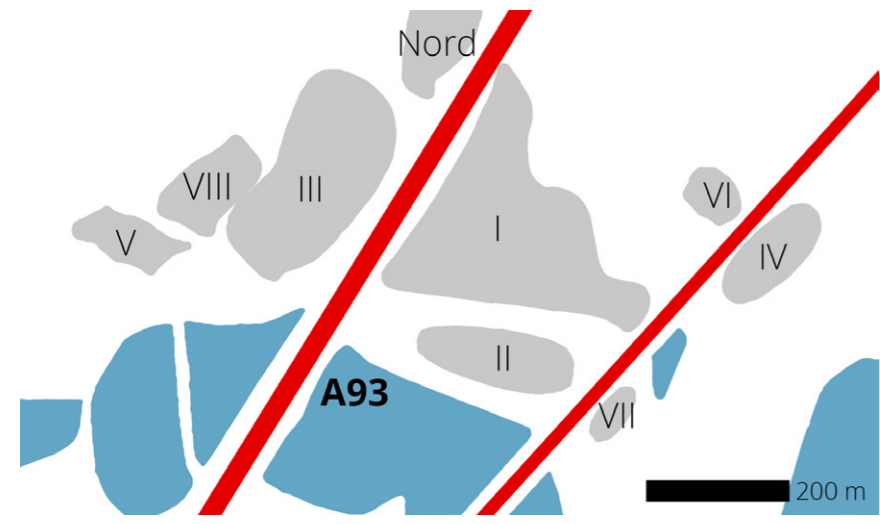


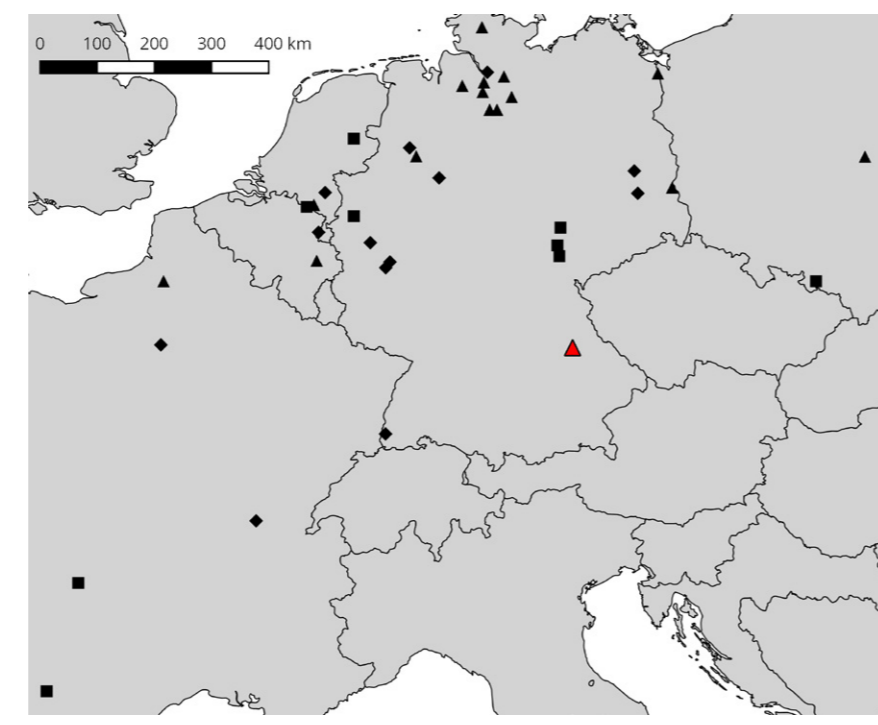
A 3D-Representation of a Newly-Discovered Shaft Smoother from the Federmesser-Site of Oberweierhaus, Schwandorf District (Bavaria, Germany) in the Naab Valley.

In the course of gathering lithic assemblages for the PhD project „Late Paleolithic Land Use in Bavaria“, the site of Oberweierhaus was recorded in 2014/2015 for feature analysis. Within the sample, a shaft smoother – hitherto unpublished – was discovered.



Find-clusters of the site of Oberweierhaus as reported by the finder, Eduard Süß.

The site of Oberweierhaus is located in the lower Naab valley near the hamlet Oberweierhaus and was discovered in 1999. The site is situated on the outskirts of the town of Schwandorf next to the A93 highway, which unfortunately divides the site-cluster. According to its finder, Eduard Süß, the large lithic scatter is actually composed of seven distinct clusters. This may actually be possible due to the site's large dimensions. It spans more than 1100 m from West to East and 500 m from North to South. It provided a very large lithic assemblage with a great number of diagnostic tools that allow the site to be dated to the Late Paleolithic Federmesser-Groups, which are abundantly known from the area of the Upper Palatinate Valley



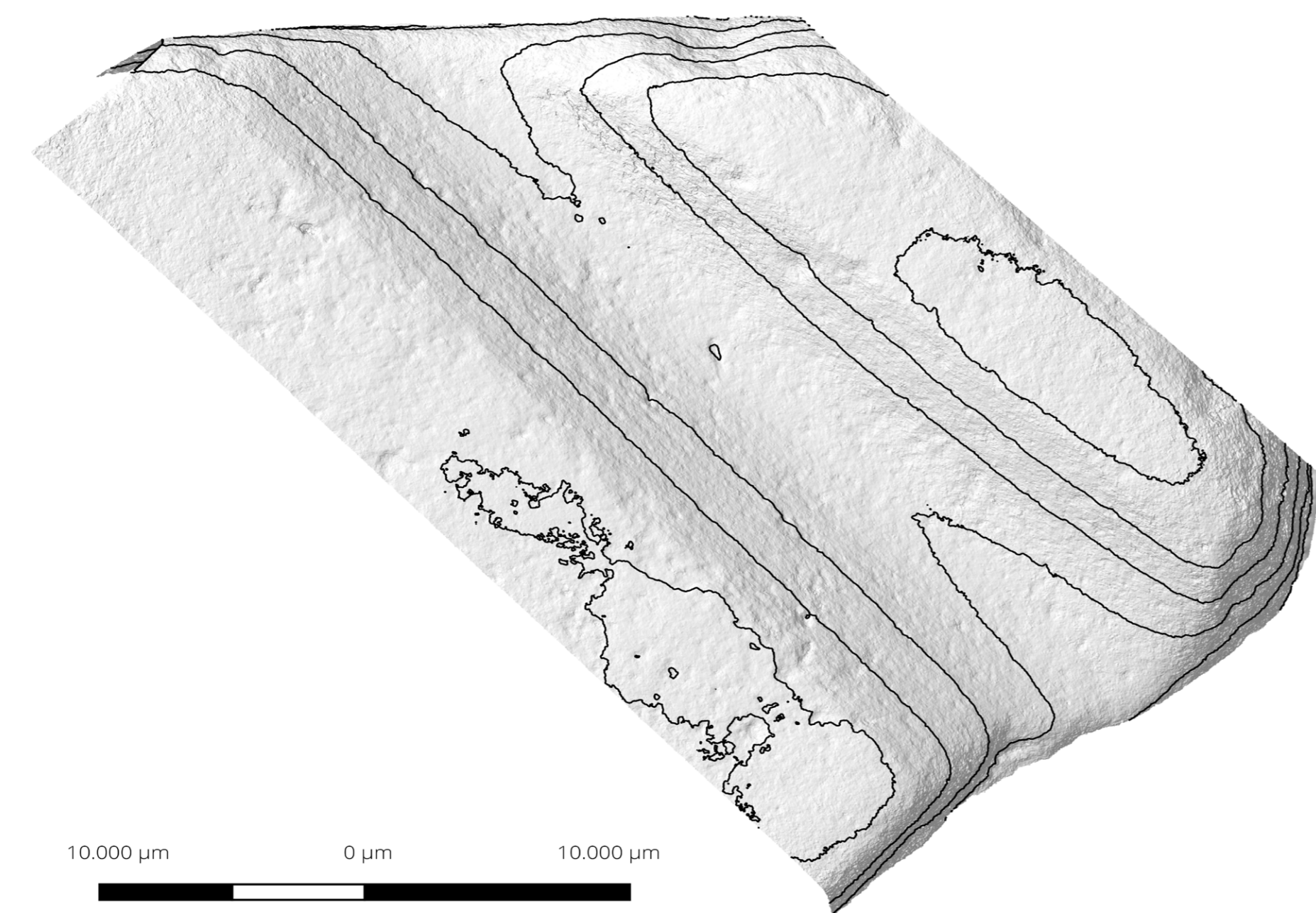
Finds of shaft smoothers in Central Europe: Squares - Magdalenian/Hamburgian, Diamonds - Ahrensburgian/Swiderian/Belloisian, Triangles - Federmesser-Groups/Brommean, Red Triangle - Site of Oberweierhaus (Extended Map based on Moreau et al. 2014, 161).

and the Upper Palatinate Forest. It is noteworthy that the assemblage of Oberweierhaus shows only a minor admixture of possible Mesolithic artefacts (1 isosceles triangle representing 0.38 % of the entire assemblage; in contrast 15 backed points representing 5.7 %). Thus, a Late Paleolithic dating for the smoother is certain.

The object itself shows dimensions comparable to the smoother published from the South-German site of Steinacker in 2014 (Moreau et al. 2014). It measures 52.5 mm in length, 43.6 mm in width and has a thickness of 25.2 mm and a weight of 43.83 g. At a volume of 22.63 cm³ the density of the material is $\rho=1.94 \text{ g/cm}^3$. With sandstone generally ranging from $\rho=2.0 \text{ g/cm}^3$ to $\rho=2.8 \text{ g/cm}^3$ (Carmichael 1984) this is still within the margin of error, although it suggests a particularly lightweight type of rock.

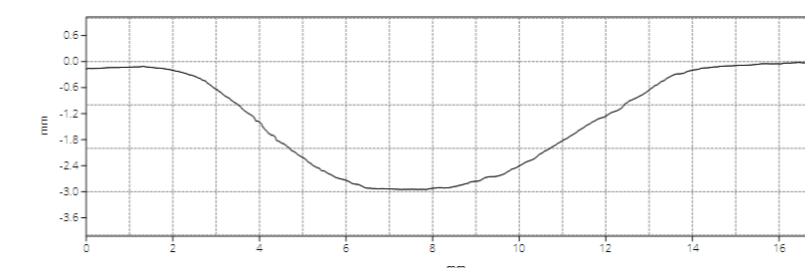


Three views of the shaft smoother.



DEM of the major groove on the shaft smoother. The black isolines are at a height-distance of 1 mm. The increasing width of the groove at both ends, probably caused by the shearing of the workpiece and the varying slope of both sides of the flutes are visible.

The smoother has a roughly triangular shape and shows three grooves of varying depth. They are set circumferentially around one corner of the triangle suggesting the multilateral use of the tool. Only the major groove shows clear dimensions, while the other two are not very pronounced with a depth of only 1.3 mm and roughly 0.9 mm and feathering edges. For further analysis, a 3D-model was generated for the major groove (as well as the entire object). For the macroscopic representation of the groove, a macro lens at an aperture of F/32, a focal length of 100 mm and an ISO-100 film-speed were used (PX-dimensions: 5184 x 3456). All images were shot with the camera fixed on a tripod and the object placed in a well-lit whitecube. The SFM-generation of the 3D-model was conducted with the Agisoft Photoscan Software. Given the opportunity by the SFM-software, the major groove was exported as a GeoTIFF-file for use in GIS.



Transect through the major groove of the shaft smoother.

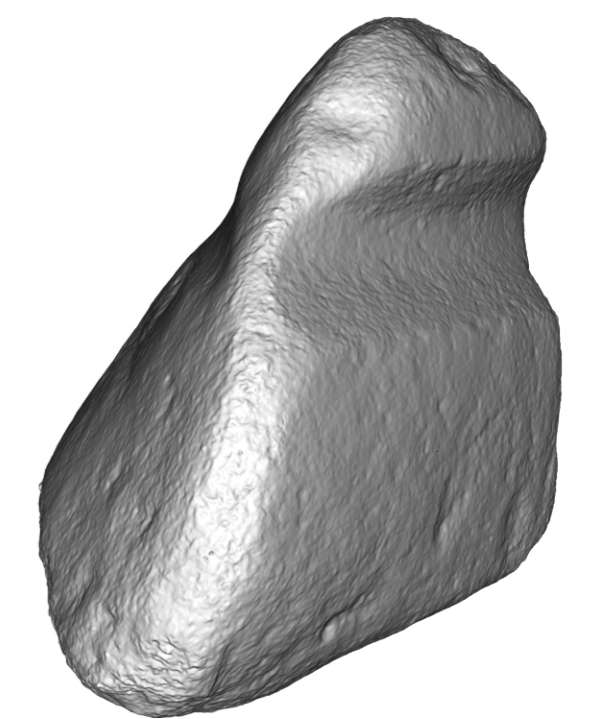
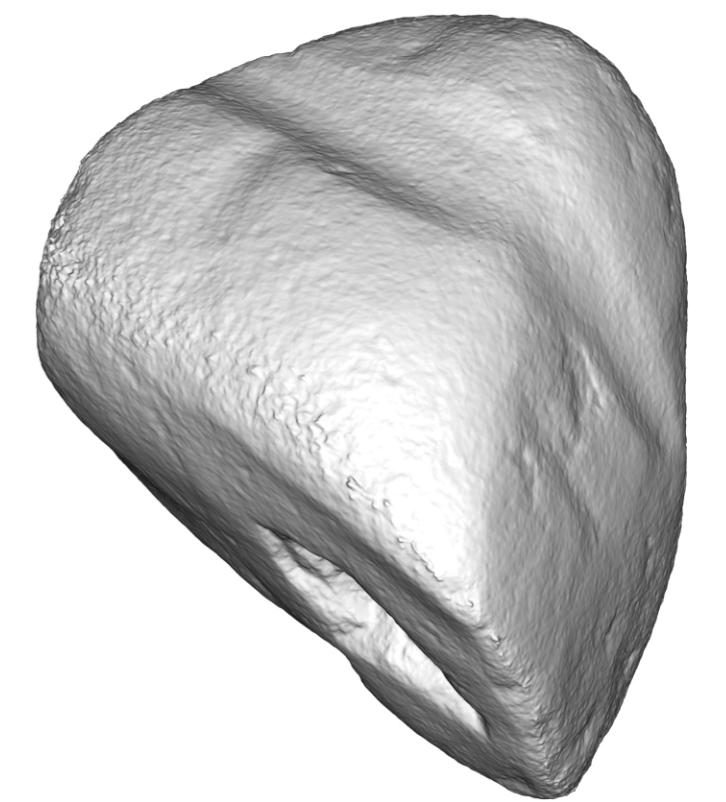
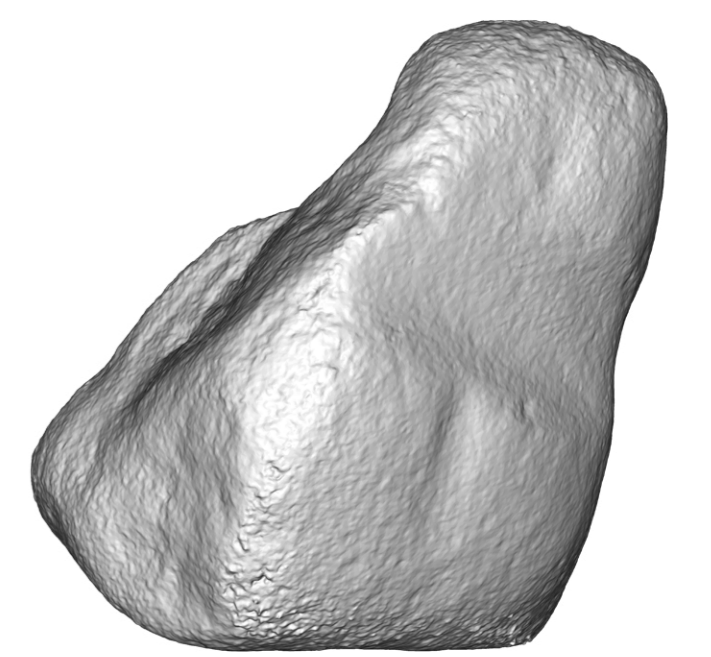
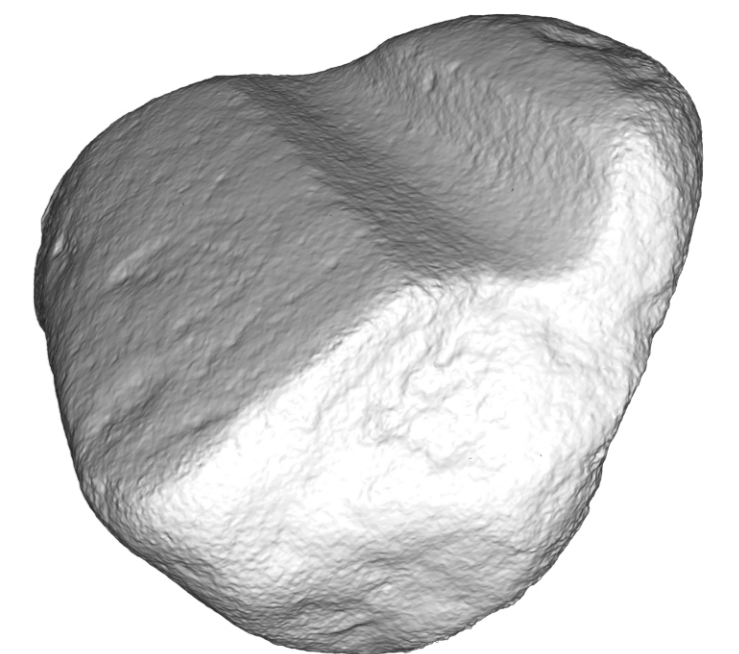
The macroscopic model shows a very high resolution and quality due to the excellent suitability of opaque materials like sandstone for SFM-modelling. Structures of a length of less than 0.5 mm can theoretically be assessed, providing the opportunity to analyze factors like surface roughness and others.

The major groove has a length of 36 mm, a width of 12 mm and depth of 2.7 mm. It shows a broadening as well as an increase in depth towards both ends as a result of the shearing of the workpiece during smoothing. The tool apparently was tilted in various directions during the sanding-process, resulting in the hourglass-shape of the groove. A similar pattern also appears on other smoothers. Along with the other circumferential flutes it also proves that the object is not broken.

A transect at a right angle to the axis of the groove shows that the flute is not perfectly symmetrical, but rather has a steeper and a flatter side. The former is at an angle of 62.4°, the latter at 53.7°. This characteristic apparently is also visible on other smoothers, like the object from Steinacker (Moreau et al. 2014).

Besides the opportunity to generate new information about the use of shaft smoothers and other tools, the 3D-modelling approach also allows the convenient exchange of the data, to better compare morphological characteristics.

The shaft smoother from Oberweierhaus is the first of its kind in Southern Germany coming from an unarguably Late Paleolithic context. It also shows the great archaeological potential of the numerous Federmesser-sites in Bavaria, which are, up to date, only poorly published.



Various views of the "working end" of the shaft smoother showing the major groove and the other circumferential flutes.

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