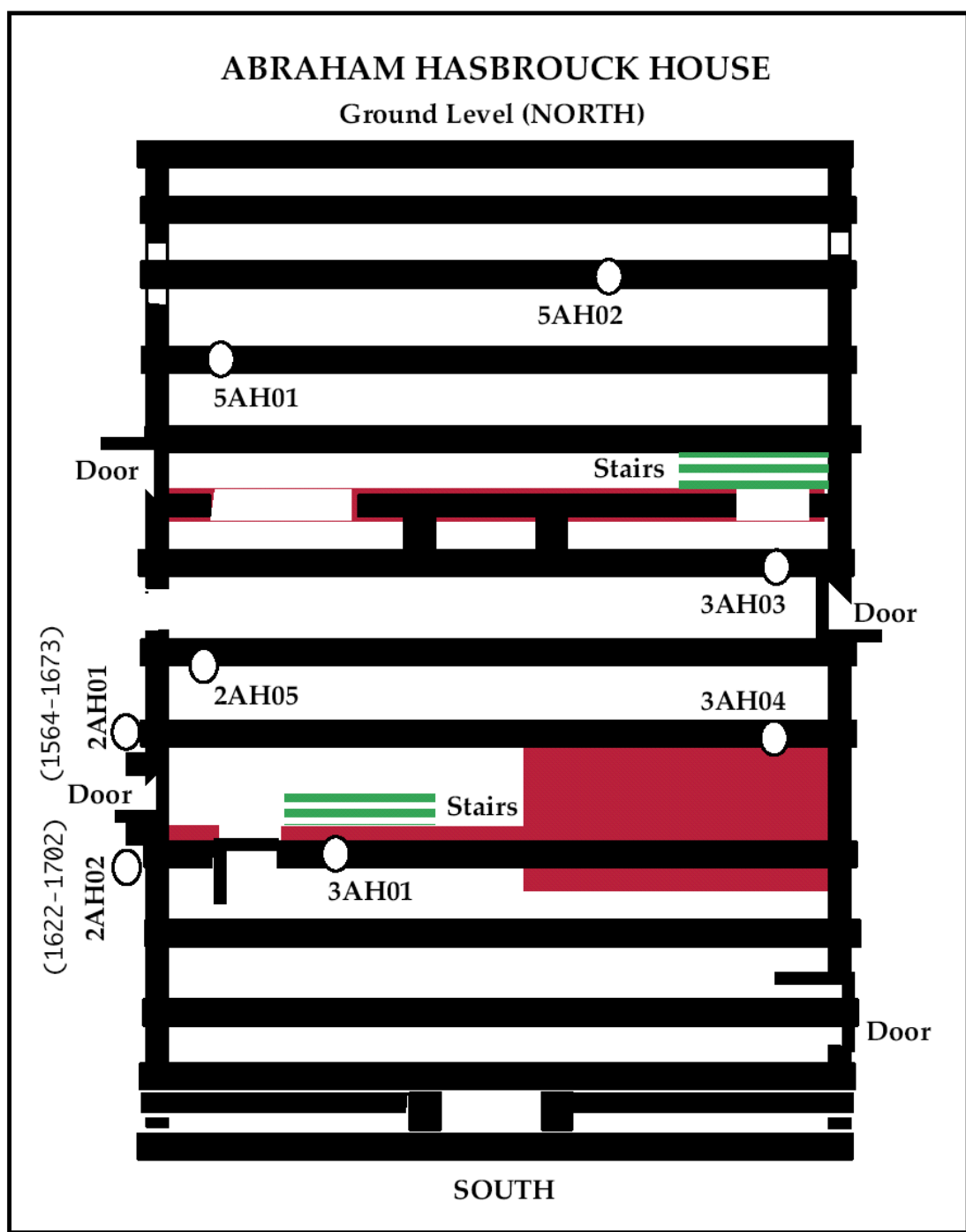


Figure A1.3. The sampling locations of the timbers in the ground floor rooms of the Abraham Hasbrouck House in New Paltz, New York (not drawn to scale). Dates are included for those timbers that were successfully dated using tree-ring analysis.

Table A1. OAK TREE-RING DATING OF THE ABRAHAM HASBROUCK HOUSE. See Figs. A1.2 and A1.3 for the precise sample locations of all but the attic samples.					
SAMPLED OAK TIMBERS (PLUS TWO MAPLE CORES)					
ID	DESCRIPTION	RADII	RINGS	DATING	BARK EDGE
1AH01A	NORTH CELLAR KITCHEN LINTEL, WEST END, SEE FIG. A1	1	143	1579-1721	NO
1AH01B	NORTH CELLAR KITCHEN LINTEL, EAST END, SEE FIG. A1	1	137	1592-1728	SAPWOOD?
2AH01	DOOR FRAME ON WEST WALL OF THE CENTER SECTION, SEE FIG. A2	1	110	1564-1673	NO
2AH02	DOOR FRAME ON WEST WALL OF THE CENTER SECTION, SEE FIG. A2	1	81	1622-1702	NO
4AH01	SOUTH CELLAR TIMBER, SEE FIG. A1	1	74	1662-1735	SAPWOOD
4AH02A	SOUTH CELLAR JOIST, SEE FIG. A1	1	171	1518-1688	NO
4AH02B	SOUTH CELLAR JOIST, SEE FIG. A1	1	197	1530-1726	SAPWOOD
4AH03A	SOUTH CELLAR JOIST, SEE FIG. A1	1	98	1634-1731	YES
4AH03B	SOUTH CELLAR JOIST, SEE FIG. A1	1	18	1714-1731*	YES
4AH04A	SOUTH CELLAR JOIST, SEE FIG. A1	1	181	1538-1718	SAPWOOD
4AH04B	SOUTH CELLAR JOIST, SEE FIG. A1	1	66	1656-1721*	YES
4AH05	SOUTH CELLAR JOIST, SEE FIG. A1	1	192	1515-1706	NO
4AH06	SOUTH CELLAR JOIST, SEE FIG. A1	1	126	1584-1709	NO
6AH01	SOUTH ATTIC RAFTER, WEST SIDE	1		MAPLE NO DATE	YES
6AH02	SOUTH ATTIC RAFTER, WEST SIDE	1	44	NO DATE	NO
6AH03	SOUTH ATTIC RAFTER, WEST SIDE	1		MAPLE NO DATE	YES
6AH04	SOUTH ATTIC WINDOW FRAME, SOUTH WALL, WEST SIDE	1	66	1616-1681	NO

*SHORT SAMPLES TAKEN TO PRESERVE WANY EDGES AND CUTTING DATES OF TIMBERS

Appendix A2

JEAN AND ABRAHAM HASBROUCK FLOATING PINE TREE-RING CHRONOLOGIES

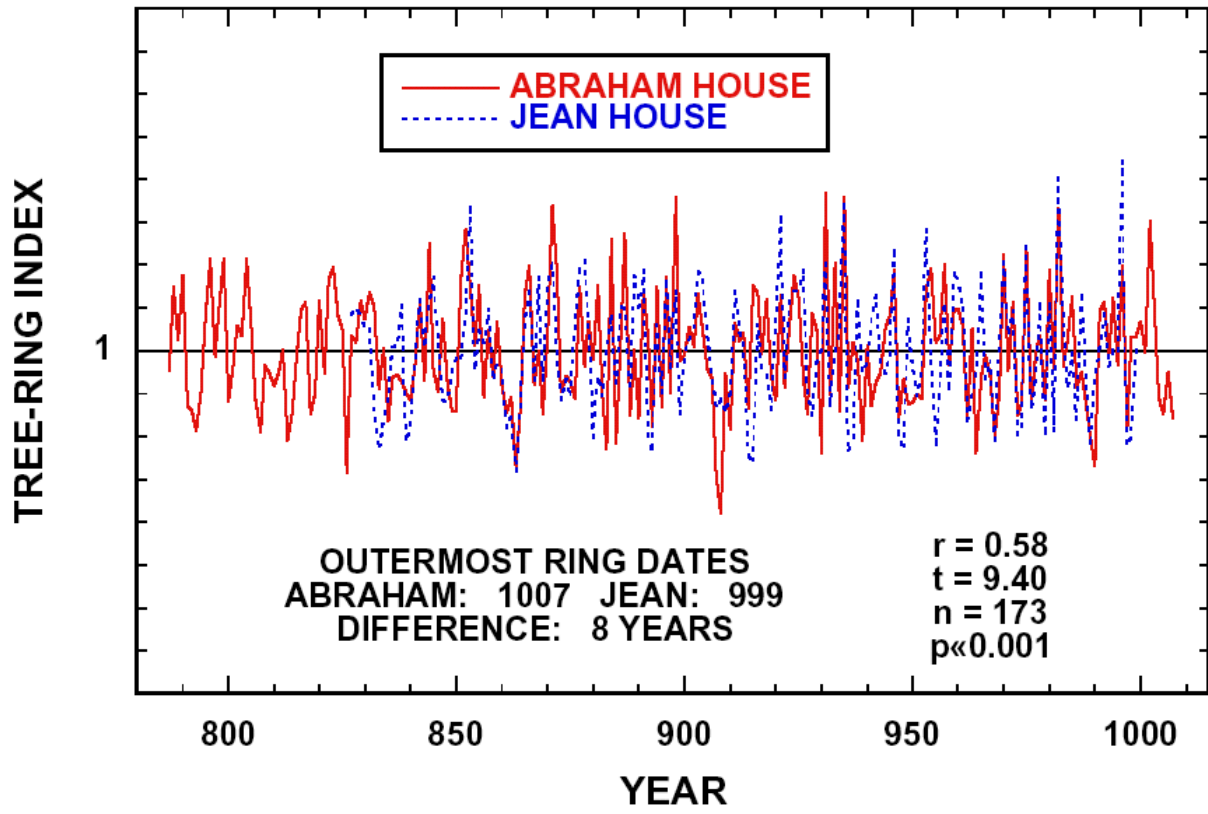


Figure A2.1. Comparison of the Abraham Hasbrouck House floating historical pine chronology with an Jean Hasbrouck House floating historical pine master. The pine tree-ring series have been cross-dated amongst themselves for each house. However, the lack of cross-dating with any absolutely-dated tree-ring master, including the oak chronologies from the Abraham and Jean houses themselves, do not allow for exact calendar years to be assigned to the pine chronologies. Therefore, the “dates” assigned to the chronologies are relative or “floating”. The point here is to show 1) the degree to which the two pine chronologies agree, and 2) the overall offset of the outermost relative dates. The two pine series have a very high correlation that is significant at much less than the 0.001 level, or 1 in 1000 of being wrong. The offset implies that, overall, the Abraham House was completed 8 years after the construction of the Jean House. However, the lack of any definite wavy edges on the Abraham House beams make this 8 year offset a minimum value, thus making 1731 a plausible date. See the text for details.

Table A2. PINE TREE-RING DATING OF THE ABRAHAM HASBROUCK HOUSE					
See Figs. A1.2 and A1.3 for the sample locations.					
SAMPLED PINE TIMBERS (PLUS TWO MAPLE CORES)					
ID	DESCRIPTION	RADII	RINGS	DATING	BARK EDGE
1AH02	NORTH CELLAR KITCHEN, SEE FIG. A1.2	1	109	884-992 [1714]	NO
1AH03	NORTH CELLAR KITCHEN, SEE FIG. A1.2	1	122	880-1001 [1723]	NO
1AH04	NORTH CELLAR KITCHEN, SEE FIG. A1.2	2	162	814-975 [1697]	NO
1AH05	NORTH CELLAR KITCHEN, SEE FIG. A1.2	1	71	853-923 [1645]	NO
2AH03	CHECK NOTES WITH PAUL	1	117	NO X-DATE	NO
2AH04	CHECK NOTES WITH PAUL	1	102	802-903	NO
3AH01	SOUTH WALL OF CENTRAL SECTION, SEE FIG. A1.2	1	77	922-998 [1720]	YES
5AH01	NORTH GROUND FLOOR ROOM, SEE FIG. A1.2	1	221	787-1007 [1729]	NO
5AH02	NORTH GROUND FLOOR ROOM, SEE FIG. A1.2	1	84	NO X-DATE	NO

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