

The oolite of the Venus from Willendorf – microstructure and provenance

Harzhauser, Mathias¹; Weber, Gerhard²; Lukeneder, Alexander¹; Mitteroecker, Philipp³; Wurm, Lisa⁴; Hollaus, Lisa M.¹; Haack, Fabian⁵; Antl-Weiser, Walpurga⁶; Kern, Anton⁶

1 Department of Geology & Paleontology, Natural History Museum Vienna, Burgring 7, A-1010 Vienna, Austria; 2 Department of Evolutionary Anthropology & Core Facility for Micro-Computed Tomography, University of Vienna, Austria; 3 Department of Theoretical Biology, University of Vienna, Austria; 4 State Department for Clinical Veterinary Medicine, Ludwig-Maximilians University of Munich, Munich, Germany; 5 State Museum Württemberg Stuttgart, Germany; 6 Department of Prehistory, Natural History Museum Vienna, Austria.

The about 30,000 years old Venus from Willendorf is one of the most iconic artifacts. The enigmatic figurine was found on August 7th 1908 in loess sediments and is assigned to the Gravettian culture. The statuette, stored at the Natural History Museum in Vienna, is 110 mm in height and represents a symbolized adult and faceless female with exaggerated genitalia, pronounced haunches, protruding belly, heavy breasts, and sophisticated headdress or hairdo. The figurine was carved from oolitic limestone and painted red, possibly with ochre, which was almost entirely removed by cleaning at the time of discovery. Interestingly, oolitic limestones do not occur in and around Willendorf. Consequently, various theories about the potential source have been discussed in the literature including Miocene oolites from the Vienna Basin and Jurassic limestones from Stránská Skála (Czech Republic). Based on new micro-computed tomography scans with a resolution of 11.5 μm , we try to trace the origin of the rock. For the first time, small fragments of Oxytomidae bivalves could be detected within the statuette, allowing for a biostratigraphical assignment of the Venus oolite to the Mesozoic. The nuclei of ooids turned out to be mostly dissolved and large limonite concretions are embedded which both now can explain the choice of material by the carver and the appearance of several semi-spherical cavities on the surface of the figurine. Sampling numerous oolite occurrences spanning across about 2500 km from France to the Ukraine, we found a strikingly close match for grain size distribution near Lake Garda in the Southern Alps (Italy). Alternatively, samples from the Donets Basin in Ukraine are very close to the Venus oolite. This might indicate considerable mobility of Gravettian people and long-time transport of artefacts from South to North or from East to West by modern human groups before the Last Glacial Maximum. The results of this study are published in Weber et al. (2022): The microstructure and the origin of the Venus from Willendorf. – *Scientific Reports*, 12, 2926. <https://doi.org/10.1038/s41598-022-06799-z>