

Dendro @ the graveyard.

Wood and tree-ring analysis on medieval coffins from Ypres (c. 1200 – 1400 CE)



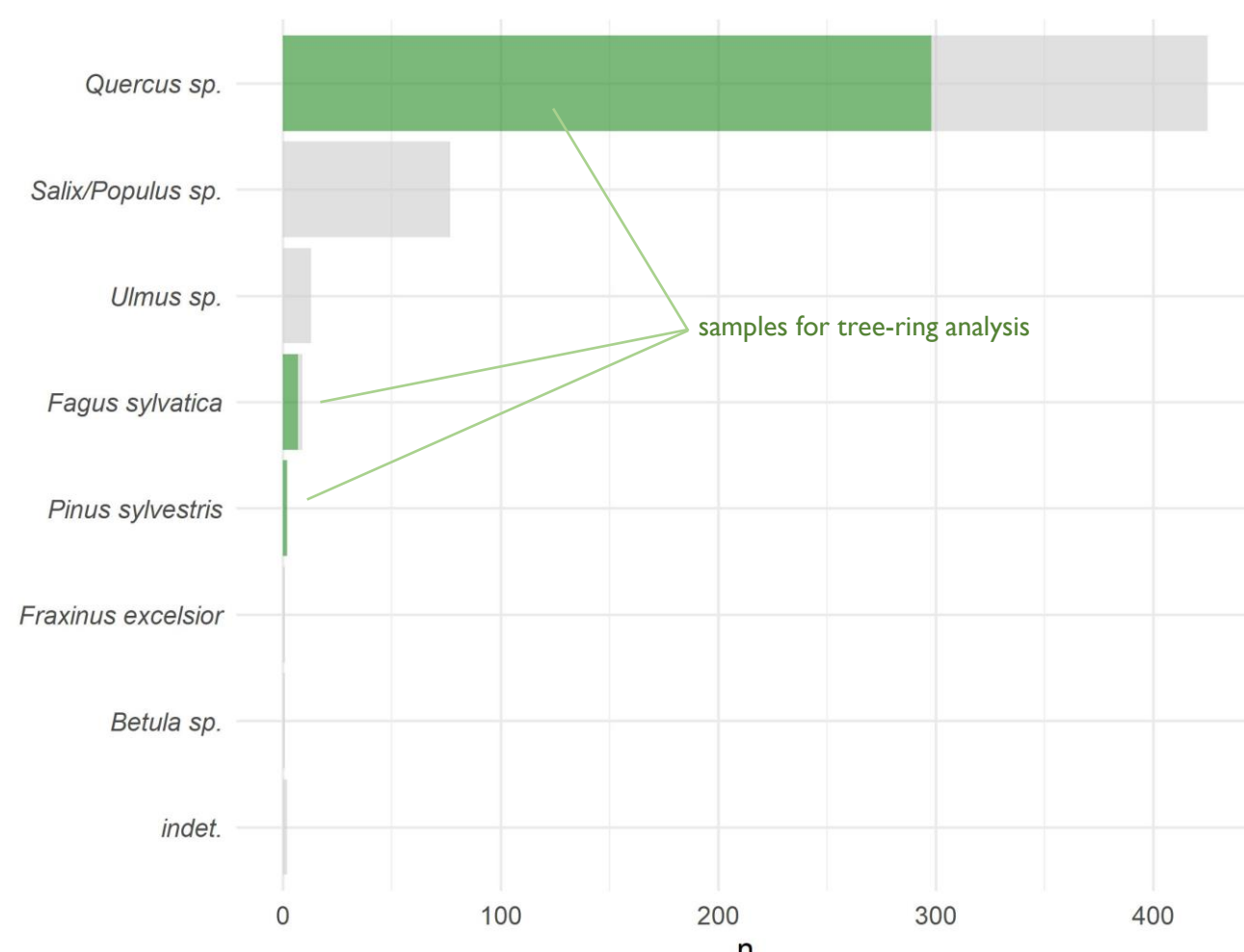
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Historical background

- Due to the success of the medieval textile industry the town of Ypres became an important economic center that rivaled Bruges and Ghent (northern Belgium).
- In 1214 CE the rapidly expanding town was walled, incorporating the Saint-Nicholas parish.
- The Saint-Nicholas Church was built between 1200 and 1220 CE, and later – presumably in the early 14th century – extended to become a hall church.
- A graveyard was installed adjoining the newly established parish church, and this burial ground was intensively used in the following decades and centuries (from the 13th up to the 16th century CE for the excavated area).
- The city's economic and demographic downfall was initiated by outbreaks of the Black Death (from mid-14th century onwards) and the siege of an English army supported by soldiers from Ghent, that attacked the town and destroyed the suburbs in 1383 CE.
- The archaeological excavation and study of the cemetery provides a unique opportunity to better document and understand the development of Ypres as a city and to study a late medieval population that was buried at one of the city's local graveyards.



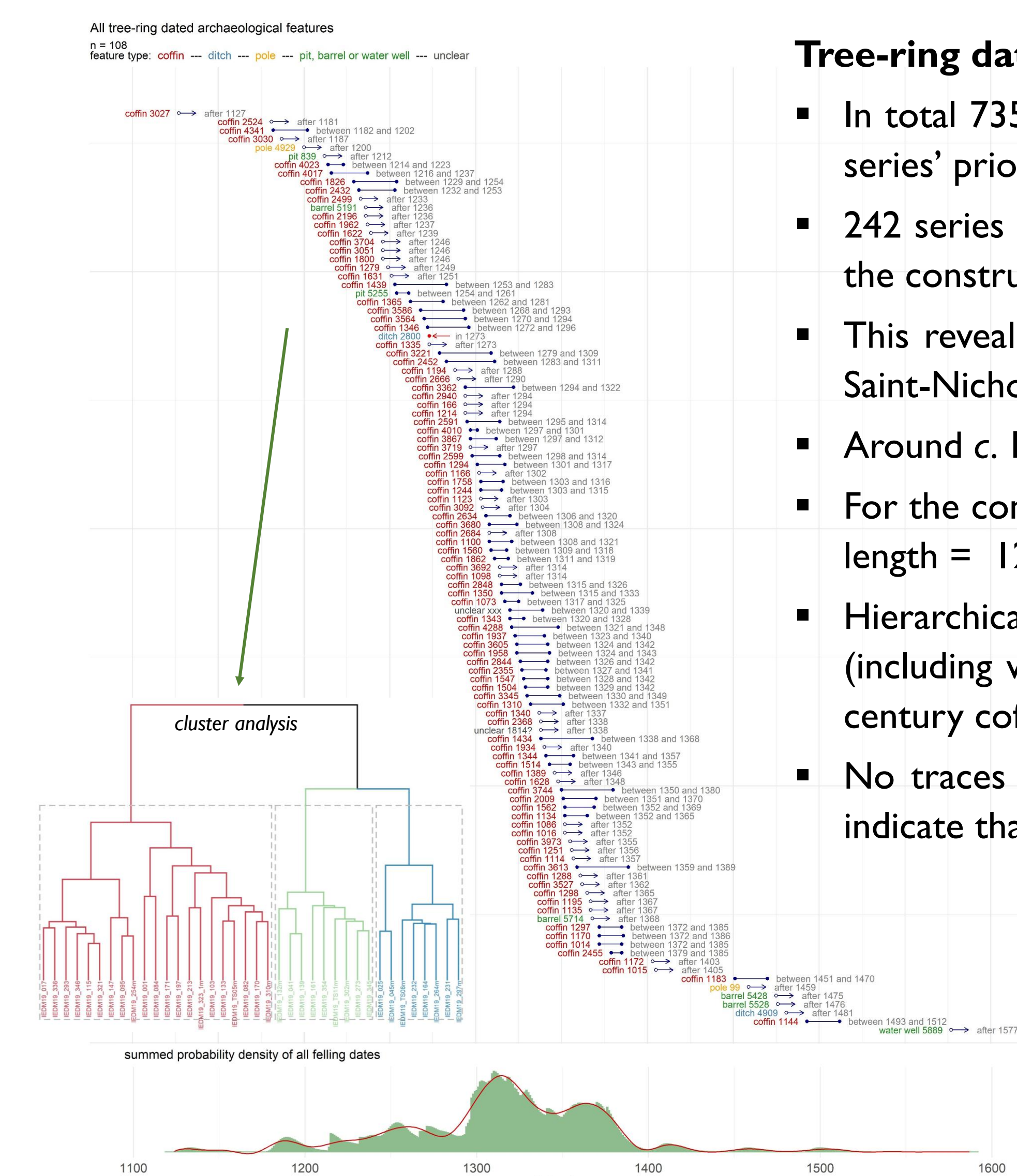
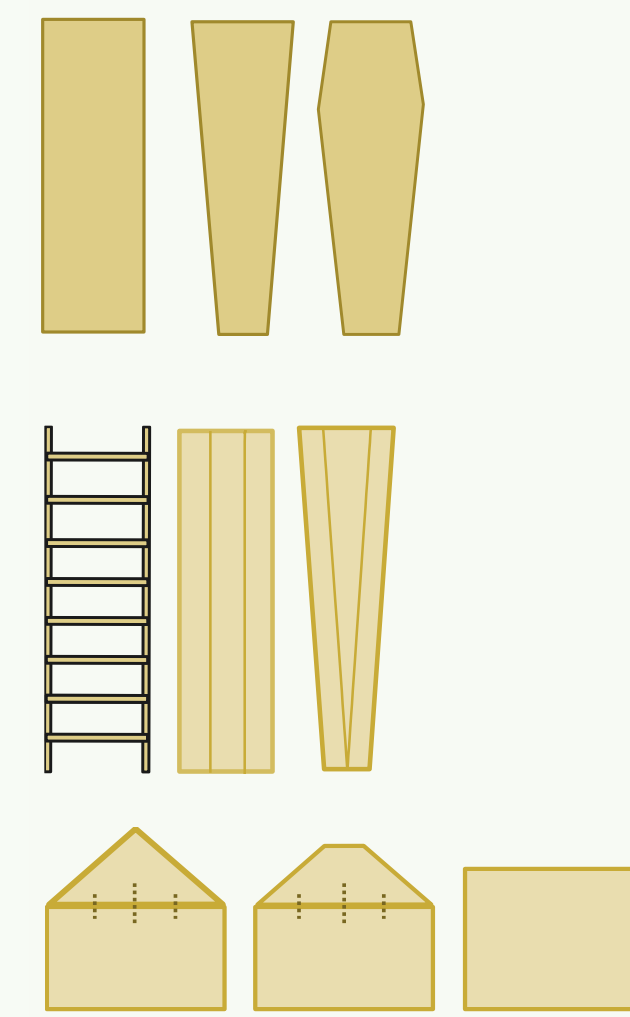
Wood use in coffin production

- Most coffins are made exclusively out of oak timbers.
- For only a limited number of coffins the lid was preserved as well.
- The lid is often made of a less durable wood species, like poplar or willow.
- The oak boards are of very high quality:
 - Slow grown
 - Quarter sawn/radially split
 - Uniform growth
- Individual planks of the sides and bottom are joined with wooden dowels.
- Sides and bottom are assembled with metal nails.



Construction details of the coffins

- Three most common outlines of the coffins are rectangular, tapered or hexagonal tapered.
- Although the bottom of many of the coffins is constructed with joined individual planks, others have a ladder-like, open structure as bottom.
- The head- and footboard is often house-shaped (pointed or topped). Rectangular head-boards are also quite common.



Tree-ring dating and provenance analysis

- In total 735 wood samples were analysed, resulting in 383 unique tree-ring series. Records from the same tree were merged into a single 'tree-series' prior to further analysis.
- 242 series could be dated (124 remain undated). These dates allowed to precisely date the construction of 84 coffins and to further document the construction of ditches bordering the graveyard, and pits and water wells from the artisanal zone located north(east) of the cemetery.
- This revealed that the graveyard was in use as a burial site from c. 1200 CE onwards, which seems to correspond to the oldest phase of the Saint-Nicholas Church.
- Around c. 1375 CE, burials ended quite abruptly on this graveyard.
- For the construction of many of the coffins imported, high-quality oak timbers were used. The tree-ring patterns count up to 303 rings (average length = 124) and have a uniform growth pattern.
- Hierarchical cluster analysis shows that during the early stage of the cemetery (c. 1200 to 1250 CE) timber procurement was more diverse (including wood of local origin and imported timbers from NW Germany and the Southern Baltic region) compared to the late 13th and 14th century coffins, that were almost exclusively made of 'Baltic timber'.
- No traces of re-use were recorded on the coffin-timbers, what suggests a deliberate choice and single-use of high-quality wood. This might indicate that a rather privileged class was buried at this graveyard.

Provenance analysis workflow

- Individual series are detrended.
- A common time-window is selected: central year +/- 40 years (minimal overlap = 81 years).
- Correlation values (t_{H_0} , r_{pearson} , %PV and sig. %PV) between all series over the common interval are computed.
- Select all series that:
 - crossdate with at least 5 other series WITH
 - sig. %PV ≤ 0.001 (significance level) AND
 - a t_{H_0} -value ≥ 5
- Perform a hierarchical k -means clustering analysis (Ward.D2, Euclidean distances) on the reduced tree-ring dataset.
- Build a chronology for each cluster.
- Crossdate the cluster-chronologies against absolutely dated oak chronologies and map correlation values.
- Evaluate provenance based on multiple correlation measures.
- Repeat the procedure above for different (and overlapping) time-windows.



Grave of an adult female with coffins for two young children.

Forthcoming

More in-depth analysis will confront the results of the dendrochronological survey (precise tree-ring dating, provenance analysis, ...) with the bio-anthropological examination of the human remains, the archaeological data and historical written sources. This will allow to further refine the interpretation of this archaeological site and provide us with more detail on the medieval population buried at the graveyard.