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PETRO-ARCHAEOLOGICAL RESEARCH ON THE NEOLITHIC STONE  
RAW-MATERIAL ECONOMY IN MID-WESTERN  
POLAND

In the face of the still poorly recognized Neolithic stone production, and particularly such its aspects as: provenance of raw-materials, methods of their exploitation, influence of the kind of raw-material upon the production technique, relation between the function of the tool and the kind of raw-material chosen for its production, a joint archaeologico-petrographic long-range research program was initiated by the Stone Age Department of the Archaeological Museum in Poznań, in cooperation with the Department of Geology of the Adam Mickiewicz University in Poznań. The aim of its first stage was to reconstruct a general petrographical structure of the Neolithic polished stone tools found in the Mid-Western part of the Polish Lowland<sup>1</sup>. Altogether 1557 artefacts made of non-siliceous rocks /flat and perforated axes, hoes, chisels, adzes, mace-heads, hammers and hammeraxes/ were examined. New data were then confronted with known archaeological data by the use of analytical methods borrowed from several disciplines, i.e.: 1/ petrography /macro- and microscopic or thin slice methods, micrometric method/, 2/ research of mineral raw-material quarries, 3/ regional géology, 4/ archaeology /typological method/, 5/ archaeological and geological cartography, 6/ statistics /non-parametric tests: chi-square and Smirnov's/<sup>2</sup>.

The problems were divided into three groups:  
a/ exploitation /among others - origin of raw-materials, selection of erratic resources, exploitation of the primary quarries/, b/ distribution /among others - occurrence of imported

raw-materials in the Polish Lowland, c/ use /differences in raw-material structure between particular Neolithic cultures of the chosen area, relations between the type of raw-material and the type of artefact, choice of raw-materials used in stone workshops of the Lowland based on the study of pre-fabricates, relations between kind of raw-material and chosen technique of production/<sup>3</sup>.

Petrographical identification of the collection was obtained by the macroscopic analysis, controlled by 59 microscopic /thin slices/ analyses and complemented by 23 micrometric analyses. 109 kinds of rocks were distinguished. In spite

of such a considerable variation in the raw-material structure, six crystalline rocks are conspicuous, viz. amphibolite /20 %/, gabbro /16 %/, basalt /12.4 %/, diabase /11.3 %/, leptonite /10.8 %/ and gneiss /10.8 %/, which constitute 81.3 % of the whole collection. The examined series of tools includes 48.8 % of metamorphic, 45.4 % of magmatic, 6 % of sedimentary and 0.4 % of dyke rocks. 94 % of artefacts were made of crystalline rocks; in this number 83.6 % pieces represent basic or chemically neutral rocks.

All the most popular rocks are dark and have high specific gravity. They are also very tight, i.e. not porous, so they have little absorbency and are frost-proof. All these rocks are also compact and hard, but simultaneously they are characterized by liability to abrasion. Therefore it seems that the specific gravity criterion cannot be considered only as an expression of the Neolithic producer's aspiration to obtain a greatest possible power of striking while working with the tool of the smallest possible size, but also as an index of using the rocks which possess the best technical parameters. This statement seems to confirm the purposeful and mostly correct choice of the raw-materials by the Neolithic tool producers. It can also serve as an argument for the thesis that they possessed a high level of practical petrographical knowledge.

The problem of the origin of the rocky raw-materials was also considered. It was ascertained that there were three possibilities for Neolithic producers to provide themselves with stone raw-materials, viz.: a/ gathering erratic boulders,

b/ importing the stone raw-materials from the rock-bearing regions situated mostly to the south of the Middle European Lowland, c/ exploitation of the primary rock quarries situated in the Lowland.

The petrographical structure of the erratics from the area of Poland was compared with the raw-materials of the Neolithic tools and it was found that, among the stone tools, amphibolite occurred 2.1 times more frequently than in the erratic materials, basalt - 17.7 diabase - 8.1 and gabbro - 9.4. It was also found that the use of erratic materials was very rational and selective, that the most frequently used were gabbro, amphibolite and diabase, although they occur in very small quantities in the erratic materials.

It was noticed that in the case of basalt it is sometimes possible to locate the original rock deposit on the basis of the comparison of microscopic samples taken from a tool and from a given quarry; while this raw-material occurs only in a very small quantity in the erratics, it is frequently found in the Neolithic tools and forms the quarries of veins and layers of limited size and of strongly differentiated petrographic structure. The comparison of the micrometric analysis results made it possible to state that three implements /the flat axe from Podanin, Voiv. of Piła and two perforated axes: from Kuźnica Czarnkowska and Czeszewo, Voiv. of Piła/ have proportions of volumetric composition similar to that of five primary basalt quarries. On the basis of geomorphological premises it was assumed that the most probable source of basalt exploitation in Neolithic is the quarry in Leśna near Lubań. Moreover, the comparison of the microscopic analysis data made it possible to suggest that the perforated axe from Jerzykowo, Voiv. of Bydgoszcz is made of olivineless basalt which occurs in Berestowiec /Volhynia/, and the similar raw-material of perforated axe from Smolniki, Voiv. of Bydgoszcz, comes from the neighbouring quarry at Micko. The micrometric analyses enabled us to formulate a hypothesis about the existence of a long-range transport of basalt from the Sudety Mountains /the distance of 180 - 250 km/ and from Volhynia /600 - 700 km/ to Wielkopolska /Great Poland/ and Kuiavia during the Neolithic<sup>4</sup>.



Statistical analyses were used in order to receive a reliable picture of the use of Neolithic stone raw-material in three aspects: chrono-cultural, typological and regional /geographical/. Distinct differentiation of the raw-material structure in all three aspects occurred. However, its scale is greater in chrono-cultural and typological aspects. When analyzing the first of them, it was estimated that the frequency of basalt and gabbro tools rises towards the end of the Neolithic, contrary to the share of gneiss artefacts.

According to the typological aspect, the preference of diorite in the production of hammeraxes and of granodiorites for making mace-heads was observed. Moreover, each of the distinguished chrono-cultural groups seemed to use a different complex of raw-materials for the production of the same type of tool.

About 6 % of the Neolithic raw-materials used for tool production consist of sedimentary rocks of local origin. Particular attention was paid to diagenesed and siliceous Poznań loam quarry which lay open at a distance of several hundred metres on the left Vistula bank near Dobrzyń.

Received results cannot be so far compared with the neighbouring areas because of the lack of similar studies. They confirm, however, the efficiency of the discussed research project which can therefore provide a methodological proposal for the further archaeologico-petrographical studies on the foresaid subject in Middle-European Lowland.

#### References

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