

Methodological approach of wood anatomy and dendrochronology in cultural heritage (one object – several techniques)

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INTRODUCTION

Wood science in the field of cultural heritage is mainly concerned with the identification, the preservation, and the age of wood (dating of elements). Identification can be macroscopic in case of appropriately preserved wood surfaces, specific characteristics and typical wood species. If the species cannot be identified macroscopically, we use microscopic analysis. For the latter it is necessary to make anatomical preparations, with the method depending on the degree of preservation of the wood.

AIM & MATERIALS

We carried out a study on a wooden mast of a ship from the archeological site of Fazine in Portorož (Slovenia). The mast was found in the sea and was reused as a mooring post in Late Roman harbour. After excavation, it was cleaned of sediments and clay and stored in demineralized water. A wooden pulley is attached to the upper part of the mast, which rotates around a wooden axis. The aim was to identify the wood species and to date the manufacture of the mast. Due to the construction and wood preservation, three methods were used for sample preparation and 14C wood dating.

3D model made by Andrea Kiss in Tomas Kiss

Radiocarbon dating of the youngest mast ring showed its manufacture between the late 2nd and early 4th century AD (222-322 cal AD; 68.2% probability).



METHODS & RESULTS

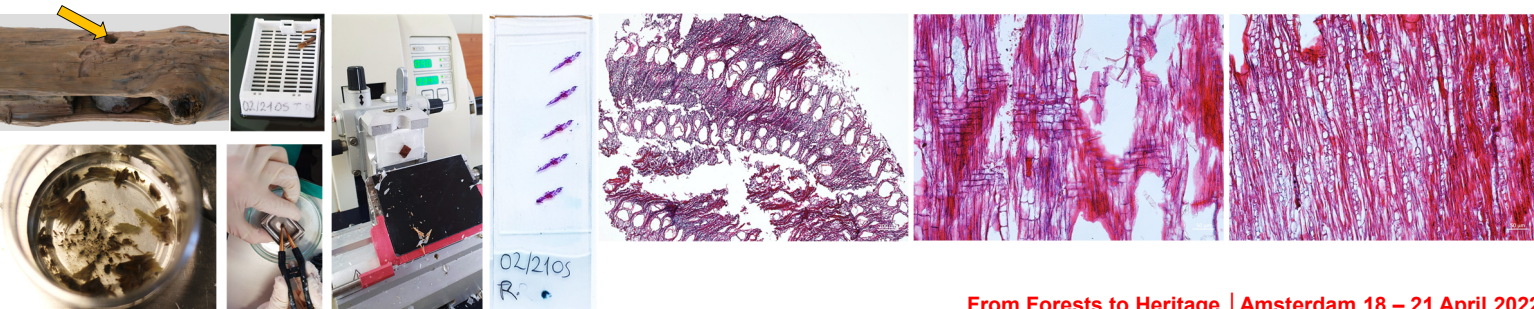
MAST: The wood of the mast was soft and rather poorly preserved. A 1 cm³ cube was taken (location marked with red arrow) and frozen at -20°C. Three planes of wood were then cut with a sharp blade and the slices embedded in glycerol for anatomical examination. Microscopic identification revealed that the mast is made of **silver fir (*Abies alba*)** wood.



PULLEY: The pulley (blue arrow) was rigidly attached to the mast and could not be rotated. Macroscopic examination revealed a reddish color and wide rays - species identification was not possible. To keep the pulley as intact as possible, it was not possible to remove any part of the wood. The wood surface was hardened by freezing with cryo-spray. Immediately afterwards, thin slices of the wood (15-30 µm) were hand cut with a sharp blade and placed in glycerol. Microscopic identification of the wood showed that the pulley was made from the wood of the **diffuse-porous oak**, most probably ***Quercus ilex***.



PULLEY AXIS: The axis of the pulley was firmly attached to the mast and inaccessible for sampling. Using thin tweezers, we removed some wood of axis from the hole in the mast and in the next step prepared wooden slices using the paraffin method. In the first step we made a transverse and a radial section, then we released the specimen from paraffin and turned it again precisely to make a tangential section. Since there was not enough wood and it was poorly preserved, we could only determine that it is **ring-porous hardwood** with large vessels. It was not possible to accurately identify the species of wood.



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CONCLUSION

To achieve the goal (wood examination), we had to use 4 different methods. In our laboratory we have experience in preparing samples for archaeological wood analysis. Since waterlogged archaeological wood is preserved in different ways, it is necessary to master all preparation and analysis techniques so that we can exploit the maximum research potential of this delicate and endangered material.