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Lecture No. 4. **Beads, symbolism and self-awareness**

Introduction

Here we will consider some of the fundamental issues in understanding the emergence of modern human cognition and symbolism. The model nominating the establishment of "external storage" of symbolic meaning as the defining criterion of modernity, mentioned in the previous lecture, also decrees that the number of instances in any period is not relevant. This rule, that even a single indisputable occurrence of an undeniably symbolic artifact demonstrates essentially modern symbol use and modern human status, becomes particularly evident when we consider just one of the classes of evidence identified at the end of the previous lecture. Whereas stone tools, which may have embodied some symbolic functions, are primarily utilitarian objects, beads and pendants have no function other than that of symbolic artifacts. One might argue about the intentionality of simple geometric engravings on bone, but the intentionality of beads cannot be questioned. More importantly, still, it only takes one single undisputable bead to demonstrate symbolism, because this kind of artifact simply cannot have existed on its own. It demands the existence of a whole tradition of bead use and of the complex social, cultural and cognitive underpinnings without which this kind of ornament or personal decoration simply cannot exist.

The study of beads and pendants is particularly productive, in terms of the information it is likely to yield about the way the artifact was produced, how it was used, and what happened to it after it was deposited in what we now consider to be its archaeological context (taphonomy). But beads convey a great deal more information about their makers and users than their history. Technologically alone they illustrate not only the ability to drill through brittle or often very hard materials, but also they imply the use of cordage. The very essence of a bead or pendant is to be threaded onto a string; it would simply be pointless to perforate a small object for another purpose but to pass a string though it. However, the use of cordage also suggests the use of knots, because a string needs to be closed to form a loop to be effective. Although the ends of a string may be joined by means other than a knot, e.g. by the use of adhesive or by plaiting, these alternative means are either impracticable or they are technologically even more complex than the use of knotting (Warner and Bednarik 1996). It is relevant to note that seafaring, too, is practically impossible without the use of ropes or lashings and knotting. The diachronic availability of Pleistocene remains of cordage (Leroi-Gourhan 1982; Nadel et al. 1994; Pringle 1997) is of no relevance to the question, because that class of material evidence obviously possesses an exceptionally long taphonomic lag time (Bednarik 1994a). In short, what beads tell us about the technology of the people who used them is well in excess of deductions concerning their manufacture.

Without doubt the technological deductions beads permit us are of great interest, but of perhaps more importance are the cultural and cognitive deductions they make possible. Beads can be used in a number of ways or for several purposes: they may be emblemic, for instance, and provide various forms of information about the wearer and his or her status in society. Availability for marriage, political status, state of mourning might be such possible symbolic meanings. At one level one might believe that beads indicate simply body adornment, but this is almost certainly an oversimplification. Even if vanity were the motivation for wearing such items, stating this explains not why such items are perceived as 'decorative'. The concept itself is anthropocentric, we do not assume that other animals perceive the information imparted by the beads as meaningful. In human culture, however, various forms or levels of meaning may be encoded in such objects, as well as in other kinds of body adornment (tattoos, body painting, cicatrices, infibulation, anklets, armbands etc.). In ethnography, beads sewn onto apparel or worn on necklaces may signify complex social, economic, ethnic, ideological, religious or emblemic meanings, all of which are only accessible to a participant of the culture in question. To name just one example: beads or pendants may function as charms, they may be a means of protection against evil spells or spirits. Clearly, no archaeological access exists to such complex meanings and practices. But there is another generic deduction to be made from the use of beads: it is impossible to escape the deduction that the people using them must have a clear concept of the self. Without self-awareness, beads are entirely useless pieces of material.

Beads have been the subject of a great deal of anthropological and archaeological attention (e.g. Beck 1928, 1941; Biggs 1969; Chen 1968; Cheng 1959: 31; Indraningsih 1985; Karklins 1987; Nieuwenhuis 1904). Some of the perhaps most extensive research of pre-Historic beads might be that of Peter Francis and Randolph White. Mistakenly believing that the ivory beads of the French Aurignacian and contemporary Russian traditions are the earliest beads known to us, White (1989, 1992, 1993a, 1993b, 1995) is the principal protagonist of the view that the appearance of beads and pendants coincides with and marks the advent of the Upper Palaeolithic. The model of an explosion-like appearance of the Upper Palaeolithic derives a great deal of support from this fallacy, which I have tried to correct on various occasions (e.g. Bednarik 1992a, 1995a, 1995b). White describes in admirable detail the manufacturing processes of Aurignacian beads of just one material, without having seen or even considered Pleistocene beads outside of France and Russia, or outside the early Upper Palaeolithic period (Bednarik 1995a: 628). Moreover, his understanding of the early Upper Palaeolithic is probably severely mistaken. As we have seen in the second lecture of this series, recent evidence from Germany and other parts of Europe render it much more likely that the Aurignacian was a tool tradition of either Neanderthals, or their direct descendents — and not as literally every Pleistocene archaeologists has believed and claimed until 2005, of fully "modern" humans. White's pronouncements concerning the beginnings of bead use, and what it means archaeologically, therefore need to be ignored.

Francis has examined aspects of both archaeological and ethnographic beads in various regions of Asia (1978, 1981, 1982a, 1982b, 1982c, 1985, 1986, 1989a, 1989b, 1989c, 1989d, 1990). In the present context, his experiments with shells (Francis 1982d) are of particular interest. They are the only replicative work with beads that I am aware of, other than White's and what is mentioned in the present article. Francis considers five techniques of perforating shell beads that he found in the literature: gauging, scratching, sawing, grinding and hammering. He has applied each of these methods to some shell species, using in all nine species, but he has not applied the most obvious method of perforation, drilling or boring. He does not elaborate on this omission. In beads or pendants other than those made of shell, which are widespread, the perforations are made almost exclusively by rotating action, except for a number of specimens that exhibit some gauging around the perforation (especially teeth). It is to be noted, incidentally, that some pendants lack a perforation altogether, having instead been attached to the supporting string with the help of an incised groove.

Stone implements used for drilling are well known from Lower Palaeolithic cultures onwards (Keeley 1977) and Francis himself reports that in replicating scratching of perforations he found himself "applying rotary motion" (Francis 1982d: 714). Francis' five methods of perforation are generally unsuitable for all potential bead materials other than shells, including stone, amber, ivory, teeth and ostrich eggshell, therefore they are of no relevance to the manufacture of most pre-Historic beads and pendants. Shell beads are among the earliest 'ornaments' found in many regions, including India (Francis 1981: 140), China (Cheng 1959: 31), Australia (Morse 1993) and South Africa (Henshilwood et al. 2004), and one of the earliest pendants of Europe, from the Châtelperronian of the Neanderthals, is even made of a fossil cast of a shell (Bednarik 1995b: Fig. 6).

Irrespective of their cultural purpose, beads convey complex information about the wearer, which it would be impossible to create a context for without the use of a communication system such as language. This complex information, clearly, is stored in them, outside the human brain, but can only be decoded by the correct cultural "software". This needs to be emphasized because it leads to the postulate that the use of beads assumes the availability of a complex communication system. We have many other indicators of possible language use during the Lower and Middle Palaeolithic (e.g. other forms of symbolism, or successful ocean navigation), and the very early use of beads and pendants provides additional crucial evidence. I will briefly describe this evidence and will then focus on the production processes involved, to illuminate their role in exploring the 'gestures' their makers would have employed.

Early pendants and beads

Small, perforated objects of the Pleistocene may have been beads or pendants (Biggs 1969), or they could have been quangings, pulling handles or buckles as reported ethnographically (e.g. Boas 1888: Figs 15, 17, 121d; Nelson 1899: Pl. 17; Kroeber 1900: Fig. 8). However, most of such utilitarian objects are not only of a quite typical shape or design, they exhibit particular wear traces and material properties. To be more specific, small circular objects with central perforation are considered to be beads, especially where they occur repeatedly. Similarly, objects such as animal teeth, perforated near one end (near the root) are not thought to be pulling handles, nor are objects that are too fragile to function as such utilitarian equipment.

Middle and Lower Palaeolithic finds with both artificial and natural perforations are quite common, and have been found since the 19th century. Thousands of such objects are reported in the literature, although there is often no reliable evidence that the perforation is anthropic (cf. Klíma 1991). Some materials can be perforated by natural processes. For instance, bones can be chewed through by animal canines or partially digested by stomach acids, while mollusc shells are commonly perforated by parasitic organisms. To acquire experience in recognizing such natural perforations I have microscopically examined hundreds of specimens of the latter type. But before hastily omitting objects with natural perforations from all consideration in this context we would do well to remember that the cultural status of such an object is not contingent on whether the hole in it was made by human agency. While it is preferable to rely on specimens bearing clear evidence of human work when dealing with a period from which bead use has not as yet been conclusively demonstrated, it is to be emphasized that the perforation of a bead or pendant certainly does not need to be man-made, as d'Errico and Villa (1997) erroneously assume. On the contrary, naturally perforated objects are commonly used as ethnographic beads (as are perishable materials) and it seems highly likely that such natural objects were also used in the distant past. Indeed, the earliest beads ever used could quite reasonably be expected to have had natural perforations. Thus the determining factor in recognizing pre-Historic beads is not an artificial perforation, but microscopic evidence of wear use. Such evidence consists of two types: the wear occasioned by the string on which the bead is threaded, and the facet-type wear around the hole that results from the rubbing of the adjacent bead on a string, in very prolonged use. I have studied both these forms (Bednarik 1997a, 2005).

The earliest presumed beads of the Lower Palaeolithic were mentioned by Boucher de Perthes (1847–64) one and a half centuries ago, occurring together with the first Palaeolithic tools ever reported, and from the very type site of the Acheulian. In the famous paper by Prestwich (1859), in which he recognized the authenticity of the St. Acheul stone tools Jacques Boucher de Perthes had been collecting for many years, the occurrence of possible beads is also mentioned. These were reported to be fossilized remains of a sponge, *Coscinopora globularis*, and Prestwich noted that '[S]ome specimens do certainly appear as though the hole had been enlarged and completed' (Prestwich 1859: 52). Numerous more apparent beads of the same species were found at Acheulian sites, in France and several decades later also in Britain (Smith 1894: 272–6). Intrigued by these reports, I examined microscopically 325 spherical specimens from Acheulian sites in both countries, and found that the fossils are not, as assumed until then, of *Coscinopora globularis*, but that they are of the species *Porosphaera globularis* Phillips 1829, a Cretaceous sponge (Bednarik 2005). To my surprise, many of them not only showed considerable human modification of the *natural* tunnel (the tunnel is thought to have been caused by a parasite, though the evidence is not conclusive), but also numerous specimens possessed clear evidence that they were worn on a string. Around both tunnel apertures there were more or less extensive wear facets, in the most pronounced cases amounting to conical depressions approaching the full size of the bead in question. This, amazingly, had not been noticed before, and together with other forms of evidence it demonstrates beyond reasonable doubts the use of the fossils as beads.

Besides these spherical fossils, circular, disc-like fossil casts have also been found at another Acheulian site, the crinoid columnar segments (*Millericrinus* sp.) from Gesher Benot Ya'aqov, Israel (Goren-Inbar et al. 1991). Here, however, no evidence of wear has been reported.

The perhaps earliest objects with indisputably human-made perforations we know of are the two perforated pendants from the Repolusthöhle in Styria, Austria. If their age estimate is correct, they are in the order of 300,000 years old. One is a wolf incisor, very expertly drilled near its root. The second is a flaked bone point, roughly triangular and perforated near one corner (Mottl 1951). Of particular significance are the three fragments of ostrich eggshell disc beads from a major Libyan occupation site of the Acheulian (Ziegert 1995). They come from the El Greifa site complex (Wadi el Adjal, near Ubari). There is ample evidence of quarrying of quartzite, and the sites' lithic inventory includes generally handaxes, scrapers, borers and burins, but is dominated by large Acheulian types. Dated by the U/Th isotopes of the calcareous sediments they are from, the beads appear to be in the order of 200,000 years old. The near-perfect rounded circumference and perforation of the El Greifa ostrich eggshell beads demonstrate that even hominids of the Acheulian possessed a well-developed technology of working this fragile medium with the greatest possible confidence and skill.

Southern African sites have yielded ostrich eggshell beads from the Middle Stone Age right up to the proto-Historic period. Decorated specimens from the Howieson's Poort phase in Apollo 11 Cave, Namibia (Wendt 1974), may well be 70,000–80,000 years old, even older. This site has also yielded beads made of eggshell from a layer thought to be 22,000 years old. Diepkloof Cave in the south-western Cape, South Africa, contained about a dozen supposedly decorated ostrich eggshell fragments of the Middle Stone Age (Beaumont 1992; Bednarik 1993c). Ostrich eggshell beads from Bushman Shelter near Ohrigstad, Transvaal, have been suggested to date from somewhere between 12,000 and 47,000 years ago (Kumar et al. 1990). Such beads still occur in much more recent periods in southern Africa.

There are numerous other perforated objects also from the early Middle Palaeolithic/Middle Stone Age, and many of them may have served as beads or pendants. Forty-one perforated snail shells have been excavated from the Howieson's Poort levels of Blombos Cave, South Africa, and are about 75,000 years old (Henshilwood et al. 2004). The Micoquian has yielded an artificially perforated wolf metapodium as well as a wolf vertebra from the Bocksteinschmiede, Germany (Marshack 1991). The Micoquian of Prolom 2, Crimea, produced no less than 111 perforated animal phalanges, besides four engraved palaeoart objects (Stepanchuk 1993). Although there is no proof that the phalanges were perforated by human hand, the fact that they are all of one species, *Saiga tatarica*, and that no perforated bones of other species were found in the cave, suggests that these may also be anthropic perforations.

The Mousterian of France has yielded a partly-perforated fox canine and a perforated reindeer phalange from La Quina (Martin 1907–10), and another perforated bone fragment from Pech de l'Azé (Bordes 1969). The two perforated canines from Bacho Kiro, Bulgaria (Marshack 1991), too, are of the Middle Palaeolithic. As we approach the end of this technological phase, beads and pendants become increasingly common, and materials of stone are now drilled, first appearing in Russia and China. Thirteen such specimens from the lower occupation layer of Kostenki 17, found below a volcanic horizon that is about 40,000 years old, include not only polar fox canines and gastropod shells with perforations, but also stone and fossil cast objects (Bednarik 1995b: Fig. 4). From an intermediate Middle to Upper Palaeolithic site in China, wenhua Shiyu, comes a broken stone pendant (Bednarik and You 1991), and the oldest beads found in Australia, from Mandu Mandu Creek rockshelter, are about 32,000 years old (Morse 1993). That country's earliest known stone pendant is from the final Pleistocene of Devil's Lair, still belonging to a Middle Palaeolithic technology (Bednarik 1997a).

With the advent of the Upper Palaeolithic in Eurasia, beads become more numerous and are increasingly manufactured from unwieldy materials, especially ivory. Just three human inhumations at the Russian site Sungir', related to a stone tool technology that is transitional between Middle and Upper Palaeolithic implement types, the Streletsian, contained more beads than have been found in the entire Pleistocene sites of the rest of the world. The three graves yielded 13,113 small ivory beads and over 250 perforated canine teeth of the polar fox. By this time, perhaps 28,000 years ago, the art of bead making had reached an extraordinary level, in which the results of thousands of hours of labor were lavished on three burials.

This synopsis of Pleistocene bead remains might convey the impression that beads were produced infrequently for 200,000 or 300,000 years, and then became much more numerous with the advent of the Upper Palaeolithic. While this is remotely possible it must be cautioned that this pattern of distribution in time provides a typical parabolic curve as demanded by taphonomic logic (Bednarik 1994a: Fig. 2). Accordingly the advent of the Upper Palaeolithic should NOT indicate the advent of frequent bead manufacture, but merely the *taphonomic threshold* of this phenomenon category. This is almost certainly the correct explanation of the evidence available to us, in which case that record must be tempered by taphonomic logic before it can be interpreted. Taphonomic logic offers the most realistic explanation for this pattern (Bednarik 1986, 1992b, 1994a).

The technology of ostrich eggshell beads

The immediate purpose of my experimental replication work between 1990 and 1996 was to determine the technological processes involved in the production of beads of ostrich eggshell. The raw material is of unusually consistent properties. The shell thickness is uniform, as is the three-layered morphology of the shell (described in admirable detail by Sahni et al. 1990). The only significant material variable is attributable to the shell's curvature, which is of a smaller radius at the ends of the egg than it is along the sides. My replication work soon established that the manufacture procedure used followed a specific pattern, as demanded by the morphology and dimensions of the end product, work traces and the nature of the available stone implements. For instance, I found that it was difficult and uneconomical to first shape the bead and then drill it, and that it was marginally easier to drill from the concave side than from the convex. Thus experimentation succeeded in reconstructing the work process quite convincingly, which it seems was as follows.

Once drained of its contents, an ostrich egg was dried and broken into fragments. These were then reduced further, into polygonal pieces of about 1–2 cm^2 area. This was done by carefully breaking the shell between fingers, probing for already existing fracture lines. The small fragments were then drilled individually, which is a little more difficult than drilling into the complete egg. An experienced operator takes between 70 and 145 seconds to perforate the dry shell from one side. No significant differences in drilling time were noted according to direction (from outside or inside), but the outer veneer (< 0.1 mm; Sahni et al. 1990) is somewhat harder to start from, and is of course of convex surface, so I came to prefer the concave mammilary innermost layer (Sahni et al. 1990: Fig. 2) to start drilling from. Contrary to various opinions stated, I do not believe that ostrich eggshell beads were usually drilled from both directions, as it is very difficult to meet up with the centre of the first opposite indentation. It is much easier to ream out the opening once the boring tool breaks through, using the point of a thin prismatic sliver of chert. I propose that this is the way ostrich eggshell beads were customarily perforated.

I also drilled shell fragments soaked in water for 24 hours, taking from 80 to 140 seconds, which suggests that this does not affect workability of the shell. The principal variable in drilling time is clearly the quality of the stone tool point, and this can vary considerably. In my replicative work I used a variety of stone tool materials, including cryptocrystalline flint, microcrystalline cherts of various types, chalcedony, coarse and fine quartzites, and quartz crystal. I also tried out a variety of tool morphologies, finding that thin points became blunt very quickly, as did finely-grained materials. Nevertheless, all materials I used necessitated the application of two or more points to produce a single perforation economically, so the time of making or resharpening borers has to be added to production time. Stout angular points on flakes or blades of 1–2 mm thickness at their end were found to be the most effective, and excessive pressure is counterproductive as it accelerates the wear of the tool point exponentially.

Once the perforation is complete it is reamed out from the other (convex or outer) side, using slender bladelets or prismatic points, which may be more fragile. The duration of this process depends on the desired hole diameter, but in about one minute an even diameter of around 2 mm, eliminating much of the drilling cone, can be attained. It is clear from my work that the three perforated beads of the Indian Upper Paleolithic were reamed out by alternating rotation of the borer: this usually results in a slightly oblong perforation, as already noted by Semenov (1964: 78) in drilling through other materials with stone tools.

Before commencing the abrading of the still angular fragment, the excess area is trimmed off by gripping the piece firmly between two fingers in the area that is to form the final bead, and pressing its convex side against a stone surface. This process of snapping off small angular fragments until the actual bead blank is obtained requires skill and judgment: if the bead is incorrectly held or handled, it can easily crack through the perforation. The average time of the trimming process is 34 seconds.

Grinding the excess material from the fragment's edge is easy, although very demanding on the operator's finger tips. I found it convenient to divide this process into two steps, first grinding the bead blank into a roughly circular shape of under 10 mm (resembling the Patne specimen from India). This requires between 65 and 270 seconds, the duration being related directly to the amount of excess material to be removed. Siliceous sandstone, silcrete or quartzite provide excellent grinding surfaces, and an experienced craftsman should not break any pieces in this process.

Ethnographic specimens of disc beads are sometimes manufactured by a method called the *heishi* technique, named after the Santo Domingo Pueblo Indian word for 'shell bead' (New Mexico, U.S.A.). The *heishi* technique was a widespread method of mass-producing beads from ostrich eggshell and other thin materials, in which the perforated blanks are threaded onto a rod or stiff fiber, the entire set is ground together, resulting in very consistent sizes and shapes (Francis 1990: 47). I emphasize, however, that I have observed no evidence that this method was used in the Palaeolithic period, anywhere in he world. Most particularly, the few Indian specimens we have were made singly (*contra* Francis 1982a, 1990).

In attempting to replicate the Acheulian specimens from El Greifa, I found that I had to further refine the product of the last step. It takes between 580 and 645 seconds to reduce the <10 mm beads to almost perfectly round specimens of about 6 mm diameter. On this basis we can estimate that the time it took to produce one of the El Greifa ostrich eggshell beads, assuming that the maker was a skilled craftsman, was in the order of 17 minutes, or about 25 minutes if we include the time of preparing and resharpening stone points.

Both the beads and the stone tools used in their manufacture were examined under a stereoscopic optical microscope at low to medium magnifications. The information so gained is not only useful in the microscopic study of pre-Historic bead specimens and stone borers, it also explained the surprisingly rapid blunting I experienced with the stone tools. Expecting to find significant microscopic spalling on working edges, I was surprised to see that the 'blunting' of borers was not so much due to wear, but due to clogging up of recesses with compacted calcium carbonate. Nevertheless, a characteristic type of wear sheen was also noted on the edges at the point of many tools.

The ground and powdered eggshell material was also examined carefully, and was found to contain surprisingly large chips of eggshell layer, commonly measuring 0.1–0.5 mm, but in rare cases of up to 1.8 mm length. However, over half the volume of the white powder is of much smaller grain size, most of it 2–20 μm. Differences in its composition were noted according to the rock type used: a gritty siliceous sandstone and a silcrete produced slightly different cumulative grain size distribution curves than a dense central Indian quartzite.

Discussion

The replication of archaeological specimens is part of experimental archaeology, without which interpretation in this discipline is of very limited use. It is through the experimentation with technologies that we gain credible insights into how materials must have been utilized to produce the kind of record the archaeologist encounters. In this sense experimental archaeology is related to the study of the taphonomy of archaeological remains, and together these two areas of research can bring archaeological interpretation to life. I will try to illustrate this with the presently considered evidence.

The most important deductions we can draw from the present replication study concern the Acheulian beads from Libya, and what we can learn about the circumstances of their manufacture, in terms of illuminating the conceptual world of their makers. The first observation we can make concerns the considerably finer workmanship of these Acheulian specimens in comparison to those we have of the Upper Palaeolithic. This may be unexpected, but it mirrors an experience we had recently with European rock art: the most sophisticated we have found so far, that of Chauvet Cave in France (Chauvet et al. 1995) turned out to be also the earliest we know of in the European Upper Palaeolithic (Clottes et al. 1995). Hence the idea of evolution towards increased sophistication is a Eurocentric myth in rock art development, and may well be so in other areas of archaeology.

The near-perfect roundness of the Acheulian beads can be obtained only by constant checking of the shape during the final abrading process, using not just a developed sense of symmetry, but possessing a very clear concept of a perfect geometric form. This roundness cannot be the result of chance or some 'instinct' driven by a mere desire to reduce the size of the beads. It is the outcome of a very clear abstract construct of form — a concept-mediated, geometrically perfect form. Moreover, it is the result of a determined effort to produce high-quality work. To extract the full potential information offered by these few beads, I find the following point particularly important, and they also demonstrate vividly the enormous benefits of replication studies.

During my experiments I found that as the beads are ground to a diameter of 8 or 7 mm it becomes increasingly difficult to hold them while grinding them, and after a time it becomes a rather painful task. The fingertips not only have to maintain a tight grip, they are also subjected to abrasion from the siliceous stone. About 6 mm is the diameter at which it becomes uneconomical to continue reduction further, and this is precisely the size of all three Acheulian bead fragments we have. This, too, is not a coincidence, but the result of a deliberate decision to *reduce the beads to the smallest realistically possible size*. It must be considered also that at sizes of under 6 mm, the beads become increasingly fragile: with a perforation of almost 2 mm, their rim width falls to under 2 mm. Moreover, because of what remains of the bi-conical perforation profile, the innermost part of the rim is never of full eggshell thickness. I found that if the beads were ground to a smaller size, they would become susceptible to fracture, either during manufacture or during subsequent use.

We have therefore two limits on minimum size imposed by practical considerations, and we need to ask: why did the makers of these beads push their technology to its practical limits? After all, a larger bead is much easier to see, yet a smaller bead represents a significantly greater work effort. This observation coincides with the already mentioned geometric perfection of the form, which is most certainly deliberate. The most parsimonious explanation for both the size and the form of these objects is that these characteristics reflect a highly developed abstract value system and a considerable social complexity in the society that made and used these beads. Without a cultural impetus placing value and meaning on such perfect forms, and on a standard of craftsmanship that pushes the available technology to the utmost limit, it seems simply impossible to account for the empirical characteristics of the evidence. There is certainly no utilitarian explanation to account for them, so the motivation of these artisans is to be found in ideology. The effect of this behavior, however, was to store a great deal of information in the artifacts: they are significant because they meet ideological specifications of perfection, they communicate a variety of unspoken statements, and they express aspects of self-awareness. For those who are in tune with this form of external information storage, the meanings of these communication devices was as complex as contemporary symbol systems. The meanings these symbols could have had are numerous: marriage or social status, attention to appearance, level of initiation, moiety, tribal or group affiliation, personal wealth or standing, artisan's skill, belief system and countless other possibilities come to mind.

The strong hypothesis that humans of the Late Acheulian period, about 200,000 years ago, possessed such a cultural system is at significant odds with the currently dominant paradigm. Not only does it postulate a value system concerning purely abstract criteria, there must have been a socially shared and communicated meaning regarding the significance of the *characteristics* of these symbolic products. There can be no purpose in producing technological perfection if there is no comprehension and appreciation of its ideals.

Another insight provided by the replication of Acheulian ostrich eggshell beads concerns their technological perfection. It suggests that their makers drew from the experience of a long tradition of manufacturing such products of which we know almost nothing. We do know that perforation of hard objects (e.g. teeth) was probably already practiced earlier, and very competently. Bearing in mind that most ethnographically known beads are of perishable materials, we may reasonably assume that this also applied in the distant past. Naturally perforated small objects may have been used as beads, such as crinoid columnar segments (Goren-Inbar et al. 1991) or the ear-bone of the cave bear (Marshack 1991: Fig. 6), and were certainly used in the form of *Porosphaera globularis* fossils. Finally, but perhaps most importantly, taphonomic logic simply demands a much earlier commencement of the use of beads than can be detected on the fossil record (Bednarik 1994a).

The excellent rounding of the circumferential edge of the Acheulian beads and the even width of the ring indicate a conscious appreciation of an essentially abstract, geometric form by 200,000 BP at the latest. Such an appreciation is amply evident from the later Middle Palaeolithic technological traditions. That period has provided such evidence from Hungary (the Tata nummulite; Bednarik 1992a: Fig. 4) to Australia (the extensive geometric rock art of that country's Pleistocene tradition, which is the world's most recent Middle Palaeolithic).

Mainstream archaeologists may find such evidence of early sophistication extraordinary, but seen in the context of other finds of the general period in question it should be neither unexpected nor controversial (Bednarik 1995a, 1997b). The question to ask is: why, for instance, are orthodox archaeologists still speculating whether language was possible prior to 35,000 BP (Davidson and Noble 1989) or 60,000 BP (Noble and Davidson 1996)? They are unaware that even *Homo erectus* must have had language to navigate the sea and colonize new islands (Maringer and Verhoeven 1970, 1977; Bednarik 1995c, 1997b). They may be unaware that petroglyphs, too, were produced in the Acheulian, that hematite or other iron compounds were used as pigment up to 900 millennia ago (Bednarik 1994b), that hafted tools with wooden handles, stone-walled dwellings and portable engravings date from the Lower Palaeolithic (Bednarik 1992a, 1995a, 1996). It is unfortunate that the dominant models in archaeology, since the time of the rejection of the Altamira art over a century ago, remain largely determined by scholars who are unfamiliar with the relevant evidence. The most urgent task in archaeology is to introduce a systematic study of the limitations of knowledge of its practitioners 'concerning existing data … how language barriers and other biases limited the flow of information in this field, or how false constructs … flourished in archaeology' (Bednarik 1995d: 120). This should be done as one of the several strategies of introducing metamorphology (op. cit.), the scientific version of archaeology.

The example illustrated here confirms this need for major reappraisal, which we have already noted in the previous lectures. But it also provides invaluable insights into the cognitive world of Acheulian people a few hundred thousand years ago. It is virtually impossible to explain the empirical record without granting them an appreciation of perfect form, also amply evident from the perfection of the handaxes of the period (Wynn 2002). These hominins of the Lower Palaeolithic had a value system of abstract qualities. Their use of beads, now amply evident, demands also the existence of fully developed self-awareness. The sheer complexity of a system of body decoration as advanced as the making and wearing of beads renders it impossible to explain this behavior away as simply a development of genetically transferred display behavior, such as that of the peacock and very many other species. It is entirely culturally (non-genetically, learnt) transmitted behavior. Moreover, single beads cannot exist, beads can only exist in large numbers, and where other members of the society appreciated their symbolism and the meanings attached to these artifacts. Or are we to suggest that some *Homo heidelbergensis* genius, some intellectual freak who had invented the bead strung a few beads onto some sinew, tied it around his neck and strutted proudly around the camp? His clan members watched with no more comprehension than the thoughts of a dog as his mistress pots on a pearl necklace? This is obviously absurd, and the only rational explanation for the use of beads, in whatever culture, is that they embodied cultural messages and symbolisms of considerable complexity. This is of fundamental importance to the topic of this course, and any explanation of symboling origins of cognitive evolution that does not make due allowance for this insight lacks all credibility.

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