Catacomb culture wagons of the Eurasian steppes

N.I. Shishlina[1,*], D.S. Kovalev[2] & E.R. Ibraguimova[1]

[1]*State Historical Museum, Red Square 1, Moscow 109012, Russia (Email: nshishlina@mail.ru)*
[2]*JSC 'Heritage', Nikitsky Boulevard 12a, Moscow 119019, Russia*
**Author for correspondence*

Received: 21 March 2013; Accepted: 1 July 2013; Revised: 9 September 2013

The origin and development of wheeled vehicles continues to fascinate today no less than when Stuart Piggott (1974) first wrote about the subject in Antiquity *40 years ago. A growing number of examples from the steppes of southern Russia and Ukraine are providing new insights into the design and construction of these complex artefacts. A recent example from the Ulan IV burial mound illustrates the techniques employed and the mastery of materials, with careful selection of the kinds of wood used for the wheels, axles and other elements. Stable isotope analysis of the individual interred in this grave showed that he had travelled widely, emphasising the mobility of steppe populations.*

Keywords: Eurasian steppes, Bronze Age, Catacomb culture, wheeled vehicles, isotopes

Supplementary material by Polina Sutyagina

The results of wood identification from the burial ground Ulan-IV, kurgan 4, grave 15

A few different wooden fragments of a carriage were found in the entrance pit of catacomb grave 15 (Ulan-IV, kurgan 4). Some fragments from completing of the grave and some fragments with uncertain localisation were also presented for determination.

All wooden fragments are rotten and in most cases the quality of their preservation is unsatisfactory. Most of them are quite deformed, even the bigger ones. The deformation is presented by some kind of flattening or fattening with shift along the rings or in different directions. Some of the wood fragments are corroded and the vessels are full of excrements. The damage sometimes is so strong that a vessel picture can't be seen.

As the result of the investigation the types of wood from which the parts of the carriage were made have been identified (Table S1).

Table S1. The results of the wood identification (Ulan-IV, kurgan 4, grave 15).

Carriage part	**Type of wood**
Fragments of western upper side-member	*Fraxinus* sp. (ash)
Fragments of western lower side-member	*Fraxinus* sp. (ash)
Fragments of eastern upper side-member	*Fraxinus* sp. (ash) and some undetermined diffuse porous wood
Fragments of eastern lower side-member	*Fraxinus* sp. (ash) and some undetermined diffuse porous wood
Fragments of first corner connection	*Ulmus* sp. (elm)
Fragments of second corner connection	*Ulmus* sp. (elm)
Fragments of third corner connection	*Ulmus* sp. (elm)
Fragments of fourth corner connection	*Fraxinus* sp. (ash)
Fragments of fifth corner connection	*Ulmus* sp. (elm)
Fragments of sixth upper corner connection	*Acer* sp. (maple) (some small fragments)
Fragments of sixth corner connection	*Ulmus* sp. (elm)
Fragments of sixth middle corner connection	*Ulmus* sp. (elm)
Fragments of sixth lower corner connection	*Ulmus* sp. (elm)
Fragments of south-western wheel	*Quercus* sp. (oak)
Fragments of north-eastern wheel	*Quercus* sp. (oak)
Fragments of south-eastern wheel hub	*Acer* sp. (maple)
Fragments of north-western corner of wagon platform	*Acer* sp. (maple)
Fragment with vertical directed filaments, from southern part of wagon	*Ulmus* sp. (elm)
Fragments from southern part of wagon	*Ulmus* sp. (elm)
Fragment with vertical directed filaments, from northern part of wagon	*Acer tataricum* (Tatarian maple)
Wood from the grave pit	*Ulmus* sp. (elm)

Wood descriptions

Ring porous hardwood

Elm *Ulmus* L. (Figure S1.1 & 1.2)
In the wide growth increments there can be seen wide vessels of the earlywood and a special vessel picture of the latewood. Narrow latewood vessels both with parenchyma cells look like oblique-tangential and tangential bands. However, this latewood vessel picture could be absent in the narrow rings.

Elm from grave 15 is mostly rotten. However, there are some fragments where the process of carbonisation has started. It generally occurs in the latewood. The preservation is not very good; the wood is flattened, compressed and deformed. Rotten elm is soft and fragile; sometimes the fragments went to pieces even by slight touch.

Oak *Quercus* L. (Figure S1.5)
Wide earlywood vessels at the transverse breaks are situated in one or two rows which can be seen even through a good magnifying glass. Outside there are narrow latewood vessels formed groups with oblique triangular shape, so called 'fire flames'. Rays are narrow and wide, the last are equal or wider than the earlywood vessel diameter. It is common to find tyloses inside the vessels. Tyloses are protuberances of the parenchyma cells, which collected tannins (special anti-rot substances) during the tree's life.
Even rotten oak is quite strong and hard to break.

Ash *Fraxinus* L. (Figure S1.3 & 1.4)
There are clear rings of wide earlywood vessels at the transverse breaks. Narrow latewood vessels occur in pairs or individually in the compact mass of the latewood. The vessels are surrounded by parenchyma cells. Rays are significantly thinner than the earlywood vessel diameter.

The ash from grave 15 is rotten. However, it already shows the beginning of carbonisation in the latewood aria. Wood preservation is quite bad, the level of deformation is high. In spite of this the wood is quite strong and hard to break. The eastern side-member wood is damaged; wide vessels are full of excrement.

Diffuse porous hardwood

Maple *Acer* L. (Figure S1.6 & 1.7)

The wood is diffuse porous; bands of the rings are clear. At the transverse breaks vessels are rare and equally distributed through the growth ring; vessels are single or united into shot groups of 2–5. Rays are wide and clearly seen at the transverse breaks. At the longitudinal section it could be seen that vessels have spirals (Figure S1.6) and quite big inter-vessel pits with maple special hexagonal form (Figure S1.7).

Rotten maple from grave 15 is not strong, easy to crumble; sometimes it could be turned into powder just between the fingers.

Tatarian maple *Acer tataricum* L. (Figure S1.8)

The main distinguishing feature of this maple species is that its wide vessels are located mostly at the earlywood aria and not so diffusely dispersed through the growth ring.

To summarise the data from Table S1, it could be said that the wagon from grave 15 had ash side-members, which were fastened together with six cross-members almost all made of elm. At least two wheels were made of oak. Maple fragments found in different parts of the wagon and also some undetermined (because of bad preservation) diffuse porous wood fragments could be perhaps some fastening elements. All previously described wood could be used for functional wagon construction. But one fact causes some doubts—the preservation of the wood. The explanation of preservation quality could be the following. The wood had been put into the tomb undried. If so and if we take into account the size of the carriage (1.65 × 0.70m) we can have some doubts about this wagon being in use. However we can't exclude the fact that such damage could have some other origin.

References

GAMMERMAN, A.F., A.A. NIKITIN & T.L. NIKOLAEVA. 1946. *Determinant of wood on microscopic features*. Moscow & Leningrad: AS USSR.

GREGUSS, P. 1959. *Holzanatomie der europäischen Laubhölzer und Sträucher*. Budapest: Akad. Kiado.

VIHROV, V.E. 1959. *Diagnostic features of wood*. Moscow: AS USSR.

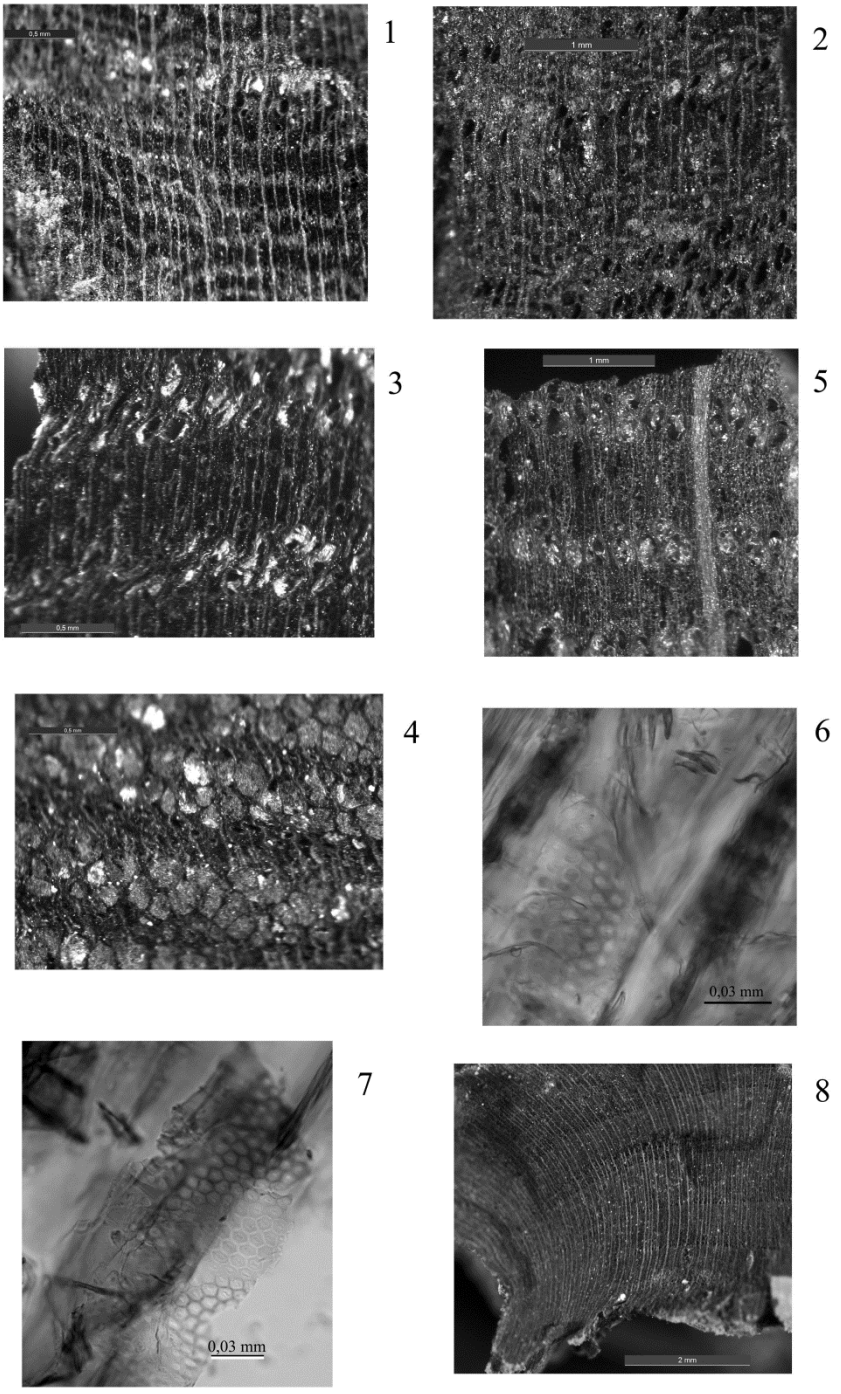

Figure S1. Breaks and sections of identified wood. 1) Elm (*Ulmus* sp.), the transverse break; wood fragment with vertical directed filaments, from the southern part of the wagon. 2) Elm (*Ulmus* sp.), the transverse break; wood fragment of the sixth corner connection. 3) Ash (*Fraxinus* sp.), the transverse break; wood fragment of the western side-member. 4) Ash (*Fraxinus* sp.), the transverse break; wood fragment of the eastern side-member. 5) Oak (*Quercus* sp.), the transverse break; wood fragment of the southwestern wheel. 6 & 7) Maple (*Acer* sp.), the longitudinal section; wood fragment of the southeastern wheel hub. 8) Tatarian maple (*Acer tataricum*), the transverse break; wood fragment with vertical directed filaments, from the northern part of the wagon.

