Global Journal of human-social science: D
History, Archaeology & Anthropology
Volume 17 Issue 2 Version 1.0 Year 2017
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-460X & Print ISSN: 0975-587X

New Research on Archaeological Wood and Wooden Artifacts in Kiev

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GJHSS-D Classification: *FOR Code: 219999p*

New Research on Archaeological Wood and Wooden Artifacts in Kiev

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Abstract- Wood is usually poorly preserved in the cultural layers of medieval Kiev. Exception is the wet cultural layers dated from the 10th century to the first half of the 11th century, where natural conditions are favorable for conservation of organic matter. In these layers the most of wooden artifacts were found [**Гупало, Толочко**, 1975; **Гупало** 1981, **с.** 319—325; **Сагайдак**, 1991, **табл.** XVI—XXII; **Сергєєва**, 2015, **с.** 42—45]. In other cases when studying Ancient Rus layers in Kiev remnants of wood, wooden artifacts and especially small wooden objects are absent or at best are represented by single samples. So any new finding of archaeological wood in Kiev is noteworthy and important for replenishing the archaeological Ancient Rus wood database.

For a long time archaeological wood from Kiev remained out of attention of scholars. Systematic studies of Ancient Rus wood and especially charcoal began to appear only recently. Now the state of research of the fossil wood and charcoal in Ukraine can be characterized as an initial stage, that is, a stage of accumulation of material [**Сергеева**, 2016]. Now the importance of such researches in the context of studying relationship between paleoecology and bioeconomic human activity is indisputable. The main directions of such researches are the study of wood as the main material for building and manufacturing, and its role as fuel. One of the most important directions of the modern study of the fossil wood in this connection is the definition of wood species. Considering the fact that most of the archaeological wood is stored in a charred form we have to take into account that along with the usual dendrological studies an important place in its studying is occupied by the anthracology (science that deals with the study of fossil coal in general). In archeology the methods of this science are used to identify species of fossil charred wood. Charcoal associated with dated cultural layers of settlements, gives additional data on the nature of the woody vegetation of the microregion in each defined period. The samples obtained directly from archaeological sites allow to identify basic tree species, used in production and economy and show preference to one or another species in various sectors. The obtained data can be the basis for studying the raw material base of the wood processing in Ancient Rus, the fuel base and the other branches related to the use of the wood.

In this regard, it is necessary to pay attention to the wooden artifacts found in Kiev Podil, Kyrylivska str., 37 in 2016. The importance of materials in question is that they are represented not only by separate small fragments of wood and charcoal, as it takes place usually but also by the remnants of structures, by particular products and by the remnants of the woodworking industry (wood chips and fragments of wood with the traces of processing). This is very important because in Kiev (and in Ancient Rus sites in general) woodworking centers are fixed extremely uncommonly. Another important result of research in 2016 is finding of pre-Rus objects which contained charcoal in their fillings. They are remains of building and oven previously dated to 7th century. Anthracological studies on this period in Kiev and its outskirts have not yet been taken place and the investigated objects gave such opportunity for the first time. Below we present the main results of the study of archaeological wood from the excavations in Kiev in 2016.

Keywords: ancient rus, kiev, wood processing, fuel, wood identification, anthracology.

Резюме- **Сергеева М.С. Новые исследования археологического дерева и деревянных артефактов в Киеве (Киевский Подол, ул. Кирилловская, 37, 2016 г.).**

Статья вводит в научный оборот результаты исследования археологической древесины, выявленной в 2016 г. в результате раскопок на Киевском Подоле: материала деревянных конструкций и изделий и угля.

Все дерево из раскопа, исходя из датировки, разделяется на три группы: материалы 18 — начала 19 вв., 11—12 вв. и 7 в. Материалы получены методом ручного отбора (образцы дерева конструкций, изделия, частично уголь) и флотации и промывки грунта (большая часть угля).

С точки зрения определения пород дерева среди материалов 18—19 вв. изучались остатки конструкций и мелкие деревянные изделия: орудия ткачества и дно бочки. Дерево древнерусского периода представлено единичными конструкциями (забор) и остатками деревообрабатывающего комплекса (щепа, колья, фрагмент изделия). Изучался также уголь всех трех периодов.

Дерево конструкций 18 — начала 19 вв. и 11 вв. представлено сосной (*Pinus* sp.), в отдельных случаях дубом (*Quercus* sp.). Остатки топлива (уголь) представлены тремя видами: дубом и сосной для всех трех периодов и березой (*Betula sp.)* для 18—19 вв. Отсутствие березы в ранних слоях пока не находит объяснения. Единичными угольками представлены также ясень (*Fraxinus* sp.), тополь / осина (*Populus* sp.), липа (*Tilia* sp.), дерево сімейства розовых (Rosaceae), ива (*Salix* sp.). Ввиду малочисленности интерпретации не поддаются.

Вся древесина принадлежит местным породам. В целом отбор сырья является традиционным для региона.

Ключевые слова: Древняя Русь, Киев, обработка дерева, топливо, определение древесины, антракология.

I. Materials and Methods

All the wood from this dig can be divided into three groups by date. This is the wood dated by the time periods from the 18th to the early 19th century, from the 11th to the 12th century and to

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the 7th century. The Ancient Rus period and the latest one are represented by the remnants of structures, by fragmented wooden products, by wood chips and wooden pieces of uncertain destination and by charcoal. Materials of the 7th century are represented only by small pieces of charcoal.

The materials for studying were obtained by manual selection from the soil or from filling of the objects (samples of the wood of details of structures, small wooden objects and partly charcoal) as well as the method of flotation and ground washing (the most of charcoal). The identification of tree species required the use of natural sciences methods. The basis of wood identification is studying features of microstructure, which are characteristic for wood of each kind of tree. The method assumes their diagnosis in three sections. Obtained results were compared with the data of wood determinants. The determinants on wood of different Eastern European tree species were published repeatedly [Сукачев, 1940; Гаммерман и др., 1946; Вихров, 1959]. When the structure of the wood is preserved satisfactorily tree species can be identified to the genus.

The results of wood and charcoal identification are represented in the tables (Tab. 1—4).

II. The Main Results of the Study

Among the materials of the 18th century small wooden objects were found in one of the buildings. They are fragmented bottom of barrel with the diameter of 48 cm (fig. 1: *1*) and knife-like object 28 cm long (fig. 1: *3*). This object may be interpreted as a tool for weft tampering in weaving. Analogies of such tools are known from Slavic ethnography [Лебедева, 1956, рис. 24]. Another wooden object was discovered in the cultural layer dated from 18th century (fig. 1: *2*). This is bifurcated tool 12.8 cm long. The most possible interpretation is its definition as a tool for weaving (ropes, belts, etc). Analogies are different bifurcated tools used for weaving ropes or belts are widely known in the ethnography of many peoples of Eurasia. All mentioned artifacts were made of pine.

Among the structures with the preserved wooden details, the object 1 dated to 18th century is of special interest. It could be interpreted as a lower part (probably cellar) of above-ground building. This preserved lower part had a wooden covering of the ground walls, which was made from vertically stacked timber fortified on the bottom by a frame structure on two crowns built of square timbers. The building had a plank floor. All the wooden details were of pine with the exception of the lower timbers built of oak. Wood chips taken from filling of the top of the building (preserved only in stratigraphic level on the wall of the dig) are also of pine. They may indicate material for the construction of the upper, terrestrial part of the building. Such a choice of raw materials for construction is consistent with the tradition well-known in Slavic ethnography, when the main material for the walls of the building was pine wood, but the lower part was constructed of oak wood. In Eastern Europe, this practice has been extended at least at the 1st half of the 20th century [Плотников, 1924, с. 6; Юрченко, 1941, с. 37]. It should be noted that this tradition developed gradually. In residential buildings in ancient Kyiv such combination of too kinds of wood was demonstrated only by isolated examples [Сагайдак, 2010, с. 539]. In Ancient Kiev and its outskirts residential buildings were constructed mainly of pine wood only.

The rest of the wooden structures of 18th century found within the dig were also constructed of pine. Oak constructions were not numerous. One of the planks of the 18th century fence was of an oak tree (the rest were of pine). The use of single oak plank may indicate a possible repair of this fence. Several poles of some structure found in the northern part of the dig were also made of pine wood, and only one was of oak wood. Judging by the fact that the oak pole unlike the rest ones was preserved only as wood chips in the pole hole, it was the earliest of all. The rest poles were preserved to a height of about 0.50 m from the daylight surface of that time.

Among the Ancient Rus materials, the woodworking complex related to the cultural layer of 11th century is of the greatest interest. It consisted of waste from wood processing. These are wood chips (the overwhelming majority is of pine), and a pine bark. Among the pieces of wood there were wood chips from the primary processing of logs and those that were waste from making some wooden products (small pieces of wood in the form of small planks and bars). This may indicate a presence of woodworking workshop situated somewhere nearby. The experience of handicraftsmen-woodworkers at the end of the 19th and early 20th centuries shows manufacturing of many kinds of products (details of wagons and sledges, wooden shovels, some kinds of barrels, etc) in the area of logging [Плотников, 1924, с. 73—81]. In this regard, it is worth mentioning the layer with the wood chips discovered on the north-western outskirts of the Kiev Podil. This layer refers to the period preceded the colonization of this territory (i.e. before the end of 11th century or the beginning of 12th century) [Сагайдак, 1991, с. 39—40, 69—70]. At this time, timber could be stored here for drying and initial processing. It can be noted a large number of pine bark in this layer (my observation during the excavations in 1993). The complex discovered in 2016 was located near this area.
In the complex in question, besides wood chips and bark, the part of tool was found (fig. 1: *4*). It had oblong form with a recess cut on one side. In the same complex a part of stave of some cooperage product (fig. 1: *7*)

and two pegs from some structures (fig. 1: *5, 6*) were also found. These materials, except the part of unidentified tool, were studied for wood identification. The stave and one of the pegs were of pine wood and another peg was of oak wood (fig. 1: *5*).

A wood of three poles from the fence dated to 11th century was also studied. It was identified as pine.

Among the analyzed charcoal samples a charcoal from the heating devices deserves special attention.

Studying charcoal as the main kind of fuel, in my opinion, is promising. This applies both to domestic and technical fuel. The source for studying this aspect of human economic and productive activities is coal from ovens (including those of technical purpose), furnaces and fireplaces. Such charcoal is a source of information about composition of local woody vegetation and the principles of its possible selection taking into account calorific values of different wood species creating the desired temperature heating mode. This direction of research in spite of the Western European researchers' attention to it [Marston, 2009; Veal,. Thompson, 2008; Veal, 2012а; 2012б; 2013], in Ancient Rus archeology until recently remained uncharted area. Its development began only in recent years after the first results from the Hlinske archaeological complex in Poltava oblast (charcoal from furnace and fireplace) [Пуголовок та ін., 2016, с. 115]. Subsequently, materials from some other Slavic-Rus sites (Vypovziv and Svedlovka, both in Chernihiv oblast) were obtained and identified by the author. Studying the fuel from the dig in Kyrylivska str., 37 is one more step in this direction.

Residues of fuel from the oven of the 18th century was represented by pine, oar and birch. This correspond to the general tendency of its selection that is seen in the ethnographic present. Birch, old resinous pine and oak belonged to the group of the most valuable fuel [Плотников, 1924, с. 14]. The birch charcoal mixed with the remains of bones, eggshells, fish scales, etc. was also found in the filling of another object. As judged by nature of filling this object could serve as a pit for garbage. The birch charcoal in this context also may be interpreted as remains of fuel. In this object the charcoal of pine and of other species of trees were also found (Tab. 3, object 8).

Charcoal from Ancient Rus and Slavic objects, which can be associated with fuel (oven 2, fireplace, Slavic oven 7) is represented only by oak and pine. It is worth noting that Old Rus and Early Slavic materials do not yet allow us to speak of any significant advantage of birch as fuel in these periods. The author's investigations reveal only isolated samples of charcoal from fuel on separate Slavic and Rus sites They are Vypovziv hillfort of 10th century and Sverdlovka settlement (Romny culture, 8—10 centuries). It should be noted that birch in general is very rare among of fossil coals of Ancient Rus period. This may be explained either by its relatively low specific gravity in the forests of the studied micro-regions in medieval period or by relatively small amount of materials studied for today. The presence of birch bark in the Ancient Rus cultural layers of Kiev is in favor of the second assumption. It is also possible that birch was used more for technical purposes (for obtaining tar) therefore its wood is not preserved. In general the reasons for such situation can be detected only with further research.

As a result of anthracological research single samples of charcoal of such wood as ash-tree (*Fraxinus* sp., apparently *Fraxinus excelsior*), poplar or aspen (*Populus* sp.), willow (*Salix* sp.), linden (*Tilia* sp.) and a tree of rose family, apparently pear-tree or apple-tree (Rosaceae) were also identified. These are very small solitary pieces of charcoal that cannot be interpreted.

Thus the studied wood is mainly represented by such species as pine (*Pinus* sp,), probably common pine (*Pinus sylvestris*), oak (*Quercus* sp.) and birch (*Betula* sp.). Pine and oak were represented both by unburned wood and by charcoal, and birch was found only as charcoal. The distribution of wood of these tree species is not the same for different periods.

In all chronological sections pine prevails. The most of wooden artifacts (structures and small objects) were made of pine. In particular details of cooperage products from the complexes of 11th century and 18th century, as well as both weaving tools found in the 18th century layer were made of pine wood. Pine charcoal is represented as the remains of both working wood and fuel. This fact can be considered as a marker for the presence of pine forests in the immediate proximity to the site, may be higher on the hill.

Kiev is located on the border of the Eastern Polissia (forest zone) with forest-steppe zone. The Eastern Polissia covers the right bank area of the Dnieper river, the area between the Dnieper and the Desna rivers and partly the area of the left bank of the Desna river to the watershed with the Supoy and Sula rivers that are the tributaries of the Dnieper Pine and oak are the main forest-forming species here [Пятницкий, Изюмский, 1966, с. 148].

Some researchers explain the proliferation of pine forests in the Ancient Rus period by anthropogenous factor that was a specificity of development of territories by the Ancient Rus population. Sandy and loamy podzolic soils preferred by pine were less suitable for farming therefore such soils were mastered last. Oak forests gradually reduced for plowing which narrowed the area of oak distribution [Лосицкий, 1981, с. 21; Сагайдак, 1991, с. 68]. It also should be taken into account that the productivity of pine is much higher than that of oak [Чеведаев, 1963, с. 201], therefore the pine forests cut down could be restored rather quickly. Thus, coniferous forests could be a significant reserve of raw materials in the area of their distribution.

Oak also has a significant role in the economy of the local population in the studied area. Among the analyzed charcoal samples from Kyrylivska str., 37 oak occupies a second place. Its wood was used as a fuel and a working wood throughout the entire time of the economic activity of the Kievan population here. Therefore, the advantage of the mentioned kinds of wood in the investigated complexes is expected. Birch, the third wood by the number of charcoal pieces, was discovered only in the complexes dated from 18th to 19th centuries. In its period it was used as a fuel. Among the charcoal samples from the cultural layers with the date of the 7th century and of the 11th and 12th centuries birch is absent. Except separate cases a material of products and structures of the 11th century is represented by pine wood. Only one of the pegs was of oak wood.

III. Conclusions and Prospects for Further Research

The results of studying of archaeological wood allowed to trace the particular use of its different species in a particular area for a long period.

In general, the composition of studied wood species does not contradict the data on the woody vegetation of the region. All wood belongs to local species. The selection of raw materials is traditional for the region. Investigations in Kyrylivska str., 37 in 2016 confirmed the composition of the wood species that were preferred in different branches of the economy. First of all, they are pine and oak (used both as material for woodworking and as fuel) with predominance of pine. The third place is occupied by birch. It is represented only by charcoal of the fuel. The role of birch as a fuel in the everyday life of people in the 18th and 19th centuries received one more confirmation.

The importance of the results obtained for the further development of the source base for the fossil tree is beyond doubt. Obtaining sufficient information due to further research of materials from different settlements will allow it to be used in the context of the study of paleoecology and economic activity during this period.

Wooden artifacts dating back to the 18th and early 19th centuries are important for replenishing the ethnographic material database. This applies to both individual products and structures. Materials of the 11th century allow expanding the informative base for the history of wood processing and using in Kiev.

Further dendrological and anthracological studies of the materials from the Slavic and Rus sites will make it possible to specify the obtained results and will allow reasonable interpretations on the use the wood of different tree species for different needs (using wood as the fuel or as the building and working raw material).

Table 1: Identification of wood species of the artifacts dated from 18th to 19th centuries

Complex	Wooden Artifacts	Number of Samples	Wood
Object 1 (building).	Vertical poles inside the building	2	Oak (*Quercus* sp.) — 2
	Upper bars of the SE and SW walls	2	Pine (*Pinus* sp.) — 2
	Lower bars of the framework	2	Oak (*Quercus* sp.) — 2
	Bar of the NW wall	1	Pine (*Pinus* sp.) — 1
	Pole in the W corner	1	Pine (*Pinus* sp.) — 1
	Vertical logs along the SW wall	5	Pine (*Pinus* sp.) — 5
	Vertical logs along the NW wall	7	Pine (*Pinus* sp.) — 7
	Planks of the upper tier of the floor	5	Pine (*Pinus* sp.) — 5
	Planks of the lower tier of the floor	8	Pine (*Pinus* sp.) — 8
	Chips from the filling of the ground level	35	Pine (*Pinus* sp.) — 35
Fence	Planks	22	Pine (*Pinus* sp.) — 21 Oak (*Quercus* sp.) — 1
Object 2, filling	Branch with th bark	1	Pine (*Pinus* sp.) — 1
	Stump of the log	1	Oak (*Quercus* sp.) — 1
	Wood chips	36	Pine (*Pinus* sp.) — 34 Oak (*Quercus* sp.) — 1 Birch (*Betula* sp.) — 1
	Small fragments of the planks	3	Pine (*Pinus* sp.) — 3
	Bottom of the barrel	1	Pine (*Pinus* sp.) — 1
	Weaver's tool	1	Pine (*Pinus* sp.) — 1
Object 5, remains of the structure	Piece of processed wood of quadrangular section	1	Pine (*Pinus* sp.) — 1
	Piece of wood	1	Oak (*Quercus* sp.) — 1
	Planks of the floor	3	Pine (*Pinus* sp.) — 3
	Lower planks of the wall covering	4	Pine (*Pinus* sp.) — 4
Object 7, remains of the structure	Pole in the S corner	1	Pine (*Pinus* sp.) — 1
	Pole in the N corner	1	Pine (*Pinus* sp.) — 1
	SW wall, upper plank	1	Pine (*Pinus* sp.) — 1
	SE wall, lower plank	1	Pine (*Pinus* sp.) — 1
	NW wall, a plank edgeways	1	Pine (*Pinus* sp.) — 1
	Planks edgeways in the building	2	Pine (*Pinus* sp.) — 2
	Upper plank edgeways	1	Pine (*Pinus* sp.) — 1
	Horizontal plank	1	Pine (*Pinus* sp.) — 1
Poles	Lower parts of the poles	2	Pine (*Pinus* sp.) — 2
Filling of the posthole	Wood (small chips)	37	Oak (*Quercus* sp.) — 34 Oak bark — 3
Cultural layer	Bifurcated tool	1	Pine (*Pinus* sp.) — 1
Object 3, filling	Horizontal block from the filling	1	Pine (*Pinus* sp.) — 1
Cultural layer	Fence planks (?)	2	Pine (*Pinus* sp.) — 2
Well in the NE wall of the dig	Horizontal logs	2	Pine (*Pinus* sp.) — 2
	Wood from the lower part of the framework structure	1	Oak (*Quercus* sp.) — 1

Table 2: Identification of wood species of Ancient Rus wooden artifacts

Complex	Wooden Artifacts	Number of Samples	Wood
Ditch 3, 11th century	Poles of the fence	3	Pine (*Pinus* sp.) — 3
Cultural layer 5, accumulation of wood, 11th century	Wood chips	186	Pine (*Pinus* sp.) — 183 Oak (*Quercus* sp.) — 1 Poplar or aspen (*Populus* sp.) — 2
	Branches	4	Pine (*Pinus* sp.) — 4
	Fragment of stave	1	Pine (*Pinus* sp.) — 1
	Peg	1	Oak (*Quercus* sp.) — 1
	Peg	1	Pine (*Pinus* sp.) — 1
	Rectangular bar	1	Pine (*Pinus* sp.) — 1
Cultural layer 5b, 11th century	Wood chips	6	Oak (*Quercus* sp.) — 6

Table 3: Results of anthracological research. Materials dated from 17th to 19th centuries

Complex	Number of Samples	Wood
Object 3, oven.	232	Pine (*Pinus* sp.) — 135 Oak (*Quercus* sp.) — 60 Birch (*Betula* sp.) — 37
Cultural layer, under the heap of bricks	12	Pine (*Pinus* sp.) — 12
Cultural layer, charred spot	1	Birch (*Betula* sp.) — 1
Object 8, filling	438	Pine (*Pinus* sp.) — 420 Birch (*Betula* sp.) — 12 Poplar or aspen (*Populus* sp.) — 2 Oak (*Quercus* sp.) — 2 Willow (*Salix* sp.)(?) — 1 Rose family (Rosaceae) — 1

Table 4: Results of anthracological research. Slavic and Rus materials

Complex	Number of Samples	Wood
Cultural layer 3, 12th century	18	Oak (*Quercus* sp.) — 10 Pine (*Pinus* sp.) — 7 Rose family (Rosaceae) — 1
Object 9, filling, 11th century	9	Pine (*Pinus* sp.) — 5
Object 11, filling, 11th century	13	Ash-tree (*Fraxinus* sp.) — 11 Pine (*Pinus* sp.) — 2
Spot of charred wood (cultural layer 4), 11th century	16	Pine (*Pinus* sp.) — 8 Oak (*Quercus* sp.) — 7 Linden (*Tilia* sp.) — 1
Ditch 10 (cultural layer 4), 11th century	81	Pine (*Pinus* sp.) — 81
Ditch 18(cultural layer 4), 11th century	1	Oak (*Quercus* sp.) — 1
Cultural layer 4, 11th century	71	Pine (*Pinus* sp.) — 4 Oak (*Quercus* sp.) — 67
Oven 2, 11th century	59	Oak (*Quercus* sp.) — 59
Fireplace, 11th century	24	Pine (*Pinus* sp.) — 21 Oak (*Quercus* sp.) — 2

		Deciduous tree — 1
Cultural layer 5, 11th century	103	Pine (*Pinus* sp.) — 103
Oven 6, 11th century	21	Oak (*Quercus* sp.) — 21
Oven 7 (7th century.)	89	Pine (*Pinus* sp.) — 15 Oak (*Quercus* sp.) — 74
Dwelling of 7th century, the floor	21	Oak (*Quercus* sp.) — 21

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