WASTE MANAGEMENT IN HUNTER-GATHERER COMMUNITIES[1]

FILIP HAVLÍČEK

Department of Environmental Studies, Masaryk University, Brno, Czech Republic, email: filipovo.havlickovo@gmail.com

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Even a space ape must urinate.
Desmond Morris

ABSTRACT

This article describes examples of material and waste management with a focus on select Upper Paleolithic and Mesolithic sites. It examines the structuring of space and landscape from the perspective of waste management as a certain need of natural human behavior. The article touches on the concept of purity and on defining the creation of waste.

Key words: Waste, Paleolithic, Mesolithic, Purity, Hunters, Gatherers, Landscape, Environmental history

INTRODUCTION

John Pichtel, in his otherwise engaging book *Waste Management Practices*, writes in an early chapter entitled "A Brief History of Waste Management," „ When wastes accumulated, nomadic people would simply move to another location." (Pichtel, 2005; p. 21). This idea represents a stereotype that often comes up when we think about human history. Pichtel's claim leads us to look more closely at the issue of waste and to look for real evidence for the assumption that a certain form of waste management can be found in the earliest history of nomadic hunter-gather cultures.

The creation of waste material is a process that occurs naturally when an organism interacts with its environment. In a broader sense, the creation of waste material is an unavoidable process involved in human existence on Earth. Therefore, I consider waste and waste management to be an anthropological constant (or universal), the result of the metabolism of human society, and an environmentally adaptive element of human nature. Waste is a necessary product of human society that should, however, be reused (O'Brian, 2008).

Waste is a real result of human action (not human thought or conviction) that can be used as an indicator of the actual lifestyle of a given society (Malina, 1981) although I also assume that reflection on impurity includes reflections on the relationship between order and disorder (Douglas, 1966). The material focused on in this paper is primarily cooking and hunting waste and waste products of artifact production. I avoid the study of funerals: funeral rituals from the Middle Paleolithic and onwards are loaded with symbolism and ritualization, the interpretation of which would require another entire article. Too little is known about the

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realities of burial practices in the studied period for this phenomenon to be studied in relation to waste management practices of the given communities.

Although it would also be interesting to study the waste resulting from the human digestive system or the locations of "latrines," I will also avoid describing the management of human excrement as waste, particularly due to the fact that this material from the studied period cannot found (as a result of its composition). Here, we can expect a certain spatial organization system existed. Although, I do not deal with the question of excrement, it should be realized that this socially excluded and taboo material must have played an important role in the spatial arrangement of settlements. This material also played a significant role for non-human organisms (Reno, 2013).

The earliest period in human history, the Old Stone Age, or the Lower Paleolithic, was also the longest period in the history of our species. It was in this period that the anatomy and behavioral capabilities of today's *Homo sapiens* were fully formed. The physical as well as psychological characteristics of humankind are the products of evolutionary history, without an understanding of which the causalities in the life of this hominid cannot be understood. Therefore, I view humans as socially territorial animals as the "third chimpanzee (Diamond, 1991), in whose life culture and society play a fully fundamental role. It is also logical that culture (in the broadest sense of the meaning) had to develop chronologically later than most of our biological and psychological capacities (Stevens, 2009).

Adaptation represents a characteristic critical for the survival of every species. Therefore, the emergence of culture (or art)[2] can be considered a form of adaptation, more precisely as a form of extrasomatic adaptation to a given environment (White, 1959). It is remarkable to observe the length of time it took for this trigger of further social stratigraphy to appear in archeological contexts. Culture necessarily became an important social glue and fundamental adaptation strategy.[3]

Despite the fact that *Homo sapiens* is just one species in the entire "pantheon" of the Earth's inhabitants, it is the clear leader in the production of non-compostable waste material, most likely due to its ability to create artifacts that help it adapt to the environment.

In this article I attempt to answer the question whether persuasive evidence about deliberate waste management or general material management[4] exists in one of the oldest periods in the history of *Homo sapiens*,[5] specifically on the basis of findings from Paleolithic and Mesolithic sites on the European continent.[6] Do these sites reveal anything about a social structure or a set of rules that allow certain acts while disallowing others (Giddens, 1999)?

[2] Cultures that subsequently influence, for example, how people handle or interpret waste, dirt, and odors (I address this topic later).

[3] The need to create art most likely emerged with the Aurignacian culture around 40,000 BP (Recall the Chauvet cave art that was created at this time).

[4] In some cases, however, it is difficult to determine the boundary between what is waste and what is deposited material. Thus, I try to avoid using the clear-cut term "waste" for all of the examples I present.

[5] It cannot be assumed that waste management is only relevant for *Homo sapiens* as a species. At the Oldowan site of Garba in Ethiopia, the remnants of tent structures have been found. The area of the shelter was empty as opposed to its surroundings; no bones, stones, or tools have been found here, and therefore, it was likely a spot for sleeping. The inhabitant of this dwelling was most likely *Homo habilis* (Leakey, Tobias, Napier, 1964).

[6] This time period was chosen because since the Upper Paleolithic the landscape has not significantly changed. The geographic focus was selected on the basis of an abundance of published research findings.

So that waste can be worked with as a concept that has its own rules and socio-anthropological role, basic terms need to be defined as does the process of producing waste.

A definition of waste

Waste is broadly defined as unwanted material. The Oxford English Dictionary defines waste as unwanted or unusable material, substances, or by-products.[7] A deciding factor in classifying a certain material as waste, however, is the attitude we hold towards it (I address this topic later).

Artifacts cease to be used as intended when they become deformed, put aside, forgot, abandoned, etc. (Neustupný, 2011). Post-deposition processes may play a role in interpreting the facts[8] (e.g., when structures collapse, the material they are made of gets into the cultural layer[9]).

I work with two basic functional types of material: resources and waste. In many cases, processes are not one-way: resources are not just transformed into waste, but waste can also become a resource. Therefore, in ideal cases waste is essentially never created; instead, material is continuously recycled (or reused).[10] Consequently, ways to reuse these materials are sought out.

Material deposits, where starting in Paleolithic times people accumulated at least some defunct artifacts, play a significant anthropological role in the artifact-waste transformation process. Many aspects of waste deposits can be observed: their location in relation to other functional areas (such as dwellings), their specialization, whether they were built underground or on the surface, their relationship to other natural conditions, and any transformations they may have undergone (Neustupný, 2011). Dwelling spaces (particularly hearths) play a significant role in the interpretation of waste. In situations where the structure[11] of a dwelling can be determined, we can begin to speculate about waste management practices that were carried out in each part of the dwelling.

Relationship towards waste

The issue of waste in human society is primarily an issue of the attitudes that people have towards waste. Whether or not an object becomes waste depends on the attitude we have towards it.

Attitudes contain three components: a cognitive component (convictions), an emotional component, and a behavioral component (the actual results of actions) (Dimaggio, 1997). Due to the period of time focused on in this study, the archeological contexts of finds are the main objects of study. Therefore, I focus mainly on the behavioral component.[12]

[7]Oxford English Dictionary [online]. Oxford University Press, [cited 2014-12-21]. Available online: http://www.oxforddictionaries.com/definition/english/waste.

[8]The diversity of natural processes may play a role in changes in spatial patterns constructed by human activities (Kroll & Price, 1991).

[9]If a tent construction made of large bones falls apart, its remains may look like a deposit of waste bones. In some cases, however, under the bones the remnants of an interior hearth and various other artifacts may be found.

[10]Reutilization is a process in which an artifact is reused for a purpose other than that for which it was intended. In contrast, recycling is a process in which material is returned to the production process.

[11] When a dwelling is divided into sections—a production and working area, a place for sleeping, and a hearth—waste management practices in each part of the dwelling can be compared.

[12]This component is the only one that archeology can provide relevant evidence of. Interpretations of feelings and justifications are only assumptions as there is no one alive to ask about these issues.

Behavioral archeology attempts to define the rules of human behavior that are mirrored in artifact structure (Schiffer, 1976). Differentiating between the systematic context and the archeological context is crucial (Schiffer, 1976), that is, between the initial state in which an artifact was deposited as part of a living social environment and the archeological context that the artifact has been found in (Neustupný, 2011).

From the behavioral perspective, it is necessary to look behind archeological artifacts taken out a specific context for processes that the artifacts have already gone through in the systematic context (Kuna & Němcová, 2012).

Whether an object is or is not waste and how it will be dealt with is determined by whether or not the object is considered pure or impure. As a rule, waste has connotations of something impure. Classifying things as impure (and pure) is a universal part of culture (that differs from culture to culture) (Douglas, 1966). This type of categorization most likely contributed to the health of the individual (and community) and may have become an adaptive behavior (through natural selection).

WASTE IN RELATION TO DWELLINGS

Perhaps the most abundant findings from the entire Stone Age consist of stone flakes resulting from the production of tools (which understandably do not decompose, in contrast to most organic materials). They are often found in great concentrations in one place, known as workshops (individual flakes can of course be found over the entire area of a settlement).[13]

Tool workshops are often located around hearths as is the case with the German sites of Poggenwisch and Borneck, where hundreds of such artifacts have been found in hearths nearby summer tents dated to 8,500 BCE (Rust, 1948).[14] In the 1960s a Magdalenian settlement was discovered at the Pincevent site near Montereau-Fault-Yonne, France by the Seine River. Each dwelling was demarcated by the density of findings, and therefore it was possible to divide each into three units. Each unit consisted of a hearth, an area with no findings (perhaps bedding for sleeping?), a curved space with bone and stone artifacts, a work area, and an entrance space (Leroi-Gourhan, 1966). On the basis of these facts, the division of living spaces is quite clear, and each space played a specific role in the life of its inhabitant.[15]

Here, too, stone tools were mostly concentrated around a central hearth, where on an area of approximately 1.5 m² more than one thousand were found (Jelínek, 1977). On the basis of the presence of these workshops around a hearth, either outside or inside dwellings, it can be likely determined in was part of the year the site was utilized (it can be assumed that a workshop located inside a shelter was used in the winter).

[13]In some cases post-deposition processes can play a significant role.

[14]Remarkable large stone slabs found in some Paleolithic habitations most likely served as insulation against moisture (Jelínek, 1977).

[15]The Magdalenian Culture is an Upper Paleolithic culture dating from 11,000–17,000 BCE. It was named after the Magdalene shelter site in Dordogne, France.

Fig. 1: Excavation of a mammoth bone accumulation in Mezine, Ukraine (Soffer *et al.* 1997)

Accumulations of large, predominantly mammoth, bones are worthy of particular attention. In Central Europe, at a site in Dolní Věstonice an accumulation of mammoth bones (a 12 m wide and 45 m long accumulation of 40 cm thick bones) was discovered. The leader of the excavation interpreted it as a waste heap (Absolon, 1945). Another excavation leader, Bohuslav Klíma, shared the same opinion (Jelínek, 1977). Two theories about "waste" in Paleolithic settlements exist. (There is perhaps even a third theory that combines the first two). On the one hand, this "waste" could be the remains of a hunt. On the other hand, hunters and gathers could have built their camps near carrion in order to obtain raw materials (see Oliva, 2003). There is most likely more relevant evidence for the first theory, that is, that the bones are the remains of hunting or collecting dead animals and are the results of anthropogenic activities.[16] The question of mammoth-bone accumulations is still debated today. This question has yet to have been fully solved.

Mammoth-bone accumulations could have also served as a source of construction material (as evidenced by mammoth-bone structures in Ukraine, which I shall mention later) or as a source of fuel in order to reduce the use of wood (Boscha, 2012). These bones may have also been used to cover Paleolithic graves, as trophies, as material to produce tools, or for a combination of these and other functions.[17] However, the fact that large bones and tusks

[16]Elephant graveyards, places where generation after generation of these animals have supposedly gone to die, have never been found in reality (Oliva, 2003).

[17]Many human artifacts reflect their social value and do not serve any practical purposes (e.g., royal crowns, golden swords). Thus, the meaning of things is imparted by us as human beings. The key to interpreting some artifacts can (and could) be found in the heads of members of a living society and is a kind of unwritten social contract. The symbolism of human artifacts is completely dependent on the symbolism of human behavior, and ultimately their relationship is causal (*see* Komárek, 2000). On the other hand, it is also true that the subjective and objective cannot be separated (whether we are talking of prehistoric cultures, modern pre-industrial cultures, or modern industrial society) and that every action, even one that is seemingly fully practical in nature, has a symbolic and social dimension (Oliva, 2003).

were intentionally deposited at one specific place in a settlement is critical, no matter how they were then used. This raises the fact that what may seem like waste to us today was not necessarily waste in the past and most likely was not (i.e., waste that in essence did not negatively affect human health, such as decomposing organic materials).

Mammoth-bone accumulations have been also been discovered in Eastern Europe, specifically at Ukrainian sites. Tusks and bones were used to construct Upper Paleolithic dwellings as findings at the Molodova and Telmanskaya sites indicate. In contrast, a dwelling at the Telmanskaya site in Ukraine contained many quartz flakes but hardly any tusks and bones (or other flakes). Many tusks and bones (as well as flakes) were found outside of this structure (Jelínek, 1977). It is likely that a considerable role was played here by the functional division of space, with which waste management was substantially related. Certain spatial rules can be assumed to exist.

Another site is also located in Ukraine. In Pushkari another dwelling made of mammoth tusks and bones was discovered (made of about 1,500 mammoth tusks, among other materials). In addition to the fact that the mammoth bones show no sign of having been worked, there was a remarkable finding of red paint amongst the findings. Such paint was found no were else in the cultural layer (Jelínek, 1977). This fact is also evidenced by the decorative painting of mammoth bones and tusks (as were found at the Mezin site, also located in Ukraine) (Pidoplichko, 1998). All of these findings suggest that these bones likely played an important sociocultural role in hunter-gatherer communities; they definitely cannot be considered to be mere accumulations of waste material. Of course the situation can differ from case to case; therefore, every agglomeration of bones cannot be simply generalized as having ritual, cult, or symbolic significance.

In some cases large bones and tusks were deposited (but not directly used for construction purposes) in some structures as their location on the bottom and not the surface of the cultural layer indicates (Jefimenko, 1958). Moving more to the east to what is today's Russia, we can find one structure at the Kostenki I site made of regularly spaced, upward-facing mammoth tusks that form arches. These structures did not likely serve as dwellings. Instead, they were probably some form of healing space similar to a sauna. Classic hearths are not located here. Only layers of ash and bone char were found. At the same

time, it was a very cramped space (Rogačev, 1955). These structures clearly had a medicinal function and are evidence of deliberate hygiene strategies being applied already in the Upper Paleolithic. These structures are reminiscent of Native American sweat lodges (Figure 3).

At the Bureť site by the Angara River in Eastern Siberia, what was thought to be a large bone-waste pit was discovered. It was, however, later determined that this accumulation of bones was deposited in a shallow depression surrounded by a bowl-shaped depression filled with charred wood remains indicating what was certainly a hearth (Jelínek, 1977). Thus, it can be concluded that it was a building made of bones that collapsed into what is reminiscent of chaotically deposited animal remains. Therefore, large bone accumulations cannot simply be interpreted as mere settlement waste. A felicitous ethnographic parallel can be found amongst Siberian Eskimos who use the bones of large mammals (whale jaws and ribs) to build winter dwellings in a manner similar to Paleolithic hunters. The use of such materials is the result of an environment that does not provide enough wood to produce dwellings (Binford, 1978).

Fig. 2: Model of a "Men's Outside Hearth" (Binford, 1978)

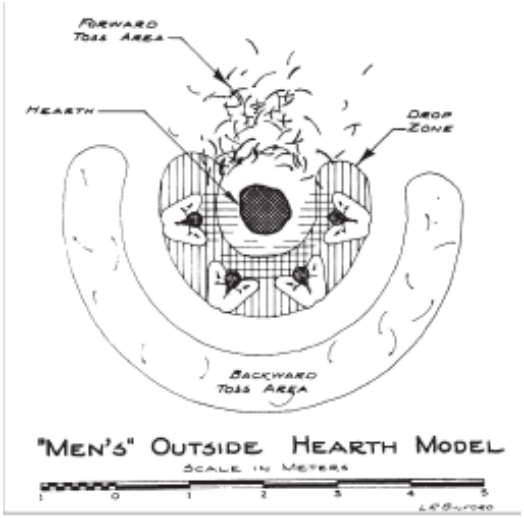

Fig. 3: A Native American sweat lodge [online]
- http://religion.blogs.cnn.com/2011/03/02/sweat-lodge-trial-fuels-native-american-frustrations/[cited 2014-12-21]. Available online. (archived at the Smithsonian National Museum of Natural History)

From these examples, we can see that in many cases bone accumulations are the remnants of dwelling structures or the deposition of material that was used in a certain way. Bones (especially large ones) were not thrown away as waste material at any site (Jelínek, 1977).

On the basis of the observation of an Eskimo hunting stand (the Mask site in Alaska), L. R. Binford, a leading ethno-archeologist, has created the *Men's Outside Hearth Model* (Figure 2), which describes the distribution of objects around a hearth (Binford, 1978). Two main sections of a settlement can be determined based on artifact size. (Novák, 2006). In the half-circle, inner "*drop zone*" near the hearth, small objects (stone and bone flakes) that fell on the ground during different activities can be found. These are artifacts that were so small that they did not restrict the users of this space. Binford uses the term *"toss zones"* to refer to

areas with larger artifacts, further away from the hearth, which could have interfered with work. Large objects were thrown away. These objects were located on the settlement's edge and created the so-called centrifuge effect (Löhr, 1979). Placing waste on the periphery of human settlements is a significant characteristics of human waste management (Douglas, 1966). Organic waste could end up in the hearth as fuel. The question arises of what people did with the ashes that accumulated in the hearth, the central spot in the daily life of prehistoric humans. For example, at the Upper Paleolithic site of Kašov I in Slovakia, 11 areas with an ash layer were identified (these layers contained charcoal and artifacts of the stone-flaking industry.) Some of these areas may have been waste deposit sites, that is, places for depositing ashes after cleaning the hearth and organic material. One concentration was discovered in the center of the excavation site. Others were found in all four directions (Novák, 2006). The Pinceventve site in France provides evidence for ash management. Hearth cleaning has been detected here (Jelínek, 1977). Materials that were not destroyed by heat (e.g., shells) were often deposited in special places. Middens, or shell middens (in Danish *køkkenmøddinger* and in Spanish *conchales*), are examples of waste areas and waste management practices (present already at the end of the Paleolithic but more prevalent particularly in the Mesolithic). They consist of deposits of primarily cooking waste (*kitchen midden*) (Figure 4). In such areas a large spectrum of artifacts, ecofacts, botanic material, and even excrement can be found. As a rule, however, they are made mostly of mollusc shells (usually 50% and more) (Stein, 1992). These materials were systematically deposited in one specific place and accumulated over the course of thousands of years.[18] [19]

Fig. 4: Excavation of a shell midden in Ertebølle, Denmark (Gutiérrez-Zugasti *et al*. 2011)

[18]As a rule, middens located near bodies of water (which served as sources of food for the creators of middens) have been preserved due their moist, oxygen-free environment. Thanks to this fact, it is not a rare occurrence to find artifacts made from organic materials as well, which help accurately date the sites (Stein, 1992).

[19] The word *midden* literally means a hill or pile of waste material.

REUTILIZATION

Resources can never be limitless. This first rule of competition between organisms must not be forgotten. As a rule, a resource will sooner or later become waste, but at the same time under certain circumstances waste itself can become a resource. It all depends on the perspective with which we look at the material. Molluscs are a source of food and cultural artifacts, such as jewellery made from shells, etc. Recycling is essentially a natural algorithm for waste management. It is an elegant technique, thanks to which we can use the material an object is made of even once that object is no longer needed. It is not surprising then that this method must have have been applied long ago in prehistoric times.

One of the oldest documented examples of recycling is the Upper Paleolithic reutilization of stone, which is attested to by stone tools found at the site of Molí del Salt in Spain. Here it was proven that one artifact was reused for various tools (Vaquero, 2012). Both ethnographic and archeological studies are in agreement that recycling or reutilization are techniques that reflect a de facto lack of material resources (Vaquero, 2012) and may reflect a growing need for more efficient behavior. Thus, the reutilization of artifacts could have played an important role in the technological behavior of our Upper Paleolithic ancestors.

Experiment: Charring Mussel Shells

In studying shell middens, the question of their purpose must be raised. The described examples of dealing with what is more-or-less waste material indicate deliberate management practices.

Fig. 5: Experimental burning of blue mussel (*Mytilus edulis*) shells

Why then couldn't material from mussels be reused (for example, as fuel as bones were)?[20] I have taken part in an experiment in which we attempted to char blue mussel (*Mytilus edulis*) shells in a hearth and then use this shell material as an alternative source of fuel. The main fuel used in this hearth of approximately 1m in diameter was pine wood (*Pinus sylvestris*), which has been proven to have grown in Europe during the Paleolithic and the Mesolithic (Haws, 2004). We assumed that the shells of these aquatic mollusks would not char due to the fact that they contain a great amount of calcium. In my opinion it is possible that if shells did char, as is the case with oily, porous bones, they could be used as a source of fuel. The shells, however, did not char, and it is likely that no other use was found for this material. In our experiment, after spending eight hours in an intensive fire, the shells showed no significant signs of having broken down. This was mostly likely caused by their chemical composition as they contain bicarbonate calcium, the building block of shells.

A HISTORY OF AROMAS AND ODORS

Waste is also inherently linked to odors and how they are interpreted. We can hardly examine the sense of smell and related psychological and biological processes from any other perspective than that of evolution and culture, on the basis of which an entire range of cultural and social alternatives can be built that as a result reflect social or cultural identity. Certainly, biology is at play here as well. It is highly likely that every member of any culture that has ever existed would prefer the scent of a flower over the smell of manure. On the other hand, odor preferences and how these odors are interpreted will certainly vary in the cultures of South America and Southeast Asia (Classen, 1994). Like all human senses, smell is directly related to human memory (Pawłowska, 2014). In my opinion, it is possible that the development of waste management is directly related to the odor trail of waste. In other words, odors warn organisms of a harmful environment and force them either to solve the problem or move to another place. The interpretation of the self, the social world, and the environment are all built to no small extent on the perception of odors. In one culture "stinky" cheese may be considered a delicacy whereas in another raw fish may be enjoyed[21]. The subjectivity of cultural appreciation is firmly founded in our biological nature. It is also important to realize that imitating taste and preferences is essentially nothing other than adapting to a certain society with which one would like to identify.

CONCLUSIONS

Waste deposits created by people in specific places and the use of waste material for certain purposes are clear proof of waste management in the early Upper Paleolithic. Based on excavations of individual Upper Paleolithic and Mesolithic sites, a spatial pattern of such objects cannot be generalized. Every situation is unique and corresponds to the given natural, and perhaps even cultural, conditions. A certain regularity, however, can be assumed. A large number of stone artifacts are found near hearths, where tools were produced. Pieces of bone

[20]If we do not include jewelry-making, etc.

[21]One such example is *Casu Marzu* (rotten cheese), which is a traditional Sardinian sheep cheese containing live insects, larvae of the species *Piophila* casei. The large amount of maggots that the cheese contains is consumed along with the cheese. Here we can observe a "clash" of cultural values because European Union legislation at one point declared this cheese to be unhygienic and outlawed its production. Later, the ban on this cheese was lifted due to its regional cultural heritage.

are found in hearths and served as fuel, amongst other things. In other cases, large bones were used for support in structures.[22] Organic waste, at least in the case of shell middens, was deposited in one specific place. Upon examining ethnological parallels, direct similarities can be found between the lifestyles of Paleolithic and Mesolithic cultures and the indigenous peoples who inhabit taiga and tundra areas today. These cultures are linked by a way of life and the related adaptation to environmental conditions (Jelínek, 1977). The archeology of waste focuses on manifestations of waste material in relation to the society that created this material. Archeological field methods can be applied to our current society's landfills as Rahje and Murphy having been doing since the 1970s in the southwestern United States (Rathje & Murphy, 1992). Ethnological observations have contributed to understanding waste produced today and the relationship between people and things (Sosna & Brunclíková, 2013) and to understanding the sociology of waste in relation to wasting food (Evans *et.al*, 2013).

Environmental history, a field I have drawn from in this paper, attempts to contribute to revealing relationships and causes that lead to pressure on living and non-living nature and rejects the assumption that human experience is exempt from natural connections and that people are a species that is above nature and that the consequences of human behavior towards the environment can be disregarded (Kušková, 2008). Traditional history cannot do this as it is environmental history that attempts to describe more than just geopolitical and economic relationships. Environmental history can be a history of culture, focused on what people think about nature, and how they have expressed those ideas *(*Hughes, 2001).

Although to some degree I feel as if I have been trying to reinvent the wheel, I still think that this paper can help break down a certain stereotype (that prehistoric humans had no problems with waste). I have examined a mere fraction of the waste strategies that existed in our deep environmental history but which clearly demonstrate a deliberate strategy for using material, which we can assume was more-or-less waste. Our ancestors had to manage waste for the same reason we do today: in the long-term doing so is more beneficial. Waste is a problem that always needs to be dealt with.

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[22]A lone lion skull was found at the Alexandrovka site (Kostienki IV). It was lying on the surface of the cultural layer and was likely used to decorate the dwelling (Rogačev, 1955). The discovery of an aurochs skull at the Kostienki I has been interpreted in the same manner (Jefimenko, 1958).

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