

Archaeological and Historical Wood Utilization

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Abstracts

(Re)constructions

The change from Anglo-Saxon timber use and joint systems to High Medieval joints and timber use

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Key Words: timber use, High Medieval period, England.

Richard Darrah has contributed to books and written papers on archaeology for many years. He has also been heavily involved in the reconstruction of archaeological finds. Survival of well-preserved wood and timber from some archaeological sites enables us to identify both the timber quality used and the sets of joints that were used in different periods of prehistory and history. This paper concentrates on the evidence of the timber use and Saxo- Norman joints used in the construction of the Hemington Bridges and describes how these differ from the techniques and joints of the High Medieval period in England.

Analyzing construction timber in farmhouses in comparison to churches

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Key Words: timber use, tree-ring analysis, specified timber use in churches and farmhouses, Austria.

In Austria wood has always been available and easy to handle. Therefore it has been the main construction material for a long time. Centuries ago, forests were seen as self-evident and open to everyone, but by the beginning of the industrialisation, wood has become rare. People, especially farmers at a low social position, were constrained to use wood in the most economical way. But what was the most economical way? What was the reason for using specific wood species? How did farmers manage to farm the yard and to construct and sustain their houses?

To answer these questions, traditional farmhouses in The Austrian Open Air Museum Stübing have been analysed. Dendrochronologically dated samples of construction timber have been examined according to wood species, century, altitude and purpose of the building.

For this study, the focus has been set on the region Styria. 608 wooden elements from 36 farmhouses were compared to 412 wooden elements from 28 churches, to investigate the difference between a public house and a farmer's house from the 15th to the 20th century.

Over 90% of the construction timber in farmhouses which were built in an altitude of over 1200m was made of larch wood, whereas larch was hardly used in churches. Nevertheless the shake roof of churches often was made of larch shingles. This indicates that farmers used the wood growing near by.

By measuring tree-rings of construction timber in farmhouses, a characteristic pattern often arises. Every 7 to 14 years, unusual small rings in spruce wood are visible, which suspect leave harvesting.

That means that almost all branches up to the top were used to bed the animals of the farm. Noticeable was one farmhouse where 70% of all beams were made out of leave harvested trees.

Another question was the time of harvesting. Some beams showing a waldkante without any latewood formation, as it is the case for trees harvested in early summer. 32% of all churches, compared to 14% of all farmhouses show at least some spring harvested beams.

Analysing construction timber opens a window to the past and once again brings back to mind, how well organised wood utilisation has been.

This study was conducted within the project "Historical Wood Utilisation in Austria", which was funded by the FWF.

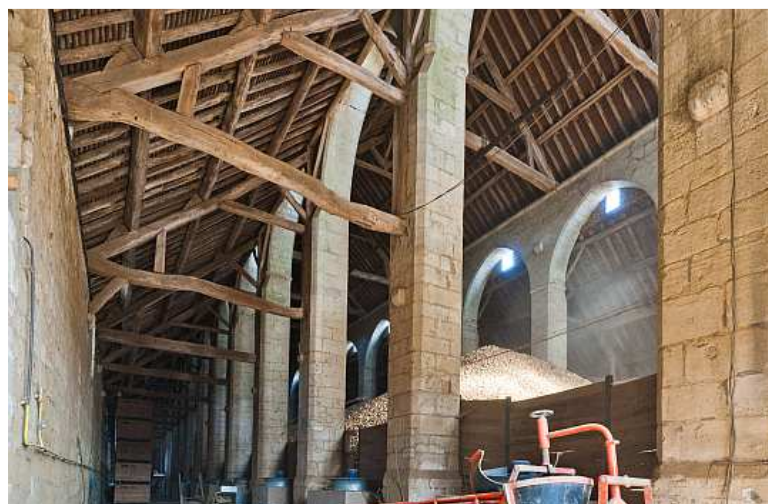
France, Normandy: Renaissance of the construction of granges after the Hundred Years' War and the technological transfer towards the northern Netherlands

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Key Words: granges, building traditions, France.

It is little known that, apart from the big monastic Granges, there were Granges similar in size and shape built on farms of the aristocracy in France and in England too. The origins of the latter may be paralleled to the monastic ones. In contrast to monastic contexts, where the construction of new granges came to a standstill due to the decline of Cistercian Order, the aristocracy, especially the landed gentry, continuously built this type of barn up to modern periods. However, the Hundred Years' War between 1337 and 1453 deeply affected building activity here too. Only after the end of the war in the course of an economic rebound, building activities increased again. Even damaged or destroyed granges were repaired or rebuilt. Thus an amount of 5 big granges has been erected between 1488 and 1493, only in the Département Eure/Haut Normandy, which have passed nearly unheeded by building researchers up to now.



Villeron, Département Val d'Oise, Ile-de-France. Grange de Vaulerent, built in the first half of 13th century. The biggest monastic barn in Europe with its length of 72m. One of 15 barns of the Cistercian abbey of Châalis. The roof was destroyed in 1446 and afterwards rebuilt in another shape.

We have been able to investigate one of these granges three years ago. We visited a noble farmstead in Aclou, next to Rouen in Normandy, which – among other things – consists of a well preserved manor, dating to 1360 (d) and a big Grange showing external timber framing. The inner structure was well comparable to those constructions we know from Cistercian granges – even in space. The grange could be dated dendrochronologically to 1492 (d).



Aclou, Département Eure, Haute-Normandie. One of the few granges with external framework. Built in 1492(d)



Sainte-Colombe-la-Commanderie, Département Eure, Haute-Normandie. Ferme de la Commanderie, Grange von 1493(d)



Daubeuf la Campagne, Département Eure, Haute-Normandie. Domain of the Benedictine abbey of Rouen. Grange dating to 1488(d)

The exact number of granges of this specific type still existing on noble farms is not known. Up to today, only a few granges have been investigated. Nevertheless, those few well known exemplars still show that the architectural tradition of the monastic barns survived on the farmsteads of the aristocracy, interrupted only by the Hundred Years' War. The youngest known Grange was dated to 1766±6 (d). It can be found at the domain of the Benedictine abbey St. Ouen, Rouen in Daubeuf la Campagne.

In 1524 the first construction with high posts comparable to those described above emerged in the Netherlands. Today the so called "Schathues" situated on the noble estate of "Uithuizen castle" has only four trusses left but the assembly marks tell us that once there were seven. Thus conclusions can be drawn on its original length. It is the same length as it is usually the case with the barns in Normandy and another interesting parallel. Most likely more of these big barns will have existed on many noble estates around the city of Groningen. We may assume that the origins and the development of the rural "Gulf"-barns of Friesland and the "Stolp"-construction north of Amsterdam can be found here.

Data archiving

Digital Collaboratory for Cultural Dendrochronology (DCCD)

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Key Words: data archiving, sharing data, international data exchange, Netherlands.

Dendrochronological data collections with relevance to historical and palaeo-environmental research in the Low Countries have been reworked, upgraded and combined in a trusted repository for the benefit of large-scale research in the field of wood usage and landscape history. This repository, the *Digital Collaboratory for Cultural Dendrochronology (DCCD)*, is accessible online at <http://dendro.dans.knaw.nl> by means of an interface that allows users to upload and download (meta)data and associated files, to define user permissions and to query the repository content. The DCCD conforms to international best practices regarding the long-term preservation of digital research data and already stores >5000 research projects from > 10 European countries.

The DCCD is based on the international digital standard for tree-ring data, TRiDaS. It is fully compatible with TRiDaBASE, a freely distributed MS Access database for producing, ingesting and analysing TRiDaS. The implementation of multi-lingual controlled vocabularies enables users to query the content of the DCCD in Dutch, English, French and German. The DCCD includes functionality to ingest and export time series in any of the >20 dendrochronological data formats in use today.

The development of the DCCD was funded by the Netherlands Organization for Scientific Research (NWO section Humanities), the Cultural Heritage Agency of the Netherlands (RCE), Utrecht University, Data Archiving and Networked Services (DANS) and the participating laboratories. The project website can be found at <http://www.dendrochronology.eu>.

Cloud-computing in anthracology – developing the WODAN online database in Ireland

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Key Words: data archiving, wood and charcoal research, networking, Ireland.

In 2008 the Irish Wood Anatomists Association (IWAA) identified a knowledge gap in the area of wood and charcoal research in Ireland. This had two main facets – a need for standardization and a need for a secure digital repository for the high volume of wood and charcoal results being generated in Celtic Tiger Ireland. The INSTAR (Irish National Strategic Archaeological Research) programme from the Heritage Council provided a unique opportunity to fund this work. The work was carried out and also financially supported by the Discovery Programme.

WODAN is an integrated on-line wood and charcoal database that can be used for archaeological and biological studies and investigations in Ireland and beyond in Europe especially. It will serve both as a digital archive and a tool for research. This database will allow specialists and non-specialists alike to search and query charcoal and wood results from archaeological excavations.

The development of an on-line database application is a fundamental departure from other environmental databases. At all times there will only be one, central, updated version available.

WODAN was designed with all known methods of charcoal and wood analysis in mind, in order to enable as many people as possible to use it.

An international element has been added with wood and charcoal specialists from various countries, such as Germany, Australia and Netherlands including *Biax Consult*, contributing to various phases of the project.

The development of queries is a crucial part of the WODAN database. We have been able to create a number of queries for the charcoal section of the database. The funding did not allow us to realize some of our wishes, such as a rapid data entry form and further queries for the wood section especially.

We will show the database and its workings, and describe the challenges and opportunities that are linked to WODAN.



Dendrochronological research

The life aboard “La Dauphine” and “L’Aimable Grenot”: Preliminary dendrometrical study and scientific imaging of objects from two French privateer shipwrecks; Saint-Malo Bay, France

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Key Words: navigation, shipwreck, archaeodendrometry, Saint-Malo, XVIIIe siècle, Quercus, Ulmus, 3D restitution

In 1995, the remains of two French shipwrecks were discovered in the channel of access to the harbour city of Saint-Malo. Their construction and their grounding are exactly dated by written sources written in the first half of the XVIIIth century. The underwater excavations lasted 10 years on near 1000 square meters and allowed to bring to light a part of remains but especially to extract all the objects of the life on board: browsing devices, utensils of cooking, medicine, religious faith, defense, equipments, clothes etc. as well as small objects made by the sailors.

More than 3000 objects were surfaced, listed, studied of with about 1700 in wood. Completely restored, no intrusive action or destructive one is allowed and in spite of PEG's impregnation, in a few weeks, 228 were already examined by archaeodendrometrical approaches among which 167 of them have a dendrochronological high potential with 72 % of oak, 15 % of elm, some conifers and some beeches.

A follow-up study is also tested for the restitution of objects in 3D by photogrammetry and by thrown light, for presentations, distribution but also later studies without having to manipulate the object.

Dendro-Provenancing – Results from the Vienna Castle (Hofburg)

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Key Words: tree-ring analysis, wood use, rafting, import of wood, Austria.

The Vienna Castle (Hofburg) was the domicile of the Habsburger for over eight centuries and so the centre of European politics. During this time a lot of construction timber was used to set up the various parts of the building, especial the roof constructions.

The tree rings of the wooden parts can not only date the construction timber used in the Hofburg, but it can also give an indication about its origin (dendroprovenancing). In the wooden roof constructions of the Vienna Hofburg rafting wedges were found. This proves that the used construction timber was not taken from the surroundings of Vienna, but had to be rafted. 425 already dated samples from the roof construction of the Hofburg had been analysed using dendroprovenancing. Therefore samples were crossdated against various chronologies in order to find the most likely origin. With this method most of the samples were allocated to “Alpenvorland Nord”, the northern foothills of the Alps in the surrounding area of the Danube river.

Binding techniques, which were assumed to differ for traditional reasons and certain technical needs determined by the rivers conditions, were studied with the help of the rafting wedges of 11

wings of the Hofburg. Different rafting-wedges were found within the same beams. The fact that it was not possible to connect binding techniques with certain parts of the Hofburg and different rafting-wedges leads to the assumption that the rafts were newly assembled or connected when reaching bigger streams.

Furthermore transliterations from writings of different archives were used for further clue about the origin of the timber, approving the results from dendro-provenancing. In this work first results in the field of dendro-provenancing in Austria could be achieved, but only an approximate mapping was possible.



Utilization of wood species

Rarely used wood species – new results and old literature

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Key Words: wood use, historical wood utilization, historical sources.

In 1917, Josef Blau, an ethnographer in Bohemia, mentioned that in a farmhouse in Carinthia 12 different wood species were found. Studying a farmhouse in Bohemia, he was able to find 27 different species. These findings underline the high variability of wood utilization in former times.

Out of all woody plants growing in the surrounding nature, just several species are used for wood processing nowadays. But in old literature we can find interesting comments about utilization of many more wood species than we are using currently. Many different wood species including trees as well as shrubs were used for special purposes in former times. Their wider utilization was mainly based on experience passed from one generation to another. Exact mechanical and physical properties of most of those species are unknown.

The problem with old literature is, that in some cases measured figures, but in most of the cases only descriptive texts are available (for example for wood density). So, the comparison of modern measurements and figures and information from old literature is complicated.

Various wood species, trees and shrubs, were collected and tested according to modern standards. Standard climate wood density varied from 360 to 1010 kg/m³.

A comparison of old literature and new results were done for several species. Most of the new results were within the range of values from the old literature. For example, the density of *Cornus mas* was 968kg/m³. The range of density of the old literature was 850 to 1050 kg/m³ and was described as high or very high. Looking at the descriptions of utilization, it is obvious, that it was used due to the high density (and strength): tools, wooden gear wheels, shafts of tools, ladder spoke ... The described utilization mentioned in the literature was confirmed by analyses of wooden goods in Austrian museums.

There was one obvious miss-fit between old literature and found utilization. The use of *Berberis vulgaris* to produce teeth of rakes was not described in literature but found to a very high percentage at the Austrian museums. It was also confirmed by old rake-makers.

A Bronze Age wattle trackway near Utrecht (the Netherlands)

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Key Words: wattle trackway, Middle Bronze Age, Utrecht.

Woven wattle trackways are not often found on the European mainland. That was why in 2010, municipal archaeologists were very surprised to discover one while excavating part of the Roman frontier road known as the limes in a south quarter of the city of Utrecht. 48 metres of wattle, approximately 1 meter wide, had remained well-preserved in the clay deposits of a former gully system. Under the modern houses and streets the trackway followed its way North. According to 14C-analysis it was constructed in the Middle Bronze Age, which makes it the oldest evidence of habitation known from the city of Utrecht. Willow branches of excellent quality; smooth, straight and almost all of the same diameter, were used to weave the wattle. A wood specialist took samples from various parts of the trackway. Growth pattern and tree ring analysis showed that the willow branches came from managed wood. The results indicate that the techniques of coppicing and pollarding have been known since prehistoric times in this part of the Netherlands.

Barrels and tanks in the VII-VIIIth century: the example of the site of Calotterie at Quentovic, Pade-Calais, France

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Key Words: barrel, tank, dendrochronology, tool traces, Early Middle Ages, France

The excavations on the site of Calotterie, "Chemin de Visemarais", allowed to bring to light more than one thousand structures from the Early Middle Ages, from the end of the VIIth to the end of the VIIIth century, on a rough surface of 1,50 hectares. The set corresponds to seven plots of land within which develops an occupation under the shape of buildings mainly on posts accompanied with numerous pits with domestic and craft vocation, with some silos and with some latrines. One

specificity of the site is the twenty six wells distributed on the totality of the archaeological site with a massive re-use of barrels and some made from vertical pickets and from interlaced boughs. Pits and puddle also supplied hundred of pickets and sharpened posts and half-dozen of structures of wattle-fences.

The archaeodendrometrical study presented here concerns 387 staves of 24 tanks and barrels among which 13 in oak, 6 in fir tree and 1 in beech, 1 in ash tree and 1 in poplar. The number of preserved staves by barrel / tub varies from 11 to 28. Depending on the diameter of the exploited tree, on the cutting and on the shaping of wood, the staves for the same barrel varies from simple to double width and of 80 to 180 cm high and with very various types of barrels.

The tool traces study shows many differences in the steps of cutting of wood, techniques of shaping and assemblies of staves and bottoms; beyond its informs about the used tools and the wood implementation. Finally, it allows, with the archaeological information, to better understand the history of the traffic and the exchanges before the Year Thousand, between the North Sea and the Baltic Sea.

Study of the archaeological wood from the Neolithic site of La Draga (Banyoles, Spain)

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Key Words: wood use, toolmarks, experimental archaeology, Spain.

The site of La Draga is located on the Eastern shore of the "Estany de Banyoles" (Banyoles Lake), it has been excavated from 1990 to 2005 and from 2010 to 2012. Those archaeological excavations have documented the only preserved waterlogged site in the Iberian Peninsula. The site was occupied between 5300 and 4900 cal BC.

The good preservation of archaeological wood allows us to document how those wooden resources were used. The main objective of the work has been to characterize the woodworking technology to produce instruments and dwellings. Our work focuses on the identification of the type of wood and how it was transformed and used. In order to achieve those objectives we have to develop a careful and wide range of different studies: anatomical and morphological analysis, tool marks and use-wear analysis,.... Our work is based in an experimental approach as well as the development of new technologies as 3D scanning.

The use of boxwood in Medieval Vilnius

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Key Words: boxwood, artefacts, distance trading, Medieval Vilnius.

The Vilnius Lower Castle is located in a valley on the confluence of Neris and Vilnia rivers at the foot of Gediminas Castle Hill. The cultural layer of the Lower Castle site has been accumulating since the 13th century and is 8 meters thick in deepest places. Bottom layers of about 4 meters thickness are saturated with ground water and are rich with organic artefacts and wooden infrastructure objects (Pukiene, 2009).

A set of wooden finds of the 14th-18th century consisting of 1700 items has been collected during the excavations conducted in the course the last two decades. Wood species of about one third of the collected artefacts was investigated and identified using standard microscopic methods and identification keys. A total of 18 wood species was found (Pukienė, 2011).

Among the wooden artefacts of the Vilnius Lower Castle there were some made of non-native wood species. Main alien species are the common box tree and the silver fir growing in the south of Europe. Twelve artefacts made of boxwood were found: eight combs and handles of four knives. All of them are from the 14th – 15th century layers.

Boxwood combs are double-sided, rectangular with lentoid profile and similar to that found in medieval Konstanz (Müller, 1996) and Novgorod (Smirnova, 2007). At least two handles of knives seem to be made of valuable box-tree root wood. Boxwood items testify long – distance trade in wooden goods in medieval Vilnius.

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Wood used to build the medieval castle stable in Veselí nad Moravou (Czech Republic)

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Key words: timber use, wood species, durability of wood species Czech Republic.

Veselí nad Moravou is situated in the south-eastern part of the Czech Republic in South Moravia. The study site is located on the right bank of the Morava River in its close vicinity. Due to the renovation of the castle in 2008–2010 the archaeological rescue research was performed. During the archaeological research located in the bailey of the castle well preserved wooden objects were found. In total 16 wooden objects were detected within the bailey of the castle. The function of these structures was identified just in three cases. One of them was interpreted as a bakery, the second one as a hayloft and the third one, discussed in this poster as a horse stable. The wooden construction of the horse stable structure was dated using the Czech oak tree-ring chronology CZGES 2010 to the year 1228. Columns, walls and doorframes were made from oak. Wood used for sills was oak and alder. The floor consisted of elm boards. The walls were woven from probably hazel twigs. The natural durability is probably the main reason why the most samples were identified as oak (*Quercus* sp.). Oak heartwood is one of the most naturally durable woods, even when stored in water. Wood of elm has mechanical properties comparable to oak but it is only slightly resistant to decay. In this case the natural durability was not as important as in the case of exterior use. We can conclude that all wood species used in the horse stable structure had been chosen for their availability in the surrounding floodplain forests. Oak, elm and alder are woody species typical of floodplain forests.

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Branch age and diameter: useful criteria to recognize woodland management?

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Key words: wood use, pollarding, coppicing, tree-ring analysis.

Management such as pollarding and coppicing is regularly discussed in archaeobotany (e.g. Morgan 1988, Rasmussen 1990). When excavations yield finds like wattle work or fish traps, age and diameter data combined with physical evidence are frequently used to argue in favour of management. However, conclusions are often based on assumptions and small samples, management is more often suggested than demonstrated and the difference with diameter selection is not always clear. To test whether former woodland management can be recognized in wood assemblages from archaeological excavations, models were developed that predict the expected age and diameter distribution of branches from unmanaged and managed trees. The models were tested by studying modern-day trees. The results of the diameter distribution differs from the model, but the age distribution of managed wood ends abruptly as predicted in the models. The scatter plot shows large overlap in the small diameters, but as the diameter increases, distinction between unmanaged and managed wood is possible. This indicates that the models can also be used to discern management in the past. It is however necessary to critically take into account issues like sample size, natural disturbance/opportunistic wood collection and diameter selection.

The poster shows the results of modern-day willow (*Salix*) as well as two examples of application to archaeological data.



Latewood from ash as raw material for baskets and boxes

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Key words: wood use, basketry, wooden boxes, ash, craftsmanship.

Because of its extraordinary mechanical properties wood from the common ash (*Fraxinus excelsior*) was and is used in highly stressed structures. Examples are tool handles, wooden wheels and frames in early waggon, car and aeroplane manufacturing. Less known is the fact that latewood from ash was also used for plaited basketry and wooden boxes.

By hammering a radially split board of the ringporous wood, the large thinwalled earlywood vessels collapse. The latewood separates from the earlywood, leaving strips in boardlength and -width. If the latewood is too thick, it can be split down to the desired dimension. The reconstruction of the process proofed it to be relatively easy and quick by applying the right technique.

In Europe ash strips were used for over 2500 years, from iron age boxes found in the Hallstatt salt mine to baskets for heavy loads in historic times in the Salzkammergut region and the Mostviertel. This technology is also known in North America, where black ash (*Fraxinus nigra*) is used for basketry by a number of indigenous tribes in Canada and the US. It is not known if there is any kind of technology transfer because of the colonialisation.

Wooden studies in Chile: Inhalation tablets from the archaeological museum R.P. Gustavo Le Paige, San Pedro de Atacama, Chile

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Key Words: Chile, San Pedro de Atacama, inhalation tablet, dendrology, archaeodendrometry, tools traces

The PROJECT ANILLO ACT-96 of investigación asociativa of CONICYT in Chile has for title: interactions and human mobility in pre-Hispanic populations of Northern Chile, mainly in the oasis of Atacama. It concerns the universities of Chile, that Católica del Norte and the Instituto de Investigaciones Arqueológicas del Museo RPG Paige of San Pedro de Atacama. It contains diverse aspects of scientific studies as the intentional cranial deformation, the metals, the DNA and the alkaloids. Psychotropics were indeed considered as vectors allowing to communicate with the

supernatural world and were consumed by nasal way by means of tube and of wooden tablets. The SPA museum preserves a collection of about 400 000 archaeological objects in particular on the history of civilization Atacama, the Tiwanaku influences and the Inca expansion, among which more than 400 tablets of inhalation resulting of some 40 archeological sites of funeral context. These are studied by the style and the iconography. Since the beginning of 2012, the dendrological and archaeodendrometrical examinations are integrated with attempt of wood determination, the study of the cutting, the shaping and the tools traces studies of manufacturing and use. A tablet is generally made by a rectangle of little thick wood with a rectangular cavity on two thirds allowing to prepare and to inhale the substance and, for the majority of them, a varied decoration (drawing, engraving, inlay...). The poster presents this preliminary work with the difficulties and the technical problems of studies met.

Indigenous navigation tradition in North Patagonia: connections, contacts and routes between the oriental and occidental slopes of the Andes

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Key words : Chilean woods, indigenous navigation, indigenous culture, Mapuche prehispanic society, *wampos*, *bongos*, Center-South of Chile.

Wood objects and waterlogged artifacts had been found in different archaeological sites in southern Chile. Even though, the study of these types of materials in Chile is still restringed. In general the methodologies for its adequate study and preservation has not been applied. From this study, we would like to propose the introduction of new approaches in this topic, and we hope to start a new level in the archaeological investigations in Chile.

This research is presented as a study of indigenous navigation and their boats (dugouts and plankboats) for the north Patagonia lakes region, and as an effort to systematize the findings on this subject that are spread and out of context in this area, with the aim of contributing to an understanding of the practices and technologies of indigenous sailing tradition and origin. In this area we can find from very early periods populations that had a lifestyle highly specialized in forest resources. This suggests, in a more regional level, the development of a wood technology, highly understanding the properties of different woods. The development of dugouts and wooden boats would be a demonstration of this specialized technology in the use of wood.

In this research we try to apply, for the first time, different techniques and methodologies for the study of North Patagonia indigenous wooden boats, set under the concept of archaeo-dendrometry, developed by Lavier *et al.* (2004). The *taxa* identification (wood anatomy), typology and morphology, traceology (tool traces, manufacture and use wears), as well as dendrochronology, let us study wooden remains not only as chronological and ecological markers, but also capable of giving economic, cultural and technological information.

In this way, the aim of this work is, by the study of the wooden boats, to make a contribution in the comprehension of the practices and technologies of the indigenous tradition navigation in north Patagonia ; helping to understand the history of mobility, the use of space and its transformations by the indigenous communities from prehispanic periods until XXth century.

New open air museum in Moravia – anatomical identification of wood

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Key words: wood use, artefacts in open air museums, landscape, Czech Republic.

The ethnographic region Malá Haná is located in Moravia, Czech Republic, near town Boskovice. Settlement started in the 11th century and finished in the 14th century, the surrounding woody hills were settled in the 16th century. The area is in between two natural forest areas – the Drahany Highlands in the east and the Českomoravské mezihorí (a flat area between mountains) in the west. Nowadays, the eastern part has more closed-canopy forests. The natural forest species composition manifests a predominance of beech, followed by oak and fir (with smaller proportions of hornbeam, lime, maple and spruce). The current species composition has been flattened to a predominance of spruce. Samples from the open air museum in preparation were taken during spring 2012. The open air museum is at the stage of collecting samples from the region and close vicinity and looking for suitable lands. Our study so far has concentrated on smaller collected things – craftsmanship tools as well as products, things of everyday use – naturally those made of wood. 300 samples were taken using knives and chisels. Some of them were identified macroscopically on the spot, the others were identified using microscope in the laboratory. Temporary microscopic slides were obtained using razor blades. In the processing of results we focused on the most frequently appearing types of objects. These were distaffs, sieves, spinning wheels, ploughs, and stakes. Some of them were made of variety of wood species (spinning wheels, distaffs, ploughs) while others were made nearly exclusively from one species (sieves from spruce or exceptionally fir, stakes from birch). The resulting species composition corresponds to the natural forest species composition, with some deviations (e.g. spruce used probably in repairs). One of the most interesting deviations was the frequent usage of trees growing in orchards – mainly pear and plum wood. The research in the open air museum is going to continue in the next months. Consequently, other open air museums of the Czech Republic will be sampled.

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Anatomical identification and dendrochronological dating of wood from coffins below St. James Church in Brno

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Key words: wood use, coffins, wood species.

Archaeological research into wooden coffins which were found in the crypt under the St. James Church in Brno was extended by anatomical and dendrochronological analyses. Individual findings were sampled and described in detail during the archaeological research into the crypt. Wooden samples were dated in compliance with the standard dendrochronological methodology and wood

species were identified on the basis of microscopic characters of wood. Most of the 24 found coffins were deposited directly on the floor of the crypt and they were covered by a layer of human skeletal remains. 14 coffins were dendrochronologically dated mostly to the second half of the 18th century. The coffins were made usually from 10 or 11 construction elements. For the manufacture of the coffins five different species were used – oak, fir, pine, spruce and lime tree. One coffin was usually made from one species or as a combination of two species. The research helped to uncover a history of the crypt under the St. James Church about which not enough satisfactory archival sources have been found.

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Toolmarks

Recording and interpretation of tool marks on historic roof structures in the Walloon Region (Belgium)

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Key Words: traceology, toolmarks, wood use, roof structures, Belgium.

Over the years, many historic roof structures in the Walloon Region (Belgium) have been the subject of archaeological and dendrochronological studies. This combination of disciplines has significantly improved our historical and technological knowledge of an important though often neglected part of architecture: the roof. Although finished roof structures in Wallonia are now relatively well-studied, it is not the case of their construction. Luckily some of the specific traces that are left by each step of transformation of a log into timber can still be found on historic roof structures. In order to record them *in situ*, a specific method has been developed in Wallonia, which records them systematically by sketches, scumbles, pictures... and describes them in a data sheet to facilitate comparison and interpretation. This work, carry out on a large scale, can reveal a lot about the carpenters' techniques and tools. At this stage of the study interpretation of tool traces on timber is based on Czech research by Petr Růžička and his *Ars Tignaria*-team. This recent archaeological approach of roof structures called *Traceology*, which is gradually developing in Europe, was the subject of a specific project at the University of Liège and is now taking off throughout Belgium.

Zwammerdam 6: Recording the timbers of a 2nd century Roman barge

Yardeni Vorst, NWO Humanities programme Arts and crafts in Roman ship building: raw materials management, construction technology, use and disposal of barges in the Lower Rhine region in the Roman period. (RCE, VU).

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Key words : Roman river barges, wood use, *limes*-research.

Zwammerdam 6, a flat-bottomed river barge, was found together with two similar river barges and three dugout canoes along the former Roman *Limes* in the Dutch town of *Zwammerdam* (the Netherlands). The vessels had ended up in a silted-up former channel of the river Rhine in front of

the Roman fort of *Nigrum Pullum*. They were excavated between 1971 and 1974 and conserved for future research and display purposes.

Zwammerdam 6, the smallest of the three barges (20.30 x 3.55 x 0.90), was discovered during the excavation of the fourth vessel when the cofferdam around that excavation took a section out of the ship's port side. For a research program this conserved section has now been studied in detail. The timbers and some photos of tool marks and constructional details will be presented.

Tool marks on timbers from archaeological sites: how to recognize the tools by using experimental archaeology

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Key words: toolmarks, tools, experimental archaeology.

The conditions for conservation of waterlogged wood in the lower parts of the Netherlands are in general extremely good. Wooden artefacts, timbers and "natural" (non worked) wood are often found in postholes, pits, wells and other settlement structures, as well as (non) worked wood in ritual pits often off-site the settlement. In many cases toolmarks are still visible on the surface of the timbers. Wood specialists measure and describe the toolmarks and document them by taking pictures of the timber. The recent discussion involves the aim of linking the toolmarks to the tool that was used. Experimental archaeology offers opportunities in this research, for example by using replica's of tools from different (pre)historic periods and comparing the results with toolmarks on ancient wood.

The chainsaw & the Mesolithic hut

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Key words: forestry, crafts, reconstructions, prehistoric techniques

Leo and Arjen have gained years of experience in building and (re)constructing prehistoric and historic houses. Often the aim is to create a realistic view of the buildings while combining modern and prehistoric tools. For projects with a scientific aim they only use natural resources from the environment of the location and often (pre)historic tools. Both are fascinated to "invent" possible technical solutions on archaeological research questions on prehistoric and medieval woodworking.

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