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THREE-DIMENSIONAL VISUALIZATION AND ANALYSIS OF THE STRATIGRAPHY AT THE BLÄTTERHÖHLE ENTRANCE AREA

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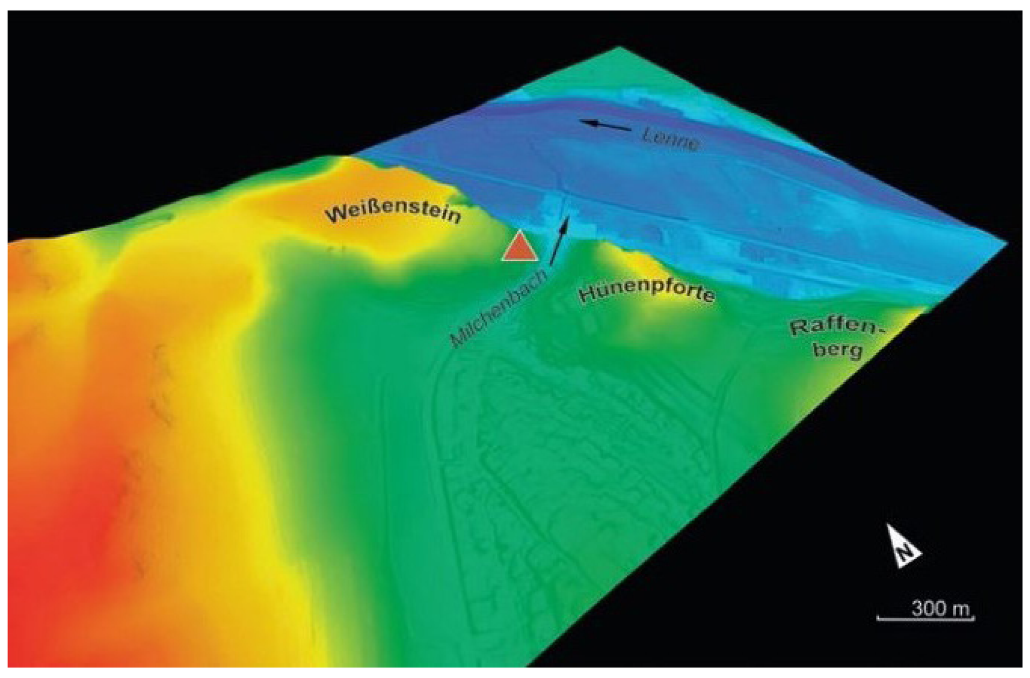

Fig. 1: 3D landscape model of the surrounding of the Blätterhöhle. The orange triangle marks the location of the site. The cave has its opening to the south in the direction of the Milchenbach (Heuschen et al., 2017, 29).

The Site

The site of the Blätterhöhle (Westphalia, Germany) lies within the city boundary of Hagen. The cave itself and the associated entrance area of the Blätterhöhle is embedded between the rock formations of Weißenstein and Hünenpforte and is located north-west of the small stream Milchenbach which flows into the Lenne river (Fig. 1). With the cave opening to the south, the Blätterhöhle has been a settlement place for humans in the Holocene and the Final Pleistocene (Heuschen et al., 2017).

The Blätterhöhle has been discovered in 1983 and a first exploration by the society "Arbeitskreis Kluterhöhle e.V." took place in 2004. Initially, a narrow cave entrance has been expanded to a 15 m long crawl space by removing sediment. The removed sediments contained numerous Early Mesolithic and Late Neolithic human bones and other finds (Orschiedt et al., 2012; 2017).

From 2006 until today, excavations also took place outside the cave below the entrance under the direction of Jörg Orschiedt and later on with support of the LWL-Archaeology for Westphalia and the city of Hagen. The result of the work is a rich stratigraphic sequence of Final Palaeolithic and Mesolithic layers. This sequence is documented in two continuous profiles DE (max. depth 195 cm) and DM (max. depth 160 cm) in the western part of the excavation area. In the eastern part, there are shorter profiles (Heuschen et al., 2017; 2020).

The entrance area has been excavated at 22 m2 at the surface and 9 m2 at the bottom. Within this area, there are several profiles have been documented.

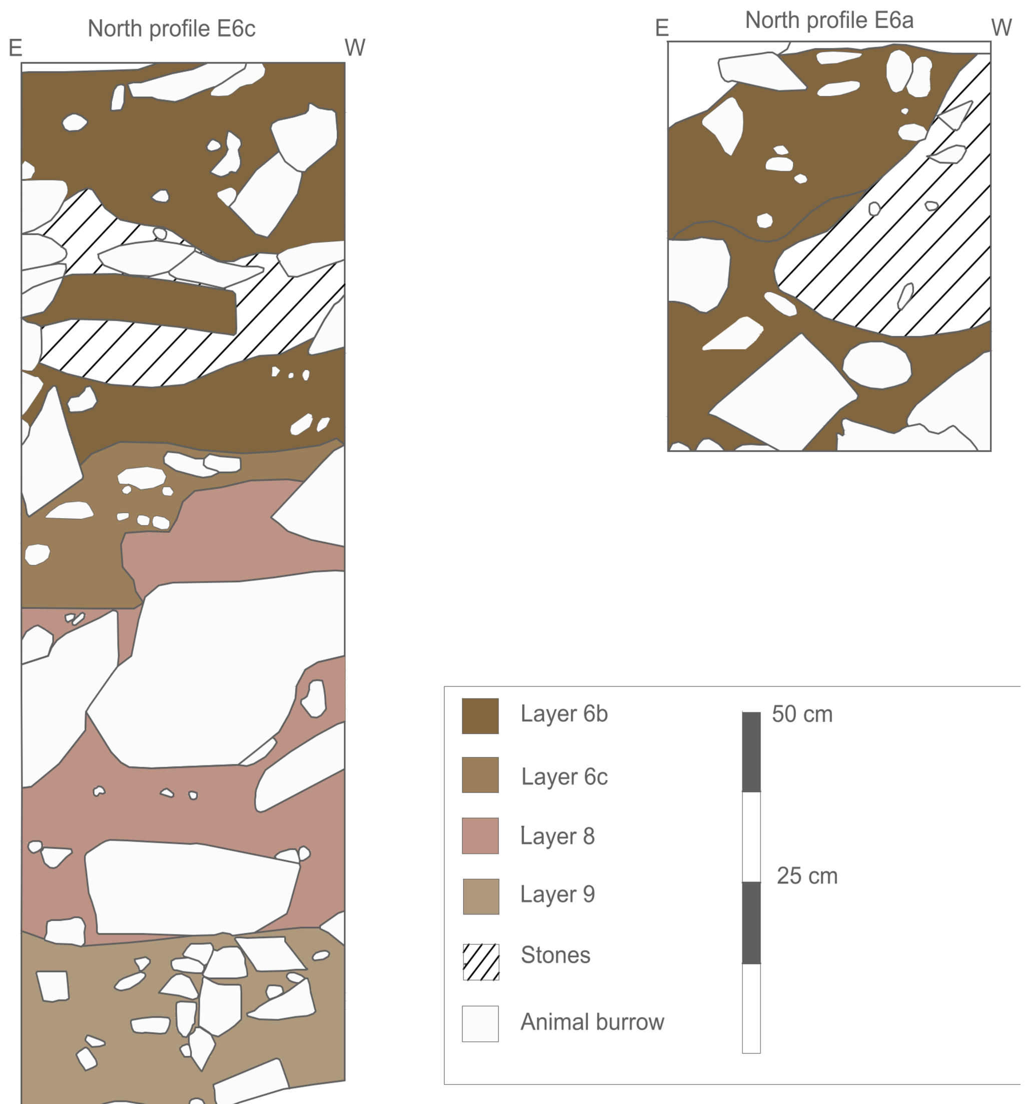

Fig. 3: 2D AutoCAD model of the north profile of quarter square E6c and E6a.

Aims and Method

This poster presents the general outline and first results of a master thesis and presents a three-dimensional reconstruction of the stratigraphy of the entrance area at quarter square meter E6a (Fig. 2). The documentation was done by hand on graph paper in a scale of 1:10. First, a scan was imported into Autodesk AutoCAD and scaled correctly. Then the profile was redrawn digitally with the polyline tool and all sediment layer outlines, stones, and animal burrows were added into the digital profile. Next the layers were color-coded following the recorded Munsell values which were converted to RGB settings by the open source online tool "Munsell Color Palette" (Munsell Color Palette, 2023). This first part produced a traditional two-dimensional digital profile drawing (Fig. 3).

The three-dimensional model was created using Maxon Cinema 4D. The spline tool was used on the imported and scaled 2D-profile to redraw the different layers. Here, all stones, sediment layers and animal burrows were drawn in individual splines and inserted in the Extrude tool. With the Extrude tool, the splines get a filled area, and the newly created objects were extruded for two centimeters, creating a thin 3D- model. Color-coding followed that of the 2D-model.

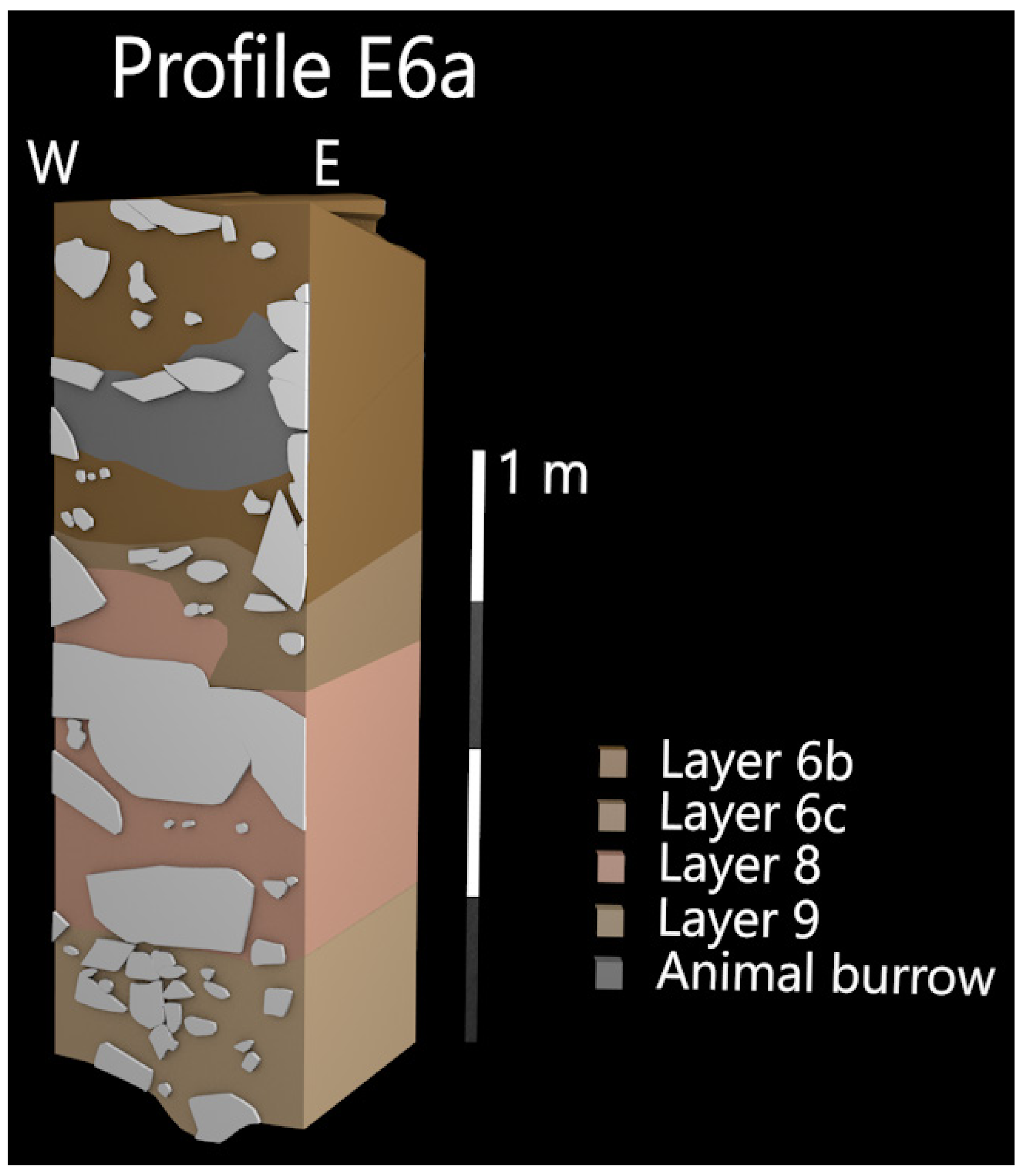

Fig. 4: 3D-model of quarter square meter E6a. The model was created in Maxon Cinema 4D by the combination of the two 2D Models shown in Fig. 2.

For reconstruction of the slope and the course of the different sediment layers, a second profile drawing is needed. We chose quarter square meter E6c located downslope of E6a towards the rock wall. After repeating the steps for E6c the two thin 3D-model were connected in Cinema 4D. To this end, each of the different parametric objects was converted into a polygonal object. With the Bridge tool, matching layers of E6a and E6c were connected, eventually providing a 3D-model of E6a with reconstructed slope and course of the different sediment layers (Fig. 4).

Comparison of 2D- and 3D-stratigraphy models

One of the main differences between the 2D- and 3D-model is the course and slope of the layers in all directions visible in the latter. In the 2D- stratigraphy, only the east-west direction of the slope is captured. For small surfaces, information about the south-north course of the sediment can roughly be inferred, but for larger surfaces this is not possible. Here, the 3D-model brings a huge advantage, since it can be turned around and inspected from any position.

Plans, Ideas and Problems

Eventually the whole entrance area of the Blätterhöhle shall be reconstructed in a 3D-model. By consecutively integrating new square meters, a complete model will grow. Ideally, larger rocks (> 50 cm) will also be represented. If individual measurements are available or the rocks are identifiable in two consecutive profile drawings, this task will be feasible.

However, not every quarter square meter has a complete profile drawing. A major challenge is thus bridging gaps of knowledge by interpolating observations from surrounding areas.

Acknowledgments

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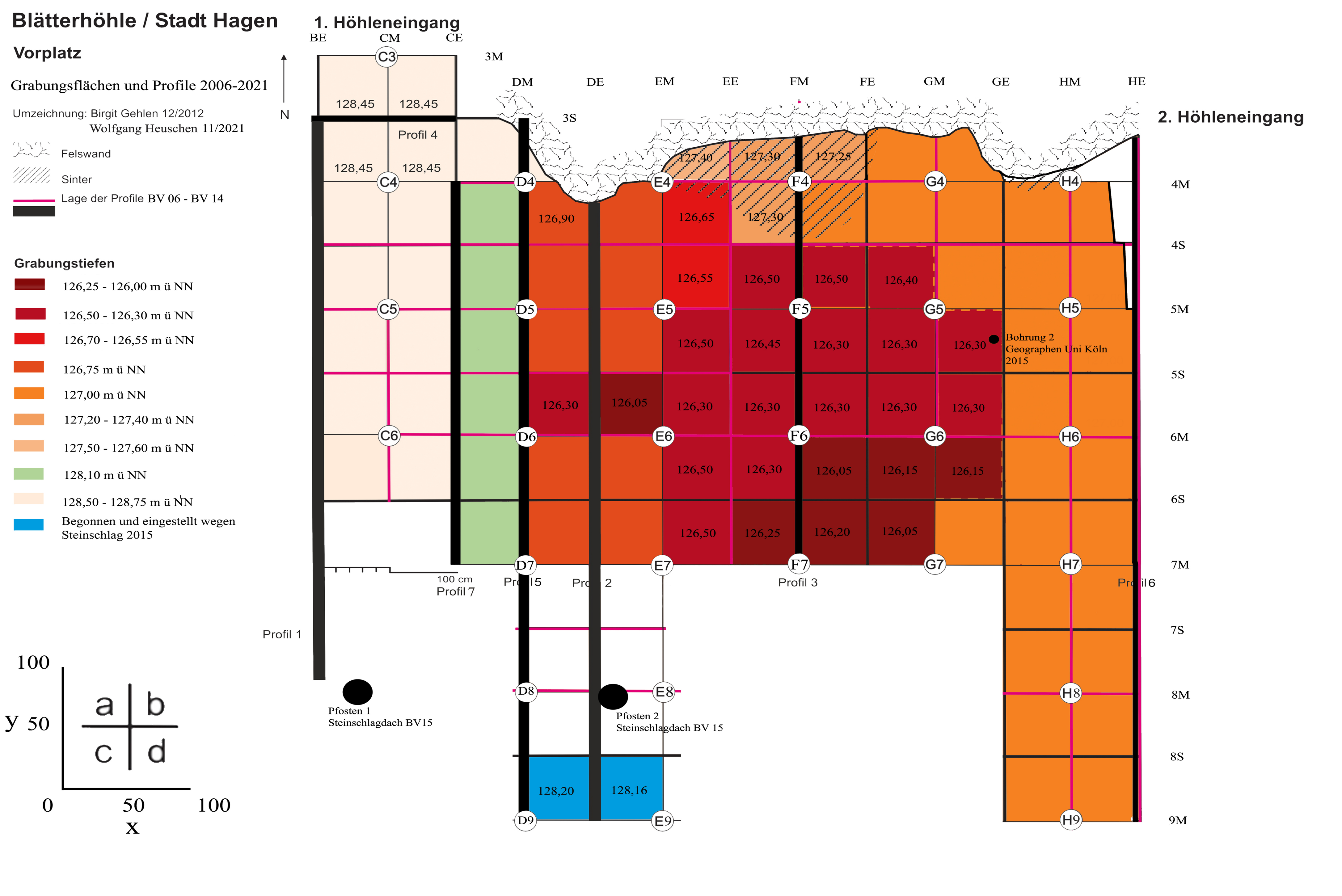

Fig. 2: Excavation area of the entrance area after the excavation in 2021 (Heuschen, 2021, 12). To create a three-dimensional stratigraphic model, quarter square E6a was chosen.

Heuschen, W., 2021. Grabung Blätterhöhle Vorplatz (BV 21) und Höhle (BH 21) (Excavation report). Hagen.

Heuschen, W., Baales, M., Orschiedt, J., 2017. Blätterhöhle 2016–nach 10 Jahren Forschung ist die Eiszeit erreicht. Archäologie in Westfalen-Lippe 29–32.

Heuschen, W., Baales, M., Orschiedt, J., 2020. Ausgrabung und erste Auswertungen des altsteinzeitlichen Fundplatzes an der Blätterhöhle. Archäologie in Westfalen-Lippe 36–40.

Munsell Color Palette, 2023. URL https://pteromys.melonisland.net/munsell/ (accessed 3.14.23).

Orschiedt, J., Gehlen, B., Schön, W., Gröning, F., 2012. The Neolithic and Mesolithic Cave site "Blätterhöhle" in Westphalia (D). Notae Praehistoricae 32, 73–88.

Orschiedt, J., Heuschen, W., Baales, M., 2017. Blätterhöhle - Bilanz von zehn Jahren Ausgrabung. Archäologie in Deutschland 2, 60–63.

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Für Westfalen-Lippe.

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