МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ
ТЮМЕНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ИНСТИТУТ ПРОБЛЕМ ОСВОЕНИЯ СЕВЕРА СИБИРСКОГО ОТДЕЛЕНИЯ РАН
ИНСТИТУТ АРХЕОЛОГИИ И ЭТНОГРАФИИ СИБИРСКОГО ОТДЕЛЕНИЯ РАН
ИНСТИТУТ ЭКОЛОГИИ РАСТЕНИЙ И ЖИВОТНЫХ УРАЛЬСКОГО ОТДЕЛЕНИЯ РАН

ЭКОЛОГИЯ ДРЕВНИХ И ТРАДИЦИОННЫХ ОБЩЕСТВ

Материалы V Международной научной конференции

г. Тюмень, 7–11 ноября 2016 г.

ВЫПУСК 5
Часть 2

Тюмень
Издательство
Тюменского государственного университета
2016

УДК 902
ББК Т44
Э400

Э400 **Экология** древних и традиционных обществ : материалы V Международной научной конференции, г. Тюмень, 7–11 ноября 2016 г. / под ред. доктора исторических наук, профессора Н.П. Матвеевой; Министерство образования и науки Российской Федерации, Тюменский государственный университет. — Вып. 5 : в 2 ч. — Ч. 2. — Тюмень : Издательство Тюменского государственного университета, 2016. — 276 с.

ISBN 978-5-400-01321-8 (ч. 2)
ISBN 978-5-400-01313-3

Доклады конференции посвящены методикам междисциплинарного исследования, раскрывающим процессы взаимодействия человека, природы и общества в самых широких хронологических рамках на территории Евразии. Особое внимание уделяется практике преобразования и восприятия ландшафтов у народов в разные эпохи. Представлены материалы изучения природных изменений и катастроф, как глобальных, так и частных, в конкретных регионах. Обсуждаются вариации физической, социальной и культурной адаптации коллективов, в том числе демографические аспекты, палеопатологии, динамика рациона питания. Рассматривается характер антропогенного воздействия на среду обитания. Научные работы объединены в разделы: «Историческая экология человека», «Реконструкция природного окружения древних и средневековых обществ», «Культурные ландшафты», «Жизнеобеспечение древних и средневековых обществ», «Этнология».

Издание осуществлено при поддержке гранта РГНФ 16-01-14030.

УДК 902
ББК Т44

ISBN 978-5-400-01321-8 (ч. 2)
ISBN 978-5-400-01313-3

на: Сборник научных статей, посвященный памяти д.б.н. А.И. Петренко. Казань: Изд-во ООО «Фолиант»; Институт истории им. Ш. Марджани АН РТ, 2011а. Кн. 4. С. 44-156.
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WELLS OF THE FORTIFIED BRONZE AGE SETTLEMENT KAMENNYI AMBAR (CHELYABINSK OBLAST, RUSSIA)

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КОЛОДЦЫ УКРЕПЛЕННОГО ПОСЕЛЕНИЯ ЭПОХИ БРОНЗЫ КАМЕННЫЙ АМБАР (ЧЕЛЯБИНСКАЯ ОБЛАСТЬ)

ABSTRACT: Access to water is one of the basic needs of humans and animals. Water resource management can be diversified and relies on available natural resources like open water bodies and streams, but also includes the utilisation of water by means of artificial constructions. The Bronze Age inhabitants of the Kamennyi Ambar settlement in the Transural steppe collected groundwater in wells that constitute characteristic features within their fortified settlements that were located close to rivers. The wells provided year-round access to fresh water and represented a strategy to secure the cattle´s high demand of water (also in winter) or the preference of groundwater over water from the river. A correlation of wells and furnaces with sacral significance of these features is not documented at Kamennyi Ambar. The wells attest knowledge of the landscape and craft technologies, highly valuable archives for various scientific disciplines that address stratigraphy, chronological sequences of the settlement occupation, woodworking, and construction techniques of the wells, the Bronze Age environment and the role of plants within the economy. This paper presents preliminary results of the examination of two well features by an integrated approach of archaeology, radiocarbon dating, plant macro-remains analysis, palynology, and thin section analysis.

Introduction. Wells are typical features in Bronze Age settlements in the steppe. In the Transurals they are first recorded within fortified settlements that appear around the turn of the 3rd to the 2nd millennium BC and constitute a feature of the archaeological Sintashta culture [Krause and Koryakova, 2013; Виноградов, 2013; Алаева, 2002; Епимахов, 2012; Зданович, 1995; Генинг и др., 1992]. Wells represent archives for a variety of analytical methods. Prior to excavations they are already visible on geomagnetic plans as positive anomalies due to their later filling and partly can serve to reconstruct house units [Patzelt, 2013]. Regarding their multiple occurrence within building structures they can be used to reconstruct occupation processes by means of stratigraphy. This can be achieved by analysing thin sections of layers together with archaeological finds and radiocarbon dating of short-lived plant material extracted from the sediments. Especially the waterlogged parts of the wells are suitable archives for palynological and plant macro-remains analyses. Wells 4.1 and 6.1 from the Kamennyi Ambar settlement are selected here to demonstrate how useful these features are for the study of daily life aspects as they do not only evidence a (new) water management but also give insight in woodworking technology, occupation chronology, local and regional environmental and vegetation conditions and plant use.

Methods. The only possibility to obtain an undisturbed and detailed stratigraphy was to gather core samples from the wells prior to excavation as otherwise the upcoming ground water mixed up sediments. The obtained material was used for pollen, macro-remains and thin section analyses. Samples for plant macro-remains analysis were also collected during excavation and later compared with the stratified profile. Wet-sieving was conducted in the field, processing of pollen samples and all identification work took place at the Goethe University Frankfurt [for details see Stobbe et al., 2016]. Radiocarbon dating (Table 1) was performed by the laboratories of the Curt-Engelholm-Centre Archaeometry (University of Heidelberg (Hd); Mannheim/Tübingen (MAMS)) and the 14CHRONO Centre for Climate, the Environment, and Chronology at the Queen´s University of Belfast (UBA). Thin sections were made by T. Beckmann [Beckmann, 1997] and analysed by A. Röpke.

Table 1

Radiocarbon dates from Kamennyi Ambar, excavation area 6 (FRS fruits/seeds; ch charred; sf subfossil); OxCal v4.2.4 [Bronk Ramsey 2009]; IntCal13 atmospheric curve [Reimer et al. 2013].

Laboratory code	feature/description	^{14}C age (uncal. BP)	± 1σ	calibrated age range (cal. BC		material	source
				1σ (68.2 %)	2σ (95.4 %)		
Hd-29292	house 4 floor level	3520	24	1893-1776	1921-1765	charc.	excav.
Hd-29410	house 4 corner construction	3415	28	1749-1668	1867-1632	charc.	excav.
MAMS-11649	well 4.1 upper rubbish layer	3989	67	2620-2351	2851-2292	charc.	excav.
MAMS-15084	well 4.1 rubbish layer	3564	23	1940-1888	2011-1782	charc. +FRS ch	core
MAMS-15085	well 4.1 utilization layer	3537	22	1922-1782	1941-1773	twig sf	core
UBA-26188	well 6.1 upper rubbish layer	3348	36	1690-1565	1739-1531	FRS ch	excav.
MAMS-15082	well 6.1 organic accumulation	3462	22	1872-1701	1879-1695	FRS sf	core
MAMS-15083	well 6.1 utilization layer	3558	28	1948-1881	2012-1776	FRS sf	core

Results and Discussion. The samples comprise pollen and plant macro-remains from 115 plant taxa out of 45 plant families and 2 subfamilies. 45 taxa were identified on species level, 50 on genus level and 20 on plant family level. Concerning the plant macro-remains, the diversity grew by more than 30 taxa that are only preserved in wells giving a much more detailed picture of the vegetation. The possibility to analyse waterlogged material is promising and extraordinary considering the rather dry steppe environment. Additionally, 3 spore types of coprophilous fungi as well as the *Ustulina* type, a fungus and plant pathogen were found. To achieve comparability of different residue types, sample sizes and numbers, we chose a semiquantitative presentation of results (Table 2), including plant macro-remains, pollen and spores as well as faunal remains and archaeological artefacts (ceramic fragments).

Table 2

Comparison of integrated results from pollen and plant macro-remains analyses, grouped into layers from wells 4.1 and 6.1 (FRS= fruits and seeds; P/S= pollen and spores; sf=subfossil; + up to 10; ++ up to 50; +++ up to 100; ++++ more than 100; wood estimated from no to ++++ large amounts).

feature	**well 4.1**		**well 6.1**	**well 4.1**	**well 6.1**	**well 4.1**	**well 6.1**		**well 4.1**	**well 6.1**
sample type	excav.	excav.	combin.	core	combin.	combin.	core	combin	excav.	combin.
no. of samples	1	1	8	4	4	5	1	8	1	6
displ.-volume (l)	4	4	27	-	13+	4	-	-	3,5	10+
depth	140-160	200-220	130-240	260-362	240-319	350-380	335	340-380	380	375-410
	FRS	FRS	FRS+P/S	FRS	FRS	FRS+P/S	P/S	FRS+P/S	FRS	FRS+P/S
	rubbish/secondary (top), organic brown clay	rubbish/secondary	rubbish/secondary (top), organic brown clay	redeposited loam with some small disturbances	redeposited loam with some small disturbances	organic layer with wood+charc.	humic grey loam with charc.and burnt clay	highly organic/humic fill above utilization layer	well bottom/utilization (below stone plate)	utilization layer
Riparian zone			++		+	++++	+++	++++	+++	++++
Meadow steppe			++		+	++	++	+++	+++	++
Ruderal steppe			++++	+	++	++++	++++	++++	++++	++++
Steppe			++++		+	++++	++++	++++	+++	+++
Kolki/Steppe woodlands			+++		+	++++	++	++++	++++	++
Dry and salty places			+			+	+	++++	++	++++
Trees and shrubs (local)	+		+++		++	+	+	++	++++	++
Trees (regional)			+				+	++		
Spores (coprophilous)			++			++++	++	++++		+
Tree funghi						++++				
varia	+	+	+++	+	+++	++		+++	+++	+++
Wood chips and twigs (sf)			++			++		++	+++	++++
Faunal remains	++	++	++++	++	++++	++++		+++	+	++
Archaeological artefacts	+	+	+		+			+		+

Well stratigraphy proved to be very heterogeneous at the Kamennyi Ambar settlement. In general, organic sediments can be observed at the bottom above the terrace sand. In this waterlogged section remains of wooden structures (planks or posts, sometimes with wattling) are preserved in a number of features. In the upper parts redeposited yellowish red loam and more organic layers (brown coloured) with settlement rubbish alternate. Wells 4.1 and 6.1 are located next to each other within the area of House 4 which was later occupied in part by the smaller and maybe only temporal House 6. The wells only appeared as separate structures already far below the floor level. In spite of or rather because of the spatial distribution their fills vary (Figure 1):

The so-called rubbish layers represent a section of the plant macro-remains that are preserved in the cultural layers of the settlement [Rühl et al., 2015] together with faunal remains and archaeological artefacts (vessel fragments). In well 4.1 plants are represented only by some vegetative plant parts and leaf scars of birch, whereas in well 6.1 the rubbish layers are more diverse. In this well an overall larger sample size of 27 l in contrast to 8 l from well 4.1 for plant macro-remains as well as palynological samples were analysed from the upper layers. In well 6.1, all vegetation units of the surroundings are represented by fruits and seeds, vegetative plant parts and also by pollen. Palynology contributes counts of taxa which do not usually survive charring such as *Artemisia* and tend to be underrepresented in the macro-remains record in general. Similarly, the identification of dung via charred macro-remains from minerogenic soils proves to be quite difficult, however, the presence of spores from coprophilous fungi shows that dung probably formed part of the heterogeneous matrix of the cultural layer that was deposited as rubbish layer in well 6.1. It can be concluded that the source material of the rubbish layers was distinct in wells 4.1 and 6.1. This is also supported by the radiocarbon dates: the source context of the upper rubbish layer of well 6.1 (same depth as upper rubbish in 4.1) is much younger.

The redeposited yellowish red loam itself is almost sterile and very fine in structure. However, these deposits show small organic brown-coloured intercalations sometimes together with pieces of charcoal or burnt clay — evidence of pollen or macro-remains is rather scarce. Some of them might be the result of bioturbation (krotovinas). Our interpretation is that these layers represent material that was dug-out during the construction of a new well somewhere else and used to fill up older wells that were discarded for some reason. During this process it might have happened that the recorded entry of settlement material like faunal remains and artefacts found their way into the layer.

The highly organic layers above the utilization layers show the best preservation for both botanical categories (including wood chips and twigs), the highest diversities in taxa and residue types. A lot of vegetative plant parts, especially stems are evidenced both by macro-remains and rondel phytoliths in thin sections. The plant remains cover the whole vegetation period from early flowering trees (pollen and buds) to relatively late flowering and ripening plants like some Asteraceae and Polygonum species indicating no seasonally restricted deposit. However, the sedimentation histories of the two wells differ. The dates of the utilization layer of well 4.1 (sf twigs) and the floor level of House 4 (charcoal sample) correspond in age. Well 4.1 collapsed and probably stood open for a short period (wooden remains and accumulation of organic material) but then quickly was filled up with material that was dug-out to build a new well (6.1 or another). The thin section also accounts for this interpretation as the sedimentation is not as horizontally and undisturbed as in the neighbouring well 6.1. The radiocarbon dates of an upper rubbish layer in well 4.1 and of the utilization period overlap in range, further backing this observation. Radiocarbon dates obtained from wood charcoal, however, have to be treated with caution — a charcoal taken out of another, upper rubbish layer above had a deviating much older 14C age, probably the result of either old-wood effect or reversed stratigraphy as it might be incorporated in the well from just another older context into this heterogeneous layer. In general, dates obtained from short-lived plant material (seeds and fruits, vegetative parts) are more reliable and we chose them whenever available.

The oldest dates of the supposed utilization layers from both wells do overlap. This does not necessarily indicate that they were used contemporaneously but that the time span between the discard of well 4.1 and the construction of the new well 6.1 might have been rather short. The latter scenario corresponds to the different sedimentation history of well 6.1. Here, in contrast to well 4.1 a 40 cm thick highly organic layer was accumulated slowly (horizontally and with almost no disturbances) as a result of natural deposition of random entry of pollen and small plant-remains, settlement rubbish, dung from non-carnivorous animals (probably sheep/goat), and soil aggregates. The date range of the lower part of this highly organic layer corresponds roughly with a date obtained from charcoal found in the corner of House 4 — 15 cm above the floor level. As House 6 was built within the borders of this house it can be assumed that the charcoal belongs to this later occupation but not to House 4. Thus, a relative chronological sequence can be traced in well 6.1 evidencing the slow accumulation of sediments in the lower part as a result of standing open for a certain time and subsequent filling event(s) in the upper part. In contrast, well 4.1 shows a rather short-time deposition of organics and a quick filling of the well pit.

This preliminary study of two out of more than twenty well features from Kamennyi Ambar shows the high potential for chronological and environmental interpretations. Ongoing comparative studies incorporate much more detailed analyses of construction woods and plant macro-remains that not only represent natural vegetation but also give hints to plant use within the settlement [see Rühl et al., 2015] and will reveal further characteristics like durability of these constructions and add to the understanding of the settlers´ economy.

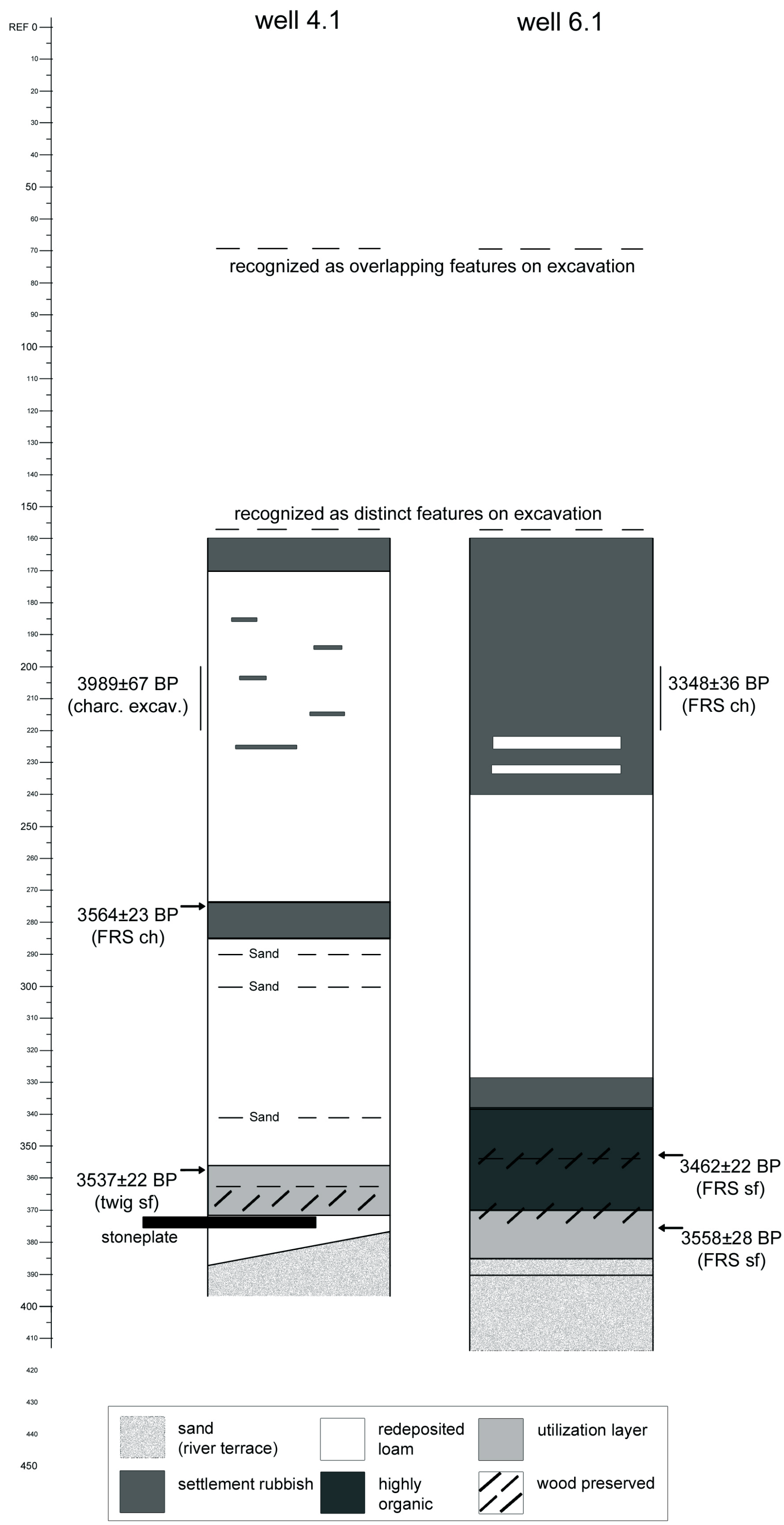

Fig. 1. Schematic stratigraphy of wells 4.1 and 6.1

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