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How the ice in the Ice Age led to the rise of sculptures

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Abstract

This essay explores the possibility that frozen carcasses not only played an important role in shaping the Upper Palaeolithic technology (lithic tools), but also contributed to the development of carving and the production of portable art. The mechanics of cutting frozen food (meat) favour the straight edge of lithic blades, and the presence of freezing conditions dictated the use of blades to slice/shave frozen carcasses. This frozen food processing technique was then employed to manipulate the fracture properties of hard materials for different purposes, some utilitarian –for the satisfaction of biological needs– and some artistic for the satisfaction of mental/spiritual needs (ornaments, figurines, bas-reliefs). Frozen carcasses indeed represent the conditions under which the dialectics of function and form are most articulated; that is, the carving/shaving of frozen meat dictated the choice of tool (backed blade), and, in turn, the blade-carved core of frozen meat served as a model for the carving of figurines and bas-reliefs.

Keywords: *Climate, frozen carcasses, blades, food processing, Upper Paleolithic.*

From meat carving to ivory sculpting

Taphonomic studies of skeletal remains focus on the analysis of bones and their articulation, cooking, secondary usages, and disposal. Lithic tools are also studied from the point of view of their typology, quantity, wear, source, and settlement patterns. What is totally absent from the literature is the processing of frozen carcasses.

Yet, frozen carcasses must have been a common occurrence in the cold zones, at least seasonally. Upper Palaeolithic people may even have integrated frozen meat into their food processes in an unexpected way. In Idaho, for example, Palaeo-Indians consistently practiced the storage of bison meat in cold caves over the last 8,000 years (Henrikson 2002). In Alaska, meat is stored frozen or dried up in pits dug up into the permafrost, which are then covered with a bent willow frame and tundra moss to prevent the sun from warming up the "meat cellar". The fresh meat, which is spaced using twigs for air circulation, slowly freezes due to the permafrost (Binford 1993: 114-115). "Pithouses" at Kostenki may have been used as meat storage (*ibid.:* 122; also Grigor'ev 1993: 59; Hoffecker 2005: 191).

It is possible to cut fresh meat with a wide range of sharp tools. When meat is frozen, however, the most efficient cutting method is to use a lithic blade to slice/shave off pieces of flesh. A lithic blade provides an efficient combination of

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friction and fracture energies. Friction along the linear cutting edge creates a partial melting of ice, further minimizing the cutting force. Blunted on one edge, blades transmit the energy of the fingers efficiently and minimize injury (Achrati 2010).

Clearly, the mechanics of frozen meat favour the straight edge of lithic blades over bifaces, denticulates, and scrapers.

Once acquired, the proficiency of cutting frozen meat with blades can be employed to manipulate the fracture properties of hard materials such as wood, bone, or ivory for utilitarian and aesthetic purposes. If such is the case, then frozen carcasses likely played an important role not only in the systematic spread of blades, but also in the development of carving and the production of portable art in Europe, where freezing conditions are more salient. In fact, it is very likely that frozen carcasses played a considerable role in the emergence of the Upper Palaeolithic technological and artistic traditions in Europe. These include the Châtelperronian, Uluzzian, Zwieryniecian, in Western Europe; Bohunician in the Middle Danube basin, Carpathian Basin and Volhynia, Tamnata Cave in Bulgaria, Korolevo and Transcarpathian Ukrain; and Szeletian and Streletskian in Eastern Europe (see Kozlowsky 2004; Svoboda 2004; Marks & Monigal 2004).

In what follows, I examine one of these industries, the making of ivory figurines, with the intention of showing how a shift from lithic reduction and the processing of frozen carcasses are related, and how connecting these two phenomena can shed new and valuable lights on Pleistocene art.

Ivory sculpting: a sensuous art

Recovered artefacts often reveal a lot about how they were made thanks to the marks they bear. These marks allow us to identify the tool used to make the artefact, its shape, type, and constitution; if the tool is a blade, the marks show the angle of its cutting edge and its depth of penetration into the worked material (Semenov 1967: 162). Upper Palaeolithic stone tools also bear traces of their uses (*ibid.:* 104). For example, blades that had been used for whittling usually show two types of wear: polishing along the edge of the tool, which gradually fades the farther from the edge; and striations appearing as microscopic lines perpendicular to the edge or slightly inclined from it, indicating the direction of the hand movement. These wear characteristics of whittling tools appear on the ventral side and are less distinctive on the other side (*ibid.:* 110-11).

Combining microscopic analysis of tools and artefacts with experimental replications, the study of these patterns of wear has evolved into a whole science that has successfully identified tool marks, gestures, and various traces in rock art and portable objects (Semenov 1967; Marshack 1991; Bednarik 2007; Villa & D'Errico 2001; Knecht *et al*. 1997). As it integrates the techniques of forensics (Montelle 2009), this science can only grow more promising.

Most of the early Upper Palaeolithic figurines and personal ornaments in Europe were made of ivory, although bone, antler, talc, and clay were also used. The repertoire of preserved ivory artefacts includes fine human and animal figurines, batonnets, beads, knives, points, and unfinished items. They come from western and central European Aurignacian sites, including Spy, Geissenklösterle, Vogelherd, Kostenski, and Avdeevo (Semenov 1967; Gvozdover 1995; White 1997; Otte 1974; Soffer 2000; Hoffecker 2005; Conard 1990; Conard 2009; Villa & D'Errico 2001).

As Semenov (1967: 113) has indicated, most of the ivory objects, particularly figurines, could not have been made without whittling blades, which explains the widespread presence of prismatic tools in the Upper Palaeolithic. Indeed, prismatic blade technology is predominant in the most significant Aurignacian sites. At its lowest level, for example, Kostenki 14 contains various blades, end-scrapers, burins, *pièces esquillées*, and small bifaces. These tools were recovered with bone points, antler mattocks, worked ivory, perforated shell ornaments and an unfinished ivory carving of a human figurine (Anikovich *et al.* 2007: 224,). At Geissenklösterle cave, refitted nodules excavated from Aurignacian layers show that they were all used for blade production (Hahn & Owen 1985: 61). Reliance on blades is also indicated in the increase of split-base points, which are found in Western and Central Europe dating to the early Upper Paleolithic (Hoffecker 2005; Knecht 1997). Flint wedges (*coins* or *ciseaux*) used for longitudinal splitting of ivory, bone and antlers, were abundant in the Early Aurignacian (Knecht 1993: 147). Burins and chisels are also present; they were used for making notches and hollows on figures, removing excess material, and smoothing the contours and giving definition to the details.

The ivory supply for these artefacts came mainly from mammoth tusk, either fresh or fossil. Reconstruction of climate, based on the evidence of sedimentology and environment, suggests that ivory-working took place there during a period of extreme cold (Hahn 1993: Fig. 1).

Carving ivory is limited by the internal structure of the tusk and the growth patterns of its enamel and dentine (Schreger lines). Often, to make a figurine, the tusk's natural shape is utilized and corrected rather than totally transformed (Gelvin-Reymiller *et al*. 2006: 1093). First, a piece of ivory is cut to the desired proportion using transverse incisions consisting of shallow notches around the circumference of the tusk and penetrating one or two layers of ivory. The ivory is then broken by applying pressure. For a longitudinal splitting of ivory, grooves are applied (Semenov 1967; White 1997; Knecht *et al*. 1997).

Although some flaking is possible by exploiting cracks in the surface of the cortex, the reduction process consists mostly of whittling, shaving, and smoothing. Figurines were carved with unretouched and retouched tools, with final polishing eliminating most traces of the carving (Semenov 1967: 232). The tools used, particularly blades, produce thin parings that curl up into circles and hardly cause friction on the upper side. Unfinished ivory objects, lithic tools and small curved shavings have been found in caves such as Vogelherd and Geissenklösterle (Hahn 1993: 231). Traces of whittling on ivory and bone objects form Kostenki I are numerous (Semenov 1967: 109).

These reduction steps are all present in a figurine from Avdeevo, which shows traces on its surface of whittling with a knife, and clear furrows cut with the angle of a burin that show best on the body and legs (Semenov 1976: 113, Fig. 80).

Softening of ivory

Measuring 3 on the Mohs scale, ivory is a hard medium, and because the cutting ability of lithic blades is limited, ways of softening it may have been sought.

Some experiments show that soaking ivory in water allows for easier shaping or gouging of ivory, but only marginally. The Chinese and Japanese alternatively heated and cooled the tusk until the enamel cracked (Ritchie 1969: 44). Gerasimov succeeded in softening a piece of ivory by soaking it for five days and wrapping it in a fresh skin thoroughly soaked, with fur folded-in, and putting it on fire until the skin was totally charred. After cooling, it was whittled with a flint knife, yielding long spiral-like parings (Semenov 1967: 160).

Soaking ivory, bone and antler in urine to soften them has been documented among the Koryak around the Bearing straits (Semenov 1967: 159, n. 2, citing W. Jochelson). And the Japanese are thought to have removed the enamel from hippopotamus teeth using acid (Ritchie 1969: 44).

In view of its susceptibility to acid, the question is whether Upper Paleolithic people used animal digestive acids from disembowelled game to soften ivory, or, for that matter, to mix pigments for their cave art. The effect of gastric acids on bones is observable in the stomach content of carnivorous animals, and it is evident in Pleistocene fragments of bone and antler fragments eroded by hyena gnawing and gastric acids (Villa & D'Errico 2001: 99). Experiments relating to the appetite for bones (osteophagia) displayed in some herbivorous animals such as giraffes show that saliva and rumen fluid can soften dense bones (Bredin 2006).

Although the use of rumen fluid for softening ivory is without ethnographic support, a kindred interest in stomach content for diet purpose is documented among the Eskimo peoples. Indeed some Eskimos are known to have used the stomach content of ungulates, especially the partially digested lichen in caribou, as a source of food and Vitamin C (Kuhnlein & Turner 1991: 37-38; Fediuk 2000: 15). Native Americans also used Buffalo gall for yellow paint, and the stomach contents were a proven medicine.[1] Bushmen rock artists may also have used use of the stomach content to prepare their pigments, producing a durable paint that sticks to rock.[2]

Stone, salience and the origin of art

So far, the discussion has focused on frozen meat processing and ivory carving. In what follows, I will explore how studying these two activities in connection with the sensory constitution of the hominid body, will deepen our understanding of the genesis and development of art.

There are differing views as to how consciousness, the site of the self and the source of language and art, has evolved. Some scientists point to emotions and the evolutionary processes involved in their gratification (Denton 2005: 101; Panksepp 1998: 122; Freeman 2003: 38-39), while others emphasize categorisation and control of movement (Edelman 2000; Llinás 2001: 15). Whether it is the primordial emotion or motor coherence that is behind consciousness, the question is still open for investigation (Denton 2005: 116). However, as far as perceptual categorization and the ability to create images in the brain, the phenomenon of salience is of prime importance: it plays a critical role in cognitive development and the perception of reality (see Bednarik 1990).

Salience describes how things that are the target of attention and interest become perceived: a perceptual responsiveness to similarity and sensitivity to gradation in the focal position, brightness, and boundary contrast of objects (Zeman 2002: 187).

1 See "Bison History", on http://www.essortment.com/all/bisonhistory_rmjg.htm (accessed 2011/10/02).
2 "From the Raod: Rock art, wild dagga and the town that the railway forgot", by Virtual Explorer 17 April 2010. http://explorer.timeslive.co.za/2010/04/17/from-the-foad-rock-art-wild-dagga-and-the-town-that-the-railway-forgot/ (accessed 2011/10/02).

Unlike stimulus, “salience has the power to swing perceptual similarity the other way” in any experiential moment (Quine 1973: 25; Zammito 2004: 34).

It is Bednarik who brought the concept of salience to bear on the study of cognitive development and its connection to lithic technology and the emergence of rock art. He proposed that the most archaic “art” in the world consists of “responses to edges or surface aspects, enhancing them or making them more interesting” (Bednarik 1990). The arousal derived from the “reshaping of salient aspects of the physical world”, he said, “resulted in an increasing consciousness of the physical reality and a feedback on the mark making behaviour”. It also enhanced the precision of vision-oriented motor skills, as well as the experience of observing intentional impact on the environment through participation. Eventually, this increasingly complex cognitive environment led to the emergence of new, associative and taxonomizing mental powers requiring a wider base of neural pathways (Bednarik 2002; also Hodgson & Helvenston 2006: 5-6).

The co-evolution of lithic technique and cognition also attracted the attention of Lorblanchet, who believes that stone tools, bifaces in particular, have been the focus of man’s creative power for more than a million years. Palaeolithic people transformed their surroundings, knapping here, making a mark there, and otherwise playing with forms and colours. This process of shaping lithic stones is, in fact, a “proto-sculpture” that eventually culminated in artwork (Lorblanchet 2007: 107). A further elaboration of this cognitive perspective is also provided by Halverson; he believes that the “immemorial practice of stone-knapping provided the motor schema for carving”, resulting in the development of the initial figural representation in the form of “three-dimensional sculptures in the round”. These “earliest works of ‘art’”, he added, were followed by “high and low relief, engraving, and finally painting” (*ibid*.), a process of “gradually reducing the dimensionality of the figural representation step by step, from three to two”, he concluded (*ibid*.). Instead of brittle flint, the medium for carving became bone, ivory, soft stone and wood (Halverson 1987: 66; also Le Tensorer *et al.* 2006; Pope *et al*. 2006).

Pleistocene art: *mise-en-abîme* of the visual

It is remarkable that in all these views on the genesis of art, the agency of the body is central. Perhaps Lorblanchet put it best when, in talking about symbolization and rock art, he said,

> *Despite the beginnings of a portable and decorative art… this is still only an art closely attached to the human body, limited to individuals and their immediate environment, the group* […The body] *contains in embryo the great rock art of the world.* (Lorblanchet 2007: 108)

What interesting is that this agency of the body in art also includes its role as a medium and support for artistic action. As Arnold Van Gennep put it:

> *Le corps humain a été traité comme un simple morceau de bois que chacun a taillé et arrangé à son idée : on a coupé ce qui dépassait, on a troué les parois, on a labouré les surfaces planes, et parfois, avec des débauches réelles d’imagination* […]. (Le Breton 2005: 88)

It is, perhaps, because of this heavy involvement of the body in the development of art that the role of the environment in shaping the aesthetic paths of various hominid groups is, as we will see, immediate and tangible.

As to what thrust hominid corporality into the history of artistic development, it may be that there is a basic need to feel the presence of one's body, and to behold its natural nakedness. This urge to visualize the body, which is a quest for self-affirmation, is demonstrable in the variety of decorative and body modifications that are ancient and widespread. From the tattoos of the Ötzi man and the Iron-Age Pazyryk people of Siberia, to the lip-plug of the Amerindian of Brazil, to the nose-ring of Bedouin women, to the finger mutilation of the Dami of New Guinea, to the scarification of the Nuer, to the body painting of Australian Aborigines, to the cranial modification of the Andes, to the wig of modern Europe and contemporary body piercing, the need to touch, feel, visualize and project the human body is strong.

Everywhere and for a long time, the human body has been experienced as a scroll to be inscribed with things meaningful, beautiful or simply mysterious.

It is just such an urge to behold the naked human body that may be behind the explosion of sculpture in Upper Palaeolithic Europe. In the tropical and temperate latitudes of Asia, Africa and the New World, humans went about in total or partial nakedness. Accessible to touch and sight, the body became the support for various artistic and ritualistic projections. In Europe, however, while the frigid climate exacerbated the awareness of the body, the necessity to wear cloth all year round to protect against the cold frustrated the urge to see and feel the human body. The Upper Paleolithic individual, therefore, could only project his/her body through ornaments worn over the cloths or represent it in miniature sculptures worn as pendants or folded in the hand.

As indicated above, the genesis of art is deeply linked to the "proficiency of tool making". With salience providing cross-boundaries of the surroundings, letting stimulating configurations emerge, it is easy to visualize the form of a human or animal in the carved carcass, in a spent nodule, or in an unfinished ivory work. Gestures and reductive processes pass from one activity to another. As they settle in a feedback cycle, these activities enhance consciousness of the physical reality, improve the motor skills and sharpen cognitive power.

It is crucial, though, to remember that the skills that inducted the hominid into art-making are not limited to visual and motor capabilities. Indeed, as indicated above, salience is not limited to the visual and mark-making; it is also inherent in sound, touch, smell and taste. "We and our fellow mammals have a robust sense of the reality of gross bodies around us. It hinges on salient, integrated patches and sharp edges in the visual field, reinforced by correlated tactile and olfactory stimulations, and subject mostly to only gradual distortion over time" (Quine 1988: 6-7).

In fact, it is not too difficult to argue that early art was informed just as much by tactile and auditory inputs as it was by visual import.

Figurines: a tactile adumbration

Sculpture is usually considered a visual art. In reality, sculpture is primarily a tactile experience, including the kinaesthetic aspect of this sensory function (see Achrati 2007). As White has shown, in choosing the raw material for the making figurines and polished artefacts, tactile considerations are as important as visual ones. "Ivory, soapstone, mother-of-pearl, and dental enamel/dentine are all characteristically warm, even mysterious, to the touch. With eyes closed, the hand cannot distinguish one of them from the others" (White 2003: 80). It is for this tactile constituent that most of the Aurignacian ornaments are talc, ivory, seashells and animal teeth (*ibid.:* 97). It is also significant that ivory is the only sculptor's material produced by the human body (teeth) (Ritchie 1969: 27).

A further confirmation of the tactile import to the genesis of early art is in the fired figurines from Dolni Vestonice I, Predmosti, Pavlov and Kostenki, which are considered to be some of the earliest surviving art objects. Primarily a tactile experience, the *façonnage* of these clay figurines involved the wetting and kneading of loess into a semiplastic mass that was moulded into zoomorphic and anthropomorphic shapes, with the small parts (feet, legs, ears, tail) made separately and stuck to the body (Soffer *et al*. 1993: 265).

When we consider the kinaesthetic aspects in Upper Paleolithic figurines, we realize that they are more than visual miniatures of a horse, a mammoth, or a woman. A figurine is a carnal "adumbration" of the real object (*ad*+*umbratus* [umbra, shadow]: suggest, disclose, outline partially). It is an intuitive amalgamation of the multiplicity of perspectival moments of a monumental object and their reduction to a tactile prehension. It is an algorithmic reduction of the rotational energies of the observer or the observed or both to a tactile experience. All-around visualization of a real mammoth being impossible under the rigid rules of perspective, the animal in figurine form is now wrapped in the neural texture of the hand, standing in a tactile horizon where consciousness is a co-presence of memory, expectation, and reality. It becomes part of a primitive "consciousness of things, of that which gives the very first stratum of mundane existence" (see Ricœur 1984: 148-149).

This kinaesthetic awareness of the Upper Palaeolithic artist is also evident in cave art. Some of the pictures in cave art (e.g., the upside-down horse at Lascaux) follow the curvature of their supporting wall or the stalagmite, thus forcing the observer to move around the depicted object. Other pictures, as Clottes (2003) has pointed out, are positioned around a cavity in the rock in a way the pins the observer to one vantage point. This is the case of a rhinoceros at Chauvet, which presents a type of "perspectival anamorphosis".

With this kinaesthetic awareness, this cave artist was acting out Merleau-Ponty's chiasmic view that a painter "takes his body with him" (Merleau-Ponty 1964: 162, quoting Valéry). In fact, Merleau-Pointy simply could not "imagine how a mind could paint. It is by lending his body to the world that the artist exchanges the world into painting. To understand these transubstantiations we must go back to the working, actual –not the body as a chunk of space or a bundle of functions but that body which is an intertwining of vision and movement" (*ibid*.).

The cave: an auditory space

The auditory also informed the development of art in ways we rarely think of, but which shed some light on our understanding of Palaeolithic art. For example, balance is crucial in visual artwork, yet the processes involved in the control of balance and equilibrium are the result of interactions of many of the sensory systems, including the inner ear, vision, and touch. One of the functions of the inner ear (consisting of the semicircular canals and the otolith, or statoconium organs), is to detect head position and head movement in any direction, and to signal them to the eye and spinal reflexes to adjust for balance and posture.

Hearing was important for Palaeolithic hunters, echo-locating danger and prey. When stalking a prey, or in the dark, control of the body is left the ears. In the long wintry night of the northern latitudes, a sharp hearing skill becomes just that much important.

There are various interpretations of cave art of Europe, and various theories were put forth to explain why the Upper Palaeolithic artists sought these cavities to accomplish their art.

One possible answer is that the choice of a cave is a realization of an auditory conception of space. As D. Ihde has shown, the auditory space is spherical and not restricted to a forward orientation. As a surrounding thing, it “exceeds” the field-shape of sight. “Were it to be modelled spatially, the auditory field would have to be conceived of as a “sphere” within which I am positioned, but whose “extente remains indefinite as it reaches outward toward a horizon” (Ihde 2007: 75-76).

Unlike in the perspectival structure, which implies a fixed location, the auditory conception of space allows for more than one moment of the object to be captured and given retinal expression. There is more. Once created in the dark recesses of the cave, the artist needs no light to animate his/her faunal creatures by imitating their sound and hearing it reverberate though the cavity.

Hence, early cave art is just as much a plastic experience as it is a dramaturgical event staged in the sheltering warmth of the earth.

Conclusion

Linked to the “proficiency of tool making”, the genesis of art is also deeply anchored in the body and its senses. As extensions of hominid teeth, nails and muscle, stone tools were applied to frozen carcasses to provide sustenance. With salience providing cross-boundaries of the surroundings and letting stimulating configurations emerge, the hominid visualization of human and animal forms in spent cores and carved carcasses intensified. The feedback of these sensory experiences and physical activities enhanced consciousness of the reality and improved cognitive abilities. For the gratification of aesthetic impulses, the gestures and reductive processes involved in tool making and frozen meat carving were applied to ivory, bone and soft stone, and sculpture emerged as an artistic phenomenon with social underpinnings and implications. With art so deeply wedded to the body, and with the early hominids so dependent on all their sensory equipments, their art was informed just as much by tactile and auditory inputs as it was by visual import.

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