

SUMMARY

Presently, we know a lot of Stone Age sites whose excavation revealed numerous artistically executed ivory and reindeer antler artifacts. High level carving artistry is primarily noticed with the Stone Age cultures where mammoth- and reindeer-hunting played an important role as well as with the ancient people's living in the regions where ivory could be quarried from their natural burial places — “mammoth cemeteries”, like that of Berelekh (Vereshchagin, 1977). Permafrosted, ivory retains its natural quality making a first-class carving material, which is testified both by the high price of ivory in the world market and present-day field development of ivory in high northern latitudes of Siberia (Smirnov, 2003). No wonder, ivory was used on the territory of the latter, together with antler, not only in the Palaeolithic Age as it did on the territory of Europe, but also after mammoths had died out — in Mesolithic and Neolithic Age.

Ivory and antler abundance had played an important role in the Stone Age carving. The people then had no metallic tools, but their knowledge of how to treat ivory and reindeer antler to create technically unique articles, was profound, for instance, two-meter long straight spears from adolescents' burial of Sun'gir' Upper Palaeolithic site, “Palaeolithic Venuses” of the upper Kostionki I layer (upper level), Avdeevo, Gagarino, Zarsk, Khotylovo II, Malta. For the past millennia, lots of ancient carving techniques had become obliterated and lost, while the interest to study them is traditionally great.

Studying ivory and reindeer antler ancient techniques treatment has a long history in home archaeology (Gerasimov, 1941; Semenov, 1957; Filippov, 1978, and others). However, unique qualities of carving of these materials have not

been sufficiently studied. Ivory and antler artifacts analysis has shown, in a certain way, these durable, hard, long-lasting materials possess an enigmatic and paradoxical set of qualities they show when treated. These two materials are good for cutting, sawing, smoothing and polishing allowing at the same time a splitting technique, typical for lithic industries, to be used (Khlopachev, 1997; Khlopachev, 2002). Thus, ivory and antler show both plasticity and fragility.

Plasticity is a property to irreversibly change the sizes and shape (to be considerably deformed) under mechanical load.

Fragility is a property of a material to be demolished under a small deformation.

What we mean is that both materials can be knapped like flint or other brittle materials. Numerous archaeological finds of various ivory and antler flakes, chips, blades, as well as cores and real nuclei, whence they had been removed, definitely prove it. These flakes just like their negatives on nuclei have all the attributes of “artificial” splitting — a butt, a bulb of applied force, ripples, a complicated system of removals special organization, etc. Artifacts of this kind are not scarce, they encounter practically all through Europe, Asia and America. Besides, items made of these materials can be not only cut, but also bent. Such finds of ivory or antler artifacts made by means of straightening and/or bending of a primary preform are similarly numerous and well spread in various palaeolindustries.

Moreover, another quality of antler and ivory can be added to the two just given: viscosity.

Viscosity is an ability of materials to resist the motion of a separate part of a body without its fragmentation due to internal friction (coalescence of particles).

Tools made of antler, thanks to its viscosity, are often used by present day flint knappers as soft hammers. Ivory, as an expensive and less viscous alien, is much less frequently used in knapping experiments. However, as it has recently become clear, it is possible to assume that ivory billets existed in the Upper Palaeolith on the territory of Austria and Czechia (Steguweit, 2005).

Archaeological materials explicitly point at the ancient use of ivory and antler treatment techniques based on mutually exclusive attributes. This can only be explained by some methods known to the ancient carvers, which allowed them to change properties of these materials. Under some circumstances, antler and ivory “behaved” as flexible, relatively soft materials which could be cut, planed, receiving long shavings, and even bent. Under some other circumstances, they were relatively hard and brittle kinds of raw material which could be knapped like tenacious rock. It is obvious that ivory/antler could acquire such attributes only due to their natural shape and structure.

The book provides studying the results of ivory/antler techniques to change their properties. They serve a striking illustration of the Stone Age carvers’ technological abilities: not only were they inferior to those of modern artisans, but surpassed them in the diversity of techniques. We have considered only two techniques which radically changed properties of ivory and antler. Freezing naturally damp ivory/antler provided these materials with extra fragility, which made it possible for a knapping technique to be applied, traditional for lithic industries. Soaking, softening of ivory and antler, on the contrary, plasticized the articles to a certain extent, which allowed to easily straighten

or bend them. For the first time reconstruction techniques of receiving long-measuring ivory and antler articles, techniques of straightening such articles, have been offered based on archaeological and experimental data, as well as shape memory effect described, which has unveiled the enigma of Sungir’ spears existing for many years.

Archaeological materials analysis, numerous ivory and antler strike-knapping experiments have shown that such treatment proved efficient only in the negative, below -25°C , temperature range, when ivory and antler raw material acquired the necessary isotropy and fragility. In the course of experiments, not only was one of many secrets of ancient technologies opened, but also was shown the significance for the scientific analysis of all the treatment produce in its entirety (ivory and antler raw material, technological context). The fact that ivory yielded to knapping at -25°C , and at lower temperature (from -30 to -40°C) its treatment by striking became more efficient and allowed to remove large ivory spalls, must be making the first archaeological evidence of specifying Stone Age seasonal settlement. In case of a production ivory/antler knapping area at a site, availability among the debitage of large spalls morphologically identical to lithic ones serves as an evidence of the site operation during a cold season (winter). Thanks to fresh ivory experiments we have a whole series of experimental traces whose practical archaeological application will expand and objectify Stone Age man behavioural reconstruction criteria. Raw material preparation techniques are sure not to exhaust the whole list of similar Stone Age techniques: we are still to read quite a few pages of ancient carving artistry history.