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# Szeletian (EUP) grindstones and pestles from Brinzeni I cave, level III (Moldova)

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## Abstract

Research carried out by an international team in 2005-2017 combined a multi-scalar approach on experimental and archaeological GSTs integrating analyses at different scales, meso (3D Scanner), micro (optical and digital microscopy) and nano (SEM, Synchrotron FTIR and ToF-SIMS for the residue). Besides the identification of wear-traces, the research is focusing on plant residue such as starch (and spores and phytoliths) adhering to the functionally active parts of the GSTs. This paper is reporting on stone tools from the Szeletian level III of the Brinzeni I cave, on Prut river left bank (Moldova). Out of 35 water-worn cobbles, one pelitomorph limestone stone slab, composed of two fragments that refit, and one elongated narrow gres pebble, composed of two refitting pieces, were selected for the in deep testing analyses. The same lithology has been used for the experiments.

Optical microscopy revealed areas with linear traces in the shape of thin shallow lines with dark lateral edges and spotty polish on their sides. Similar use-wear traces were observed on two fragments of the broken elongated pebble. Residues analysis revealed starch grains on the functionally active areas of both tools.

These data make it possible to interpret the large flat slab as a lower grinding stone, and the elongated pebble as an upper stone used on both the ends (pestles). Observed utilization traces were confirmed by experiments carried out in two labs (IHMC, St. Petersburg and NTU, Singapore) during which rhizomes of cattail, acorn' kernels and other nut (plants selected on the base of their availability at the time of the cave-dwelling) were ground, and fine substance resembling flour was produced.

SEM analysis of the studied tools made it possible to single out zones of working surfaces with less developed use-wear and starches below 7 m. Results of digital microscopy and SEM scanned working areas had been further investigated by means of surface texture analysis using MountainsMap software.

Biogenic residues, namely starch grains of different morphology and size, were studied with the help of multi-scalar approach including Optical Microscopy (AXION DM, RAS Vladivostok), SEM/EDS, FTIR/ Synchrotron (ELETTRA, TS) and ToF-SIMS (INFN/UniRoma3)

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in order to define their structure and qualitative and quantitative composition. Altogether the data collected on the grinding stones from Brinzeni I cave confirm the use of the stone tools for treatment of various plants, roots, and tubers by EUP (Szeletian) hunter-gatherers around 35 ka BC.

**Keywords:** Grinding stones, EUP, Traceology, Experiment, FTIR, SIMS 3D scan