



Burnt structures on the Bernstorf hill (Upper Bavaria, Germany) – an integrated research



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Introduction

The Bernstorf hill is located 30 km north of Munich and belongs to the tertiary hills of Upper Bavaria. Excavations were carried out since 1997 until 2014. Three fortifications have been investigated: 1. an Early Medieval fortification, 2. a Hallstatt period fortification and 3. a large middle Bronze Age fortification (Moosauer et al. 1998, Bähr et al. 2012) (Fig.1, Table 1). In our latest investigations we focused on prehistoric burnt structures: The Bronze Age fortification consisted of a 1,645 km long wall which was built of wood and loam. It dates around 1339 to 1326 BC and burnt down shortly after its construction. Due to intensive Iron Age settlement, the Bronze Age features on Bernstorf hill are strongly disturbed. A burnt structure of the same age is situated on the southern slope of the hill. Furthermore, we examined an Iron Age burnt settlement feature. In order to compare burnt structures we applied a combination of disciplines such as archaeology, micromorphology and phytolith analyses. Our investigations aim to distinguish between the composition of Bronze Age and Iron Age construction material by identifying different features of the construction (e.g. plaster, daub, floor) regarding sediment composition, treatment and possible tempering.

* Fig 2: Bronze Age burnt sample from the fortification (left), Bronze Age burnt structure (middle), Iron Age burnt building structure (right).

Bronze Age fortification



Fig. 3A: Section III-3 intersects the Bronze Age fortification wall. The profile shows the fire debris that consists of reddened sandy loam as well as solid pieces of burnt loam.

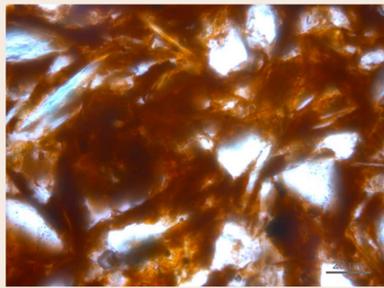


Fig. 3B: Thin section DS3/4 Hematitic groundmass, phytoliths are not detectable (PPL).

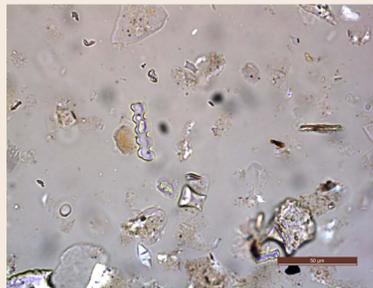


Fig. 3C: BT3 PY2, sample 558, a polylobate trapeziform and a rondel Poaceae short cell phytolith.

Bronze Age structure



Fig. 4A: Section III-7 cuts a Bronze Age structure with postholes. Charred building timber lies between reddened material. It covers an occupation layer with ceramics and other finds.

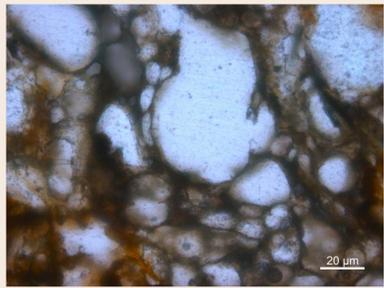


Fig. 4B: Thin section DS BT7PY6, Partly molten and hematitic sample, phytoliths are not detectable (PPL).



Fig. 4C: BT 7 PY 6, sample 557, a bilobate Poaceae short cell phytolith.

Iron Age occupation



Fig. 5A: Section III-12 cuts an Iron Age building structure with postholes. The feature consists of solid burnt loam, which shows imprints of wickerwork. Beneath lies an occupation layer.

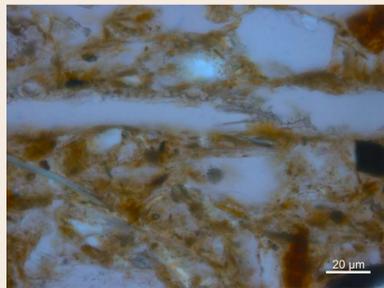


Fig. 5B: Thin section DS BT12PY3, banded, dendritic phytoliths within burnt groundmass (PPL).



Fig. 5C: BT 12 PY 3.2, sample 629, a sheet composed of elongate dendritic long cells and papillae (Triticeae husk phytoliths).

Table 1: Site information and analysed samples from Bernstorf.

Site description	Thin sections (according to Stoops 2004)	Phytoliths (according to Piperno 2006)
Bernstorf, Kranzberg council, Freising county. Southern profile 2 in section III-3, excavation 2012 (Fig. 3A).	DS3/4 (Fig. 3B)	BT3PY2 (Fig. 3C)
Bernstorf, Kranzberg council, Freising county. Section III-7, excavation 2012 (Fig. 4A).	DSBT7PY6 (Fig. 4B)	BT7PY6 (Fig. 4C)
Bernstorf, Kranzberg council, Freising county. Section III-12, excavation 2012 (Fig. 5A).	DS BT12PY3 (Fig. 5B)	BT12PY3.2 (Fig. 5C)

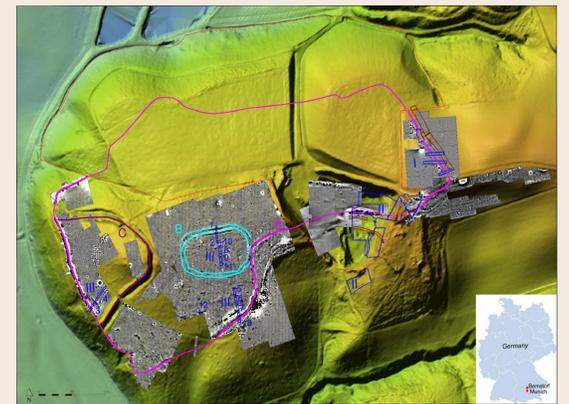


Fig. 1: Digital terrain model of Bernstorf, Freising county, combined with the results of geophysical prospections featuring the three fortifications (A. Middle Bronze Age; B. Hallstatt period fortification; C. Early medieval fortification) and the excavation areas between 1994 and 2014.

Main points

The Bronze Age burnt structures are visually comparable. Thin section and phytolith analyses show that they are composed of the same source material and resemble the Bronze Age cultural layers as well as colluvial layers (reference soils). Most samples have high amounts of grass phytolith short cells in common. Concerning phytolith compositions the wall material is comparatively uniform with only two exceptions. Without definite evidence of intentional tempering, the phytoliths indicate open grassland vegetation shaped by men. Bilobate phytoliths attest the presence of wild and/or cultivated millets.

Iron Age burnt building structures differ distinctly from the Bronze Age samples. Macroscopically, tempering is visible. Thin section and phytolith analyses confirm this observation. The building material has high amounts of inflorescence phytoliths (husks, mainly from the Triticeae tribe) often in cell sheets derived from threshing remains which were used as temper. According to micromorphological analyses the use of dung can be excluded. This is in contrast to the occupation layer containing mostly single inflorescence phytoliths.

Conclusion

This interdisciplinary approach of archaeology, micromorphology and phytolith analyses offered the possibility to distinguish Bronze from Iron Age burnt construction materials as well as different samples from one archaeological settlement feature. Furthermore, conclusions on the local vegetation composition could be drawn.

Acknowledgments

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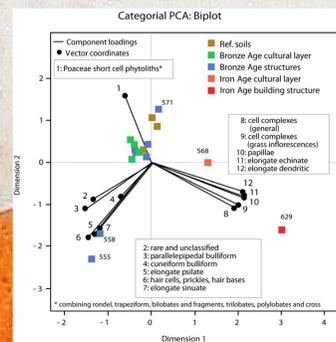


Fig. 6: Categorical PCA biplot of Bernstorf phytoliths.

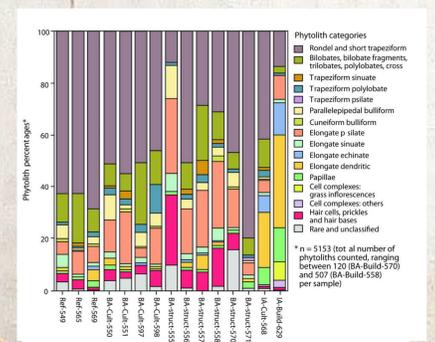


Fig. 7: Percentage distribution of phytoliths in all investigated samples of Bernstorf.

Statistics

The bar graphs in fig. 7 show the dominance of Poaceae short cell phytoliths in the references as well as the Bronze Age structures. An exception of this rule are the burnt structures sample 555 and, though less distinct, 558 where short cell ratios are reduced in comparison to more robust phytolith types such as bulliforms, elongate psilates and hair cells/prickles. This might be caused by a different sediment composition. The Iron Age cultural layer and building structures reveal a distinctly higher proportion of husk phytoliths (elongate dendritics, papillae) relatively frequent as cell sheets in building structure sample 629 only. PCA confirms this affiliation of Iron Age samples and husk phytoliths in general and the affiliation of building structure 629 with cell complexes in particular. Bronze Age samples cluster obviously with grass short cell phytoliths except for the aforementioned samples 555 and 558.

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