



## **13th Internationale exar-conference, Saalburg, Bad Homburg (Ger) October 1th – 4th 2015**

**Friday October 2nd 2015**

### *Introduction*

#### **Saalburg Roman Fort – 120 years of experimental archaeology Rüdiger Schwarz**

Römerkastell Saalburg, Am Römerkastell 1, 61350 Bad Homburg, Germany,  
schwarz.r@saalburgmuseum.de

The Saalburg Roman Fort as a museum and reconstructed limes garrison has ever since been involved in reconstructive and experimental archaeology. Within the reconstruction of the fort on the original foundations a major part of the work was done using authentic handcrafts. The techniques and materials and several architectural details were based on the archaeological findings on the site or from elsewhere at the limes. Where these were absent comparable objects from other regions of the Roman Empire were considered to achieve a realistic result.

Considerable illustrative material in the museum consisting of models and replicas was manufactured after original finds in order to represent the Roman material culture as true-to-life as possible in addition to the architecture. So, to a certain degree the reconstruction of the Saalburg can be considered an archaeological experiment itself.

In the following decades Saalburg archaeologists and researchers associated with the museum accomplished a wide range of experiments. Among these were varying topics such as building research, metallurgy, reconstruction of Graeco-Roman artillery, Roman fortification earthworks, hypocausts, Roman bread-baking, manufacturing arrow-tips and brick production.

Some of the early experiments are mentioned in articles on the history of experimental archaeology but a general presentation of the work is still pending. This contribution is intended to give an overall view on the experimental archaeological research of the Saalburg museum and to show relations, research traditions and developments within the work of the venerable institution.

#### Literature:

- Amrhein, C., Löhnig, E. 2012: Nach 100 Jahren – Die Sanierung der wilhelminischen Bauten im Römerkastell Saalburg. Der Limes vom Niederrhein bis an die Donau. 6. Kolloquium der Deutschen Limeskommission. Stuttgart 2012.
- Andraschko, F.M., Schmidt, M. 1991: Experimentelle Archäologie – Masche oder Methode? Anmerkungen zur Geschichte und Methodik einer „neuen“ Forschungsrichtung. In: Experimentelle Archäologie – Bilanz 1991, 50-68. Archäologische Mitteilungen aus Nordwestdeutschland, Beiheft 6. Oldenburg 1991.
- Baatz, D.: Heizversuch an einer Rekonstruierten Kanalheizung in der Saalburg. Saalburg-Jahrbuch 36, 1979, 31-44.
- Drescher, H. 1998: Rekonstruktionen und Versuche zu frühen Zimbeln und kleinen antiken Glocken. Saalburg-Jahrbuch 49, 1998, 155-170.
- Hüser, H. 1979: Wärmetechnische Messungen an einer Hypokaustenheizung in der Saalburg. Saalburg-Jahrbuch 36, 1979, 12-30.
- Jacobi, H. 1911: Der Wiederaufbau des Römerkastells Saalburg. Sonderdruck aus der Wochenschrift des Architekten-Vereins zu Berlin. Berlin 1911.
- Knierriem, P., Löhnig, E. 1997: Panificium im Experiment. Ein Erfahrungsbericht aus dem Saalburgkastell. In M. Junkelmann: Panis Militaris: die Ernährung des römischen Soldaten oder der Grundstoff der Macht. Mainz 1997.
- Kretzschmer, F. 1953: Hypokausten. Saalburg-Jahrbuch 12, 1953, 7-41.
- Löhberg, K. 1969: Untersuchungen an Eisenfunden aus Limeskastellen. Saalburg-Jahrbuch 26, 1969, 142-146.
- Miks, C. 2001: Herons Cheirobotallistra. Überlegungen zu einer Geschützentwicklung der Kaiserzeit. Saalburg-Jahrbuch 51, 2001, 153-242.
- Peuser, J. 2001: Zur Rekonstruktion des Saalburg-Kastells. Saalburg-Jahrbuch 51, 2001, 243-305
- Schramm, E. 1910: Griechisch-römische Geschütze. Metz 1910.
- Schramm, E. 1980: Die antiken Geschütze der Saalburg. Nachdruck der Ausgabe von 1918 mit einer Einführung von Dietwulf Baatz. Bad Homburg vor der Höhe 1980.
- Schwarz, R.: Römische Ziegelproduktion an der Saalburg in der Praxis nachvollzogen. In Experimentelle Archäologie in Europa 13 – Bilanz 2014. Unteruhldingen 2014.
- Schwarz, R.: Antike Artillerie. Rekonstruierte Geschütze der Saalburg. Bad Homburg v.d.H. 2015.

Weiner, J. 1991: Archäologische Experimente in Deutschland von den Anfängen bis zum Jahre 1989 – Ein Beitrag zur Geschichte der experimentellen Archäologie in Deutschland. In: Experimentelle Archäologie Bilanz – 1991, 50-68. Archäologische Mitteilungen aus Nordwestdeutschland, Beiheft 6. Oldenburg 1991.  
Zanier, W.: Zur Herstellung römischer dreiflügeliger Pfeilspitzen. Saalburg- Jahrbuch 48, 1995, 19-25.

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### *Reconstructing Archaeology*

#### **New experimental archaeological studies of bandceramic well constructions in MAMUZ – Lower Austrian Museum of Prehistory in Asparn an der Zaya Wolfgang Lobisser**

VIAS Universität Wien, Franz Klein-Gasse 1, 1190 Wien, Austria, wolfgang.lobisser@univie.ac.at

Since 1983 the fortified early Neolithic settlement of the Bandkeramik in Schletz in Lower Austria was systematically excavated. In 1993 an early Neolithic well in lock-cabin-technique was discovered by H. Windl, which had been built in the same way as the famous well of Erkelenz-Kückhoven in Germany. In 1995 an architectural model of the well was reconstructed using methods of experimental archaeology that was put to earth in 1997. The reconstruction work was carried out with remakes of Neolithic tools made from wood, stone and bone up to a high degree. In 2014 this well model started to sink down on one side, so it became clear that the structure was damaged. In 2015 the well construction was rebuilt again by the experimental archaeological team of the VIAS (Vienna Institute for Archaeological Science) – an interdisciplinary institute of the University of Vienna. This gave the chance to carry out practical experiments concerning the latest well findings of that time especially the hafting of stone adzes with angles over 90 degrees. Before the new well construction was put into earth, the rests of our first well model from 1995 were penible documented.

#### Literature:

W.F.A. Lobisser, Die Rekonstruktion des linearbandkeramischen Brunnenschachtes von Schletz, Brunnen der Jungsteinzeit, Internationales Symposium Erkelenz 1997, Materialien zur Bodendenkmalpflege im Rheinland 11, 1998, 177 – 192.

H. Windl, Der Brunnen der Linearbandkeramik von Schletz/Asparn a.d. Zaya, p.B. Mistelbach, im Nordosten Österreichs, Brunnen der Jungsteinzeit, Internationales Symposium Erkelenz 1997, Materialien zur Bodendenkmalpflege im Rheinland 11, 1998, 85-93.

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#### **Reconstruction of three craftsmen's houses in the Archaeological Park Xanten**

##### **Dr. Kathrin Jaschke**

LVR-ARchäologischer Park Xanten, Trajanstraße 4, 46509 Xanten, Germany, kathrin.jaschke@lvr.de

After several years of construction, in May 2015 three craftsmen's houses were inaugurated in the LVR-Archaeological Park Xanten. These houses are not only the biggest rammed-earth construction in Germany for more than 50 years, but they also set new standards for reconstruction methods.

Due to the absence of stones the people of the Roman town Colonia Ulpia Traiana used materials, which they found in abundance on site like wood, clay and brick. The reconstructions were built with modern tools, but also by handwork to gain interesting insights in the Roman methods and time of working.

How reconstruction work was done can be seen in the one of the houses, the other two are furnished as Roman craftsmen's houses to show the everyday life of craftsmen in the Roman province of Lower Germany. Roman finds and depictions from the north-west Provinces stood model for furniture and equipment.

But the houses serve not only as a demonstration of Roman everyday life, but their workshops come to life. Smiths and weavers show their skills and the Roman working techniques from May to September in fully equipped and functional workshops. Visitors don't look at just another showroom but experience Roman craftsmanship and get a hands-on experience.

But there is even more than that – for example, the weaving of a Roman tunic helps to learn more about the Roman way of weaving (see lecture Köstner/Michel).

#### Literature:

P. Kienzle/S. Leih, Die Handwerkerhäuser auf Insula 39 der Colonia Ulpia Traiana (CUT) – Ausgrabung und Rekonstruktion, Archäologie im Rheinland 2005, 65-68.

P. Kienzle, Rekonstruktion der Wohn- und Gewerbehäuser auf Insula 39 in der Colonia Ulpia Traiana, Archäologie im Rheinland 2007, 189-191.

P. Kienzle, Moderne Technik und traditionelles Handwerk – Die Rekonstruktion von drei Wohnhäusern im LVR-Archäologischen Park Xanten, in: M. Müller/T. Otten/U. Wulf-Rheidt (Hrsg.), Schutzbauten und Rekonstruktionen in der Archäologie. Von der Ausgrabung zur Präsentation, Xanten, 21.-23. Oktober 2009, Xantener Berichte 19 (Mainz 2001) 275-288.

K. Kraus, Die Befunde der Insula 39 in der Colonia Ulpia Traiana (Xanten), BAR Internat. Ser. 797 (Oxford 1999).  
M. Vollmer-König, Insula 39 – Bericht über die Grabung 1989-1991, Xantener berichte 6 (Köln/Bonn 1995) 9-109.

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### **Straight off the Loom – weaving on a Roman on two-beam loom with an audience**

**Barbara Köstner**

Universität Bonn, Merowingerstraße 50a, 50677 Köln, Germany, barbara.koestner@gmx.de; Gisela Michel, Pfaffenweg 10, 53227 Bonn, Germany, Michelgisela@gmx.de

Over the last years, Roman craftsmen's houses were built at the LVR-Archaeologic Park Xanten. In the so-called "House C", designated for textile crafts, a two-beam loom was reconstructed. The first part of the lecture (Gisela Michel) will concentrate on the sources that were the base for the reconstruction. The second part (Barbara Köstner) will present the outcome of the weaving that was done during opening hours, in front of an audience. The sleeved tunic that was woven at Xanten is based on a woollen tunic with red clavi from Dura Europos, but was woven as a child-sized version. As a part of this project, which combined practical trial with a transfer of knowledge, several copies of weaving implements that were found at Xanten were tested. Bit by bit, a typical Roman piece of clothing was woven while visitors could watch and learn about the craft. Apart from gaining experience in working with this special kind of loom and the implements used, teaching the visitors of the APX about typical characteristics of the Roman textile production and raising awareness for the value of textiles in antiquity was a main goal of the project.

Literature:

E. Anderson Strand, Experimental Textile Archaeology. In: E. Anderson Strand et al. (ed), North European Symposium for Textiles X (Oxford 2010), 1-3.

M. Ciszuk/L. Hammarlund, Roman looms – a study of craftsmanship and technology in the Mons Claudianus Textile Project in: C. Alfaro/L. Karali (Hrsg.), Purpureae Vestes II (Valencia 2008) 119-134

A. Goldmann, Experimente am Gewichts-, Rund- und Trittwebstuhl im mittelalterlichen Museumsdorf Düppel in: L. Bender Jørgensen/ E. Munksgaard (Hrsg.), Archaeological Textiles in Northern Europe, Tidens Tand Nr. 5 (Kopenhagen 1992) 187-196

P. Jung, Die römischen Beinartefakte aus dem Gebiet der Colonia Ulpia Traiana (Xanten). Xantener Berichte 26 (Mainz 2014).

E. Peacock, The contribution of experimental archaeology in:

P. Walton/L. Bender Jørgensen/A. Rast-Eicher (Hrsg.), The roman textile industrie and its influence. A birthday tribute to John Peter Wild (Oxford 2001) 181-192

R. Pfister/L. Bellinger, The Textiles. Dura Europos Final Report IV.2 (1945)

P. Walton Rogers, The re-appearance of an old roman loom in medieval England in: P. Walton Rogers/L. Bender Jørgensen/A. Rast-Eicher (Hrsg.)The roman textile industrie and its influence. A Birthday tribute to John Peter Wild (Oxford 2001) 158-171

J. P. Wild, Textile manufacture in the northern roman provinces, Cambridge 1970

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### **Lime kiln construction at Klein Köris: Students capture a German settlement**

**Christiane Ochs**

FU Berlin, Heidebrinker Str. 3, 13357 Berlin, Germany, christiane\_ochs@msn.com

During a seminar of the institute for Prehistory of the Freie Universität Berlin an experiment has been conducted to reconstruct the building of a Roman Iron Age lime kiln under the direction of H.-J. Nüsse together with twelve students in the middle of June 2014. The genuine archaeological record of Klein Köris in the Mark Brandenburg served as a role model. The reconstruction took place in close collaboration with the excavator S. Gustavs and the staff of the open-air museum Germanische Siedlung Klein Köris e. V. Both preceding experiments of K.-U. Uschmann generating quicklime were the decisive factor amongst others. These experiments were reflected by small teams in the seminar to isolate potential sources of error within an anew procedure. Furthermore the already existing six graphical reconstruction attempts were previously examined more closely for reasons of technological practicability. This was done because this experiment primarily attended questions about the kiln construction and a corresponding building:

What kind of covering appears to be most suitable?

How much drain holes are necessary and how big should they be?

How to get the kiln overwintered best without suffering any damages?

How could the protection structure of so-called kiln halls have looked like?

As the archaeological record of original coverings in its constructions could never have been proven certainly and both experiments of Uschmann were conducted with a clay cover, we decided to reconstruct a cupola superstructure. But the kiln cupola couldn't resist the weather conditions and so we are going to test another type of kiln covering in the upcoming experiment in the middle of September 2015. This time we are going to reconstruct a stack-like superstructure.

This year the acquisition of burnt lime also succeeded and the kiln now can be tested for its functionality. In addition the post settings of the kiln hall should be adopted in this way the visitors receive a better impression of the building plan. The genuine archaeological record of twin-post setting seems to entangle the attendants according to the feedback of the staff of the open-air museum. Beyond that the spectrum of the museum will be extended by two bloomery furnaces of which one will be installed permanently and the other will be used for smelting.

Literature:

S. Gustavs, Ein Freilufftherd und ein Wirtschaftsbau mit Kalkbrennöfen aus der Kaiserzeit bei Klein Köris, Ortsteil von Groß Köris, Lkr. Dahme-Spreewald (Kr. Königs Wusterhausen). *Archäologie in Berlin und Brandenburg* 1990-1992, 1995, 46-50.

S. Gustavs, Spätkaiserzeitliche Baubefunde von Klein Köris, Lkr. Dahme-Spreewald. In: A. Leube (Hrsg.), *Haus und Hof im östlichen Germanien*. Tagung Berlin vom 4. bis 8. Oktober 1994. *Universitätsforschungen zur prähistorischen Archäologie* 50 (Bonn 1998) 40-66.

R. Leineweber/ K.-U. Uschmann, Experimentelle Branntkalkerzeugung in einem germanischen Grubenofen als Pilotversuch. *Jahresschrift für mitteldeutsche Vorgeschichte* 83, 2000, 125-140.

A. v. Müller/ M. Zimmermann, Ein kaiserzeitlicher Kalkbrennofen aus Berlin-Tiergarten. *Berliner Blätter für Vor- und Frühgeschichte* 90, 1960, 109-140.

J. Schuster, Rundbauten und Kalkofenhäuser. Sonderformen des Hausbaus bei den Germanen in der römischen Kaiserzeit. *Prähistorische Zeitschrift* 75, 2000, 93-123.

K.-U. Uschmann, Technische Anlagen in germanischen Siedlungen (Kalkbrennöfen). In: A. Leube (Hrsg.), *Haus und Hof im östlichen Germanien*. Tagung Berlin vom 4. bis 8. Oktober 1994. *Universitätsforschungen zur prähistorischen Archäologie* 50 (Bonn 1998) 25-30.

K.-U. Uschmann, Kalkbrennöfen der Eisen- und römischen Kaiserzeit zwischen Weser und Weichsel. *Befunde – Analysen – Experimente*. *Berliner Archäologische Forschungen* 3 (Rahden/Westf. 2006).

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### *Experiment and trial*

#### **Knochenjob – bone tools and their functions**

##### **Anja Probst-Böhm**

Bahnhofstr. 21, 71729 Erdmannhausen (Institut für Archäologische Wissenschaften, Abt. Urgeschichte, Albert-Ludwigs- Universität Freiburg), Germany, a-probst@t-online.de

In most cases bone, antler and tooth tools are analyzed only typologically. Thereby terms for the different tools like "Meißel", "Pfriem", "Ahle", "Schaber" are only given due to the form without checking the actual function or the intended use. Experimental archaeological analyses have shown, that there are differences in use-wears, which can give a hint to their actual use and the worked material. My Dissertation will establish this missing link between conventional archaeological methods (mere descriptive typology) and experimental archaeological studies. Thus the use-wears are analysed through experimental tests. Afterwards they are compared and systematically processed with the use-wears of the artefacts. The previous experiments have shown that the use-wears can be split into three groups. All three provide an important indication of the kind of movement or handling and with it of the worked material. Only the traces, which are generated in the working area through the use, are not enough for a functional identification. Only the interaction of all three groups gives a sufficient picture. Furthermore the investigations of the replicated tools and the artefacts have shown that the micro-traces can be compared directly to each other. This gives us more information about the living of the people, the evolution of craftsmanship and the craftsmanship in general.

Literature:

Campana, D. V., Natufian and Protoneolithic Bone Tools. The manufacture and use of Bone implements in the Zagros and the Levant, *BAR* 494 (1989).

D'Errico, F., Possible bone threshing tools from the neolithic levels of the Grotta di Piccioni (Abruzzo, Italy). *Journal of Archaeological Science* (1995) 22. 537-549.

Jacomet, S./Leuzinger, U./Schibler, J., Die jungsteinzeitliche Seeufersiedlung Arbon, Bleiche 3 (Frauenfeld 2005).  
Legrand-Pineau, A./Sidéra, I., Ancient and Modern Bone Artefacts from America to Russia. Cultural, technological and functional signature, BAR 2136 (Oxford 2010).  
Museo Civico di Storia Naturale, "Prehistoric Technology" 40 years later: functional studies and the Russian legacy, Verona 20-23 April 2005 (Verona 2005).  
Probst, A., Die Knochen-, Geweih- und Zahnartefakte aus der jungneolithischen Feuchtbodensiedlung von Reute-Schorrenried, Kreis Ravensburg (unveröffentlichte Magisterarbeit Universität Freiburg 2010).  
Schibler, J., Osteologische Untersuchungen der cortailod-zeitlichen Knochenartefakte. Die neolithischen Ufersiedlungen von Twann 8 (Bern 1980).  
Schibler, J., Typologische Untersuchungen der cortailod-zeitlichen Knochenartefakte. Die neolithischen Ufersiedlungen von Twann 8 (Bern 1981).  
Semenov, S. A., Prehistoric Technology (London 1957).

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## **Consumption of meat during animal sacrifice in the Greek Archaic Period – a pleasure???**

**Mag. Dr. Hannes Lehar**

Universität Innsbruck, Institut für Archäologien, Im Kerschbäumer 34, 6112 Wattens, Austria,  
hannes.lehar@aon.at

Meat was a rare food for the bulk of Greece's population in the 8th and 7th century before Christ. Grain mush and vegetables were the norm. Consuming the meat after an animal sacrifice was one of the rare opportunities to do so. In this time it was mainly cattle, sheep, chicken and – nearly only for Demeter- pigs that were sacrificed.

Nowadays we never eat freshly slaughtered meat of these animals; it is usually refrigerated and especially with beef hung for one or two weeks in a cold storage room – which means ripened. In archaic Greece there was no possibility of chilled storage, and furthermore it was not permitted for anything, which had been brought into the Temenos (holy district) to be brought out of it. This means that the entire meat quantity, after the killing of the animal and the burnt offering of the abattoir refuse for the gods (which was all they got), needed to be consumed quickly, probably in the course of a festival. How did the meat get confected and how did this freshly slaughtered and confected meat taste?

To determine this we have started a series of experiments which has already started and will be done in September. For this we organized freshly slaughtered meat of varying quality from various animals – which was not easy in Tyrol – and confected one part of each of these pieces in different ways (roasting on a spit, cooking, cooking and then frying).

The process of the preparation and the result concerning taste and texture are the main theme of this talk. So far the results have been partly as expected and partly surprising. Additionally there will be elaborations on the amount of meat incurring during a sacrifice, in doing so the question arises how big sacrifices as for example hecatombs were executed organisationally.

### Literature:

AMA Austria, Rund ums Schaf – Reifung von Lammfleisch

[www.rund-ums-schaf.at/fleisch/fleischgewinnung/reifung](http://www.rund-ums-schaf.at/fleisch/fleischgewinnung/reifung)

Dalby Andrew, Essen und Trinken im alten Griechenland (Stuttgart, 1996)

Grashorn Michael, Fleischqualität Rind, Schwein, Geflügel (Universität Hohenheim, 2010)

[https://www.uni-hohenheim.de/fileadmin/.../Grashorn\\_2010\\_Handout.pdf](https://www.uni-hohenheim.de/fileadmin/.../Grashorn_2010_Handout.pdf)

Marcus Gavius Apicius, De re coquinaria; Übersetzung R. Maier (Stuttgart 1991)

Müller Simone, Untersuchung zur Fleischbeschaffenheit und Fleischreifung unter besonderer Berücksichtigung ausgewählter Tiergenetiken in der ökologischen Haltungsform (Tierärztliche Hochschule Hannover, 2011)

Maria Schuh, Gemeinsam Haushalten – Fleisch und Fleischprodukte (Wien, 2014)

Schwarz Irene, Diata – Ernährung der Griechen und Römer im klassischen Altertum (Universität Innsbruck, 1995)

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## **Experimental salt-production in early iron-age Briquetage using textiles.**

**Sebastian Ipach**

Bereich für Ur- und Frühgeschichte, FSU-Jena, Camburgerstraße 18, 07743 Jena, Germany,  
sebastian.ipach@uni-jena.de;

**Daniel Scherf**

Philipps-Universität Marburg, Vorgeschichtliches Seminar, Biegenstr. 11, 35037 Marburg/Lahn, Germany, daniel.scherf@staff.uni-marburg.de

The presentation consists of three parts.

- 1: Discovery of textile imprints on the inner sides of Briquetage-Vessels.
- 2: Results gained in an experiment on prehistoric salt-production using textiles.
- 3: Implications on processing the textile-imprint containing material.

1: During the processing of finds for a master-thesis dealing with prehistoric salt-production in Erdeborn, Saxony-Anhalt, which was finished in march 2015, structures on the inner walls of Briquetage-Vessels attracted attention. Under supervision of Dr. Grömer (NHM Wien), those structures could be identified as textile imprints. The process of discovery and the textile-imprints themselves will be elucidated.

2: Based on the artefactual material of the aforementioned master-thesis, an experiment was planned and realized at the MAMUZ Museum Schloss Asparn in 07.28.-30.2014. Planning, realization and results are to be presented.

3: Further implications regarding salt-production and trade arose out of the association with other finds from Erdeborn, based on the results of the experiment. These, too, will be addressed and discussed briefly, ending the presentation.

The presentation will be held with Daniel Scherf M.A., who was involved in the realization of the mentioned experiment.

Literature:

S. Ipach/D.Scherf/K. Grömer, Experimentelle Salzherstellung unter Verwendung von Textilien in spätbronze-/früheisenzeitlicher Briquetage. *Archäologie Österreichs* 25/2, 2014, 43-48.

Prähistorische Salzherstellung in Erdeborn, Lkr. Mansfeld-Südharz. Untersuchungen und Ergebnisse der Ausgrabungen von 2002 bis 2006. Unpubl. Master-Arbeit, Bereich für Ur- und Frühgeschichte, FSU-Jena 2015; Textilreste in Salztiegeln – ein interessantes Detail an Briquetagefunden aus Erdeborn, Deutschland. *AISA*, 9, 2016. (im Druck);

Experimentelle Salzherstellung unter Verwendung von Textilien in spätbronze-/früheisenzeitlicher Briquetage. *AISA*, 9, 2016. (im Druck).

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### **Testing ancient roman catapults**

**Arne Döpke**

Universität Trier, Universitätsring 15, 54296 Trier, Germany, doepke@uni-trier.de

Rebuilding and testing of ancient roman catapults has been done excessively since Schramm's great achievements at the beginning of the 20<sup>th</sup> century, thus providing far reaching insights into their operating mode. Focusing on the performance in action and further technological development with machines of similar constructive features, a co-operative project between the Universities of Hamburg, Osnabrück and Trier as well as the Landschulheim Ising is currently conducted.

Literature:

Baatz, D.: Katapulte und mechanische Handwaffen des spätrömischen Heeres, *JRMES* 10, 1999, 5-19.

Marsden, E.W.: *Greek and Roman Artillery. Historical Development*, Oxford 1969.

Miks, C.: *Die Cheiroballistra des Heron. Überlegungen zu einer Geschützentwicklung der Kaiserzeit*, Saalburg Jahrbuch 51, Mainz 2001.

Schramm, E.: *Die antiken Geschütze der Saalburg*, Berlin 1918.

Wilkins, A.: *Roman Artillery*, Pembrokeshire 2003.

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### **Experimental studies to investigate the functioning of Roman aqueducts and water machines**

**Gül Sürmeli Hindi**

Max Planck Institute for the History of Science, Boltzmannstrasse 22, 14195 Berlin, Germany

gsuermelihindi@mpiwg-berlin.mpg.de;

**Prof. Cees Passchier**

Geowissenschaften Universität Mainz, Bechehrweg 21, 55099 Mainz, Germany, cpasschi@uni-mainz.de

Roman aqueducts are amongst the most impressive legacy from the ancient world, both in size and as a technological and artistic achievement. More than 1700 long distance Roman aqueducts are presently known, which carried water over hundreds of kilometres, echoing Vitruvius' "Utilitas, Firmitas, Venustas. Studies of the capacity, age, working period and development of aqueducts are an important topic in archaeology and contribute to our knowledge of the economy and development of Roman cities. Many aqueducts contain carbonate deposits that form a potential record of water

volume, composition and temperature, and changes in the use of an aqueduct with time. These deposits can also show when cities had their periods of prosperity and decline. Carbonate deposits also occur in Roman watermills, such as the mills of Barbegal and the baths of Caracalla, and in water lifting machines. A study of these deposits can give information on the working and use of these machines. A major hurdle in the understanding of such carbonate deposits is that nearly all Roman structures are ruined, and water supply lines are no longer functioning. For a correct interpretation, observations and measurements are required on functioning Roman or similar aqueducts and water machines in which carbonate is actively depositing. Since it is financially difficult to reconstruct a full-scale Roman aqueduct, we have localized a number of still working Roman aqueducts, in Rome, Syracuse and Frejus, and a 19th century aqueduct which was constructed like its Roman predecessors. The Aqua Virgo in Rome is a large scale aqueduct that does not deposit carbonate and is fed by an aquifer; the Galermi aqueduct of Syracuse, in which abundant carbonate is being deposited is fed by a karstic river, while the Roman aqueduct of Frejus is spring-fed and also deposits carbonate. We carried out monitoring studies in these three aqueducts including regular water sampling and measurements, and experiments in the growth of carbonate. We are presently setting up an experimental study in the 19th century aqueduct of Jerez de la Frontera, Spain that is using the same water source as the ruined Roman aqueduct of Cadiz. The Jerez aqueduct was built like a Roman water supply line, including masonry channels, bridges and an inverted siphon. Carbonate deposits of the last 150 years are still present in the channel, and can be compared with recent deposits. With this experimental work, it will be possible to reconstruct the functioning of Roman aqueducts, and also obtain information on temperature and rainfall in Roman time. Finally, we plan to set up experimental studies on the functioning of Roman water machines. This concerns water lifting machines, and especially the watermills that were such important tools: politically through the "cura annonae" and to prevent famine, and economically both on a local scale and as a crucial tool in the food supply of Rome.

#### Literature:

Sürmelihiindi, G., Passchier, C. W., Spötl, C., Kessener, P., Bestmann, M., Jacob, D. E., Baykan, O. N. 2013. Laminated carbonate deposits in Roman aqueducts: Origin, processes and implications. *Sedimentology* 60, 961-982.

Gül Sürmelihiindi and Cees W. Passchier. 2013. Sinter Analysis – A Tool for the Study of Ancient Aqueducts. In: G. Wiplinger (ed). *Historische Wasserleitungen Gestern – Heute – Morgen*. BABESCH Supplement 24/ÖAI Sonderschriften 49, 269-287.

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### **Experimental Reconstruction and Firing of a 5/6th Century Updraft Kiln from Mayen Germany** **Erica Hanning**

Römisch-Germanisches Zentralmuseum, Lutz Grünewald, Römisch-Germanisches Zentralmuseum,  
**Gregor Döhner**

Fachschulen für Keramikgestaltung und Keramiktechnik, Höhr-Grenzhausen,

**Arno Hastenteufel**

Fachschulen für Keramikgestaltung und Keramiktechnik, Höhr-Grenzhausen,

**Achim Rech**

Fachschulen für Keramikgestaltung und Keramiktechnik, Höhr-Grenzhausen,

**Anna Axtmann**

Raiffeisenstrasse 14, D-92353 Postbauer-Heng, Anja Bogott, Humboldtstr. 121 D-56077 Koblenz

The city of Mayen, (district of Mayen-Koblenz, Germany) has a long pottery tradition that spans almost 2000 years of continual ceramic production (see Grunwald 2012). Relicts of the Late Antique and Medieval industry include several pottery kilns of different form and function, which have been unearthed during modern construction work. One of these, an updraft kiln dating to the 5/6th centuries AD was chosen as the basis for an experimental reconstruction. It was chosen not only because of its unusually good state of preservation, but also because of its period of use (constructed in the 2<sup>nd</sup> half of the 5<sup>th</sup> century A.D. and filled in during the 2<sup>nd</sup> half of the 6<sup>th</sup> century AD). During this time the kiln was used to fire so-called "Mayener Ware", a robust coarse ware widely traded during the 5<sup>th</sup> century in Europe (Grunwald 2012). Using the excavation documentation and other published data (ex Eiden 1976, Redknap 1999), this kiln was reconstructed in 2014 taking into consideration ceramic-technological aspects and its performance was tested. This project took place at the RGZM Laboratory for Experimental Archaeology, in conjunction with Fachschulen für Keramikgestaltung und Keramiktechnik Höhr-Grenzhausen as well professional potters.

The following lecture presents the results of construction and first experimental firing, including the decisions made in reconstructing the parts of the kiln. Additionally the documentation and

measurement procedures will also be presented, as well as a discussion of the firing process and efficiency of the kiln. The investigation of Late Antique pottery kilns from Mayen is part of a long-term study: the experimental firings of the kiln will be used to evaluate the technology of the pottery industry in Mayen and beyond.

Literature:

H. Eiden, Ausgrabungen im frühmittelalterlichen Töpferbezirk der Siegfriedstraße in Mayen. Bericht des Amtes Koblenz der Abteilung Archäologische Denkmalpflege des Landesamtes für Denkmalpflege Rheinland-Pfalz an die Deutsche Forschungsgemeinschaft vom 16.01.1976.

L. Grunwald, Die römischen und frühmittelalterlichen Töpfereien von Mayen (Lkr. Mayen-Koblenz). Eine zwischenzeitliche Standortbestimmung. In: M. Grünewald/St. Wenzel (Hrsg.), Römische Landnutzung in der Eifel. Neue Ausgrabungen und Forschungen. RGZM – Tagungen 16 (Mainz 2012) 111-129, dort 116-119 Abb. 7-9.

M. Redknap, Die römischen und mittelalterlichen Töpfereien in Mayen, Kreis Mayen-Koblenz. In: H.-H. Wegner (Hrsg.), Ber. Arch. Mittelrhein u.. Mosel 6 = Trierer Zeitschr. Beih. 24 (Trier 1999) 11-401.

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**Fresh glass batch, mosaic glass, ribbed bowls and Roman window panes – selected results of the "Borg Furnace Project 2015" in the Archaeological Park Roman Villa Borg, Germany**  
**Frank Wiesenberg**

Glasofenprojekt im Archäologiepark Römische Villa Borg, Stammheimer Str. 135, 50735 Köln, Germany, info@glasrepliken.de

From the 27<sup>th</sup> May until the 7<sup>th</sup> June 2015, the Archaeological Park Roman Villa Borg carried out its third glass research project called „Borg Furnace Project 2015 (BFP2015)“. The Saarland University's Institut für Alte Geschichte and the Lehrstuhl für Vor- und Frühgeschichte und Vorderasiatische Archäologie were institutional partners, so this project was again organised as a university seminar in experimental archaeology. Research was mainly focusing on the production of Hellenistic and Roman mosaic glass, ribbed bowls and Roman window panes. Making theories by the Dutch glass expert Marianne E. Stern and the English glassmakers Mark Taylor and David Hill (ROMAN GLASSMAKERS) were experimentally evaluated and recorded.

Also the primary melting of fresh glass batch of Roman composition was researched.

Literature:

Denise Allen, Roman Window Glass. In: *Artefacts and Archaeology*, 2002, 102-111.

Marianne E. Stern, Blowing Glass from Chunks Instead of Molten Glass: Archaeological and Literary Evidence. In: *Journal of Glass Studies* 54, 2012, 33-45

Mark Taylor / David Hill, Webseite Ribbed Bowls

[<http://www.romanglassmakers.co.uk/ribbed.htm>]

Frank Wiesenberg, Experimentelle Archäologie: Römische Glasöfen. Rekonstruktion und Betrieb einer Glashütte nach römischem Vorbild in der Villa Borg. Borg Furnace Project 2013. Schriften des Archäologieparks Römische Villa Borg 6 = ARCHEOglas 2 (Merzig 2014).

Frank Wiesenberg, Zur Herstellungstechnik römischer Rippenschalen, mit einer Einführung in die "Beweisführung" bei der Erforschung antiker Herstellungstechniken

[[http://www.archeoglas.de/downloads/pdfs/2013/wiesenberg\\_glastag2013\\_-\\_zur\\_herstellungstechnik\\_roemischer\\_rippenschalen\\_\\_pdf-kurzfassung.pdf](http://www.archeoglas.de/downloads/pdfs/2013/wiesenberg_glastag2013_-_zur_herstellungstechnik_roemischer_rippenschalen__pdf-kurzfassung.pdf)]

Frank Wiesenberg, Webseite Glasofenexperiment

[<http://www.glasofenexperiment.de/>]

Frank Wiesenberg, Webseite Glasofenexperiment Borg Furnace Project 2015

[[http://www.glasofenexperiment.de/p\\_bfp2015.htm](http://www.glasofenexperiment.de/p_bfp2015.htm)]

Frank Wiesenberg, Webseite Römisches Fensterglas

[[http://www.glasrepliken.de/p\\_artikel\\_fensterglas.htm](http://www.glasrepliken.de/p_artikel_fensterglas.htm)]

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**An experimental suggestion for a textile fitting of Merovingian square cloaks**  
**Tobias Schubert**

Blücherstr. 18, 50733 Köln, Germany, TSchubert72@gmx.de

Although brooches are a common find in Merovingian grave goods they are discovered exclusively in the burials of females. In the reconstruction of male clothing there is no need for brooches on trousers or tunic, but there should be a brooch fastening the supposed cloak.

In late antiquity the square cloak is the typical garment of the Germanic tribes, fitted on the right shoulder by a crossbow brooch. This type of brooch disappeared by the end of the Roman Era.

There are different suggestions for the missing brooches in male graves, ranging from „there's no



cloak at all“ to „the cloak is not worn at the burial“. Furthermore there is the assumption of short robes which are equally difficult to prove.

So reconstructions of male garments often do not show the cloak fitting at all.

Evidence for a textile fitting of a square cloak is depicted on a mosaic from Karthago showing a Vandal horseman with a cloak closed in front with what seems to be organic bands.

Though technical details are not at hand, this picture gives enough hints for an experimental reconstruction.

Literature:

Badisches Landesmuseum Karlsruhe (Hrsg.): Das Königreich der Vandalen. Erben des Imperiums in Nordafrika. Karlsruhe 2009. Abb. S. 26, 223.

Linscheid, Petra: Textile Bodenfunde der römischen Kaiserzeit und der Merowingerzeit im Bestand des LVR-Landesmuseums Bonn. In: Kunow (Hrsg.): Textilien in der Archäologie. Materialien zur Bodendenkmalpflege im Rheinland 22. Bonn 2011.

Strassmeir A./ Gagelmann, A.: Das fränkische Heer der Merowingerzeit. Teil 1: Bekleidung, Trachtzubehör, Persönliche Ausrüstung, Rüstung.

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### **”Diz buoch sagt von guoter spise, daz machet die vnverichtigen koeche wise” – From recipe translation to interpretation**

**Andreas Klumpp**

Kirchstr. 19, 96123 Litzendorf/OT Pödeldorf, Germany, andreas\_klumpp@yahoo.de

With this presentation I want to demonstrate the interpretation process for medieval culinary recipes. Starting with extraction and translation of original source material we encounter many obstacles on the way to the finished dish. Not only the lingual barrier – problems in translation like words that have lost or changed their meaning – and imprecision of cooking instructions – missing weights and measurements, missing cooking steps – but also our inexperience in historic kitchen practices are often to be overcome. After having presented an overview of my PhD project last year, this time the lecture will focus on practical execution and cooking experiments.

Literature:

Fourme of Curye, English MS 7, The John Rylands University Library, The University of Manchester:

<http://enriqueta.man.ac.uk/luna/servlet/view/search/who/Master%20Chef%20of%20King%20Richard%20I%20of%20England?q==%22Fourme%20of%20Curye%22>

Mesnager de Paris, Bibliothèque nationale de France, Département des manuscrits, Français 12477:

<http://gallica.bnf.fr/ark:/12148/btv1b10501679k.r=menagier+de+paris.langDE>

Buoch von guoter spise, Universitätsbibliothek München, Cim. 4 (= 2° Cod. ms. 731): <http://epub.ub.uni-muenchen.de/10638/>

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### **Spot removal from textiles about 1500 AD**

**Fabian Brenker**

Sonnhalde 39, 71394 Kernen, Germany, fabian.brenker@gmx.de

Some linen and woollen cloth are stained with spots characteristic of the Middle Ages and treated with the recommended cleaning processes on the basis of instructions from the late 15th and early 16th century. The outcome will be compared with today's commercially available washing powder. As information in the late medieval cleaning prescriptions are very vague, it must be investigated what the terms “wine” or “beans” really stood for or which quantities were appropriate.

Literature:

Bartl, Anna/Krekel, Christoph/Lautenschlager, Manfred/Oltrogge, Doris: Der „Liber illuministrarum“ aus Kloster Tegernsee. Edition, Übersetzung und Kommentar der kunsttechnologischen Rezepte, Stuttgart 2005.

Edelstein, Sidney M., The Allerley Matkel (1532): Facsimile Text, Translation, and Critical Study of the Earliest Printed Book on Spot Removing and Dyeing. Technology and Culture 5/3, 297-321.

Leed, Drea: „Ye shall have it Cleane“. Textile Cleaning Techniques in Renaissance Europe, Medieval Clothing and Textiles 2, 2006, 101-120.

Ploss, Emil Ernst: Ein Buch von alten Farben. Technologie der Textilfarben im Mittelalter mit einem Ausblick auf die festen Farben. München 6. Aufl. 1989.

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## *Theory and mediation*

### **The toolbox of an early medieval goldsmith**

**Angelika Ulbrich (Restauratorin)**

Landesamt für Denkmalpflege- HessenArchäologie, Schloss Biebrich, 65203 Wiesbaden, Germany,  
a.ulbrich@hessen-archaeologie.de

In 2007 an almost complete content of a toolbox was found in an early medieval grave (6th century AC) in the city Wölfersheim-Berstadt (Germany) and recovered with and in the surrounding earth.

The restauration of this find was done with modern methods in 2014.

For example a computerized tomography was made at the beginning of the restauration.

Because of the use of a microscope (binocular) and a micro sandblast device for the uncovering of the mostly on one another corroded objects, astonishing details can be observed.

Beside tools as an anvil, hammers, different pairs of pliers, plate scissors and a soldering pipe, a drawing plate, a scale, a hand drill, a mould, bowls and a lot of interesting tool restitutes and raw almandine, glass and stone were discovered.

If previous publications about medieval graves of goldsmiths are compared, this still unpublished find of Wölfersheim-Berstadt is the most spectacular discovery of tools and could be the base of many experiments for experimental archaeology.

Literature: not published

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### **Experiment and Simulation**

**Michael Zülch**

Beethovenstrasse 30, 76689 Karlsdorf-Neuthard, Germany, michael.zuelch@gmx.de

It is important for any research to optimally and purposefully employ the few available resources, such as research funds, staff or materials, which by definition are scarce. Particularly resource-intensive real experiments, following the "trial and error" principle, can prematurely tie up much-needed funds for follow-up experiments and secondary aspects to explore, but also for the preparation and interpretation of the results.

A method to reduce repetitions with relatively little information gain, known in natural and engineering science, is the embedding of an experiment in a simulation framework, in which the parameter space of the experiment, i.e. basic assumptions and influencing factors are determined in advance and if possible restricted using a computer based methods. By simulating a real experiment in an idealised, virtual environment, it is furthermore also possible to measure targeted soft factors, meaning factors that are hard to expose in the experiment, or are elusive such as stochastic variations, environmental factors and human factors in a model, and measure their effects.

The foundation for the simulation-supported approach is the use of mathematical models, which can come from a variety of sources. The selection and linking of adequate models for this question requires a wide perspective that stretches beyond the borders of the discipline itself, especially when it comes to the multidisciplinary topics used in experimental archaeology.

A well-founded knowledge of the simulation method itself, but also of potential pitfalls for the users, however, is important in the use, evaluation and interpretation of results obtained through simulation.

The contribution is intended to present the method of simulation in its principles and possible definitions of the simulation supported experiments in the context of experimental archaeology. In addition, possibilities for using both the data collected as well as the set-up models of the actual experiment will be identified.

Literature:

Kurt Binder: Computersimulationen. Physik Journal 3 (5), 2004, 25-30.

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### **A different look at the past – a tour with objects at the archaeological open-air museum Oerlinghausen**

**Sylvia Crumbach**

Friedenstr. 30, 47053 Duisburg, Germany, s\_crumbach@gmx.de

We designed a new program for visually impaired persons to give them a unique chance to get impressions from guided tours in our archaeological open-air museum. Obviously it is not a brand new idea to tell stories through objects. But don't you think a newly made stone axe to get hands-on while listening may attract the attention in an inquisitive way? And how do you explain visually impaired people the size and construction of a house without going up and touching the roof?

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**All wrong?! Sence and nonsense of pearl making demonstrations with a modern gas burner  
Maren Siegmann**

Museum in der 'Alten Schule, Nikolaus-Däublin-Weg 2, 79588 Efringen-Kirchen, Germany,  
museum@efringen-kirchen.de

Really real very authentic nice Celts, or Alamans, or whatever, pepping up some museum-festival, with really real very authentic gear and ornaments and props, and oops: a plump real very authentic dressed up senior-chick, be-spectacled, making beads using some cheap gas burner normally used for weed-extinction.

Heaven forbid! Or makes this sense, after all?

To get an answer to this, we will worm ourselves through a variety of arguments. Starting with some Originals (selected examples) via the traces their manufacture left on them. The glass-processing that can be concluded from these traces. And the sources for the heat used to produce them. Finally, the truth: dire, as always...

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**Annoying Authenticity: Impetus of Living History**

**Andreas Sturm, liveHistory**

Passstraße 113, 52070 Aachen, Germany, andreas.sturm@livehistory.de

Authenticity is a central idea of Living History (LH). Proliferation of LH as a means of live interpretation does require museum professionals to get accustomed to this concept.

So far, any attempt to develop authenticity as objectively quantifiable benchmark of quality has failed.

The various manifestations of LH and heterogeneous source material of the portrayed periods prevent a uniform assessment of authenticity.

Nevertheless, LH must not give up their quest for authenticity. Reconstructions of the past make use of certain sets of common symbols to provide us with the impression of being from the past (so-called pastness). These cultural codes are deeply rooted in our collective memory and can equally be addressed by science as popular culture. Therefore, archaeological laymen might easily be lead astray by stereotypes. The unattainable ideal of authenticity prevents LH from slipping into the arbitrariness of entertainment.

LH-Practitioners are called to develop a considerate handling of the phenomenon authenticity. Their main objective should be to identify factors of influence that might reduce the level of authenticity unnecessarily. Doing so, authenticity will remain the evolutionary force of LH.

Literature:

Groschwitz, H. 2010: Authentizität, Unterhaltung, Sicherheit. Zum Umgang mit Geschichte in Living History und Reenactment. Bayerisches Jahrbuch für Volkskunde, 141–155.

Holtorf, C. 2010: The Presence of Pastness. Themed Environments and Beyond. In: J. Schlehe, M. Uike-Bormann, C. Oesterle, W. Hochbruck (Hrsg.), Staging the Past: Themed Environments in Transcultural Perspectives. Historische Lebenswelten in populären Wissenskulturen 2. Bielefeld: Transcript, 23–40.

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*Poster*

**Winged bonnet of the Lüneburg-Group: Possible construction and design**

**Sylvia Crumbach B.A.**

Friedenstr. 30, 47053 Duisburg, Germany, s\_crumbach@gmx.de;

**Thorsten Seifert**

Radstr. 9, 63814 Mainaschaff, Germany, Thorstenseifert@gmx.de

The winged bonnet as a prominent costume part of the Lüneburg-Group is shown on many illustrations. Unfortunately no parts of the organic construction are preserved and have survived after the many years. Two possible constructions made of contemporary disposable materials will present to illustrate the grave goods on one hand. On the other hand we ask how new pictures in history-presentations can be shown satisfactorily, even when there are no conclusive remains to make a honest and solid reconstruction.

Literature:

Bergerbrant, S. 2007: Bronze Age Identities: Costume, Conflict and Contact in Northern Europe 1600 - 1300 BC. Stockholm Studies in Archaeology 43. Stockholm 2007.

Laux, F. 1986: Flügelhauben und andere Kopfbedeckungen der bronzezeitlichen Lüneburger Gruppe. Hammaburg N.F. 6, Hamburg 1986, S. 77-96.

Laux, F. 1996: Tracht und Schmuck der Frauen und der Männer. In: Leben - Glauben - Sterben vor 3000 Jahren. Bronzezeit in Niedersachsen. Wegner, G. (Hrsg.): Begleithefte zu Ausstellungen der Abteilung Ur- und Frühgeschichte des Niedersächsischen Landesmuseums Hannover, Heft 7. Oldenburg 1997, 95 - 116.

Piesker, H. 1958: Untersuchungen zur älteren Lüneburger Bronzezeit. Lüneburg 1958.