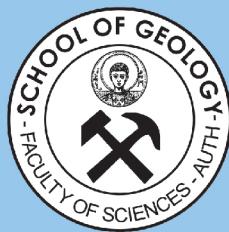
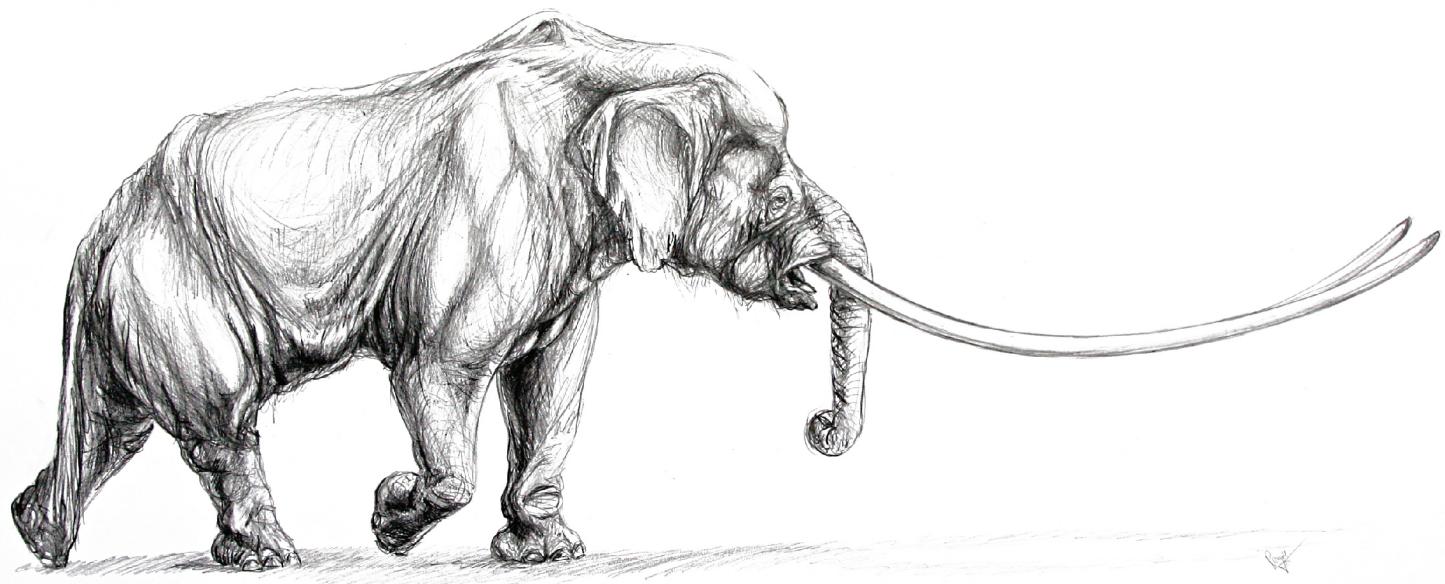




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## SPECIAL VOLUME 102



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## ABSTRACT BOOK

Editors:

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## The fat of the land: tales from a Gravettian hearth (27,000 years BP) at Krems-Wachtberg (Lower Austria)

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The last two decades provided a number of publications using mammalian bone element abundances and breakage patterns to approach the reconstruction of fat yields from prey bodies (e.g. Blumenschine & Madrigal 1993, Outram 2003, Morin 2007). Apparently these were all inspired by the "palaeonutritional" pioneer study by Speth & Spielmann (1983), which had largely been influenced by John D. Speth's own archaeozoological research. At the same time, on a more public level amusing debates took place between proponents of a fat-rich, low-carbohydrate "palaeodiet," allegedly approved by millions of years of hominin history, and another party propagating a rather designed high-protein life-style based on a decisively low-fat diet. The important role of amino acids or more generally speaking, protein, at least, has been strongly emphasized by the studies of physical anthropologists (e.g. Milton 1999).

This presentation is mainly based on the recent analysis of bone fragments, which are mainly from mammoth, wild horse and reindeer, and their spatial distribution inside and around a 1.5 m diameter fireplace at a 27,000 BP Gravettian camp site by the Danube (Fladerer et al. 2012). The title is inspired by the archaeologist and ethnographer Vilhjalmur Stefansson (1961) who demonstrated in a laboratory setting that he could live on a 100% meat diet for several months based on his observation that Inuit eat only meat and fish for six to nine months. This represents a low-carbohydrate diet based on ca. 60 % of total calories from animal fat and max. 30% from proteins. "Carnivorous" ethnicities traditionally gather wild fruits and seeds, if available in their landscapes but the main supply of plant micro-nutrients is also consumed via the stomach contents of the herbivorous prey (e.g. Eidritz 1999). These observations serve as models for the reconstruction of butchering practices of the mammoth steppe people. Archaeological evidence indicates some nutritional role of seeds, fruits and roots in the diversified palaeolandscapes of Central Europe (e.g. Revedin et al. 2010), but results establishing these to be a substantial source of carbohydrate or fat are not available.

Archaeozoology has a long tradition documenting bone destruction and marrow extraction from ungulate bones as an important subsistence activity for ice age people, but only a few reports have been published considering Proboscideans (e.g. Yravedra et al. 2012). Two incorrect arguments have been repeatedly used even in the scientific literature, namely that the interior of elephant limb bones lacks marrow cavities (Fig. 1) and secondly that elephant limb bone is too thick to be broken without modern tools. References and detailed observations (e.g. Haynes 1991, pp. 290) were likewise ignored.

We detected heavy breakage of marrow-bearing mammoth limb bones into small pieces and we ask why the majority of these greasy bones were left unburned around the hearth (Fig. 3). Artefacts from these bones are very rare in regional sites and thus tool manufacturing can be broadly excluded, as can the primary use of bone for fuel, a conclusion supported by the abundance of charcoal. We rather argue that compact and spongy bone were reduced to smaller pieces on the spot around the hearth (Fig. 2) in order to render the marrow more liquid by use of the heat allowing the fat to be slurped from

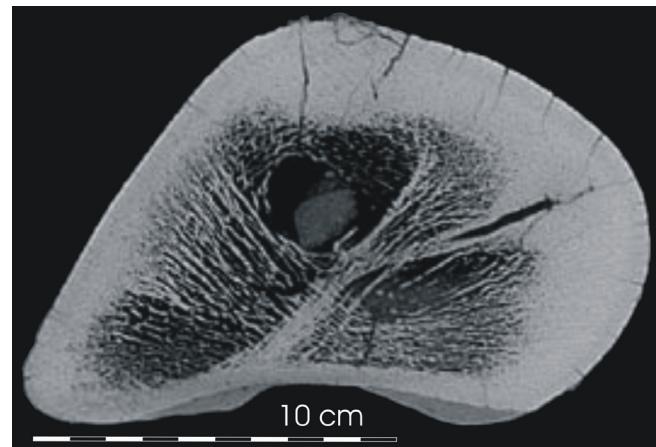


Fig. 1. Radiography of a *Mammuthus primigenius* humerus (mid shaft position) from Krems-Hundssteig (Hu 76/1; Fladerer & Salcher-Jedrasik 2008), Lower Austria. Please note the marrow cavity without spongy tissue.



Fig. 2. Example of refitted compact limb bone fragments (bone flakes) with impact scar from Woolly mammoth, archaeological layer AH 4.4, living floor around the hearth 1 at Krems-Wachtberg (Wa 4105 refitted). Position see red circle in Fig. 3.

the fragments in a manner similar to reports from Central Africa (Fisher 1992). We further suppose that the Gravettians were aware of the core of pure marrow present in some limb bones (compare Fig. 1) as well as its seasonal oscillations in fat content and taste. Grease-rendering is not testified from the actual data, but, incidentally, grease-rendering without using heated stones is quite feasible in bark, hide and stomach containers, though obviously almost impossible to prove (Speth 2012). Archaeological signatures of subcutaneous and visceral mammoth fat exploitation are not available, too, but ethnographic analogy (e.g. Duffy 1986, Bailey 1989) suggests highest probability also for Palaeolithic people.

Mammoths played an important role by providing life-supporting oleic acid and other fatty acids in the Gravettian nutrition, at least for the Middle Danube region. The targeting of proboscidean marrow has probably been a vital activity, at a minimum, during bottlenecks caused by seasonal or periodic food shortage.

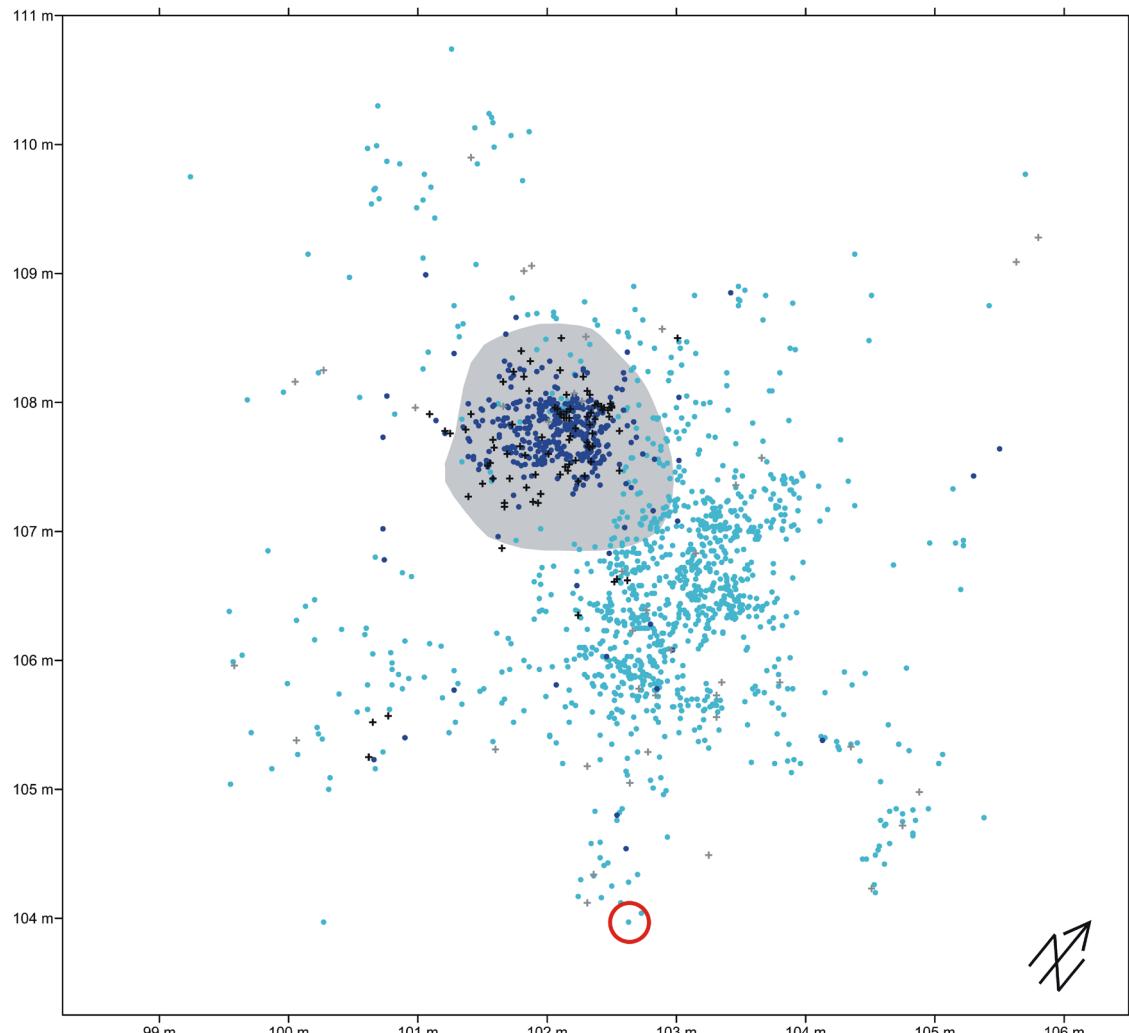


Fig. 3. Spatial distribution of Woolly mammoth bone fragments (including "very probably mammoth bone") within the hearth and archaeological layer AH 4.4 at Krems-Wachtberg.

Legend: ++: axial elements (rib, vertebra, sternum); dots: limb bones, coxae, compact bone; thin/light blue: unburned to slightly scorched; bold/dark blue: fully burned, shaded area: maximum extension of the fire place in the second of three chronological hearth use phases; red circle: position of refitted limb bone example (Fig. 2). Please note the unburned - potentially greasy - bone fragments outside the fire place indicating that bones were not used as fuel.

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