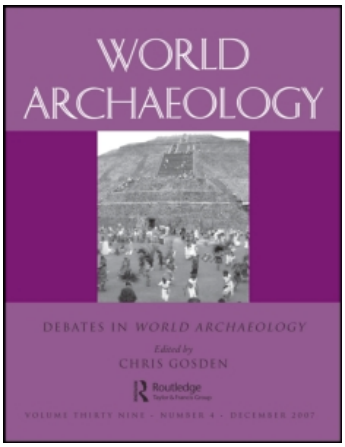

World Archaeology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713699333

Modern analogy, cultural theory and experimental replication: a merging point at the cutting edge of archaeology

Krish Seetah

Online Publication Date: 01 March 2008

To cite this Article Seetah, Krish(2008)'Modern analogy, cultural theory and experimental replication: a merging point at the cutting edge of archaeology',World Archaeology,40:1,135 — 150

To link to this Article: DOI: 10.1080/00438240701843652

URL: http://dx.doi.org/10.1080/00438240701843652

Modern analogy, cultural theory and experimental replication: a merging point at the cutting edge of archaeology

Krish Seetah

Abstract

An experimental approach to cut-mark investigation has proved particularly successful and should arguably be a prerequisite for individuals interested in developing standard methods to study butchery data. This paper offers a brief review of the criteria used to investigate cut marks and subsequently outlines recent research that has integrated results from replication studies of archaeological tools and cut marks with written resources to study historic butchery practices. The case is made for a degree of standardization to be incorporated into the recording of butchery data and for the integration of evidence from the analysis of cut marks and tool signatures. While the call for standardization is not without precedent the process would benefit from a suitable model: one is proposed herein based in large part on experimental replication and personal vocational experience gained in the modern butchery trade. Furthermore, the paper identifies issues that need to be kept at the forefront of an experimental approach to butchery investigation and places emphasis on the use of modern analogy and cultural theory as a means of improving our interpretation of cut-mark data.

Keywords

Cut marks; experimental archaeology; replication; butchery; tools.

Experimental research in zooarchaeology

The underlying tenet of experimental research within an archaeological context was acknowledged by the early 1960s (Ascher 1961) and firmly established by the time Coles (1979) wrote a seminal book on the subject. Notable developments in this facet of archaeological investigation were reported in works by Ingersoll et al. (1977), Bell (1994), Stone and Planel (1999) and recently by Mathieu (2002). The particular benefits of an experimental approach are that the research is performed in a rigorous and 'scientific' manner; it can be repeated, follows an established protocol and provides both qualitative

Routledge
Taylor & Francis Group

World Archaeology Vol. 40(1): 135–150 *Experimental Archaeology*

ISSN 0043-8243 print/1470-1375 online
DOI: 10.1080/00438240701843652

and quantitative data. Certain aspects are common within the paradigm of experimental work, including a level of control. The provision of a testable hypothesis (though not always made explicit) is implicit and relates to the specific purpose of the particular experiment. Replicability is arguably the most important aspect and underpins experimental research by providing the context within which to situate interpretation and inference (Mathieu 2002: 1–4). Experimental archaeology has been important for understanding the innovation and perpetuation of material technologies and for appraising the *chaîne opératoire* of manufactured goods and performed tasks, for example in the context of flint knapping (Soriano et al. 2007), pottery production (Wallaert-Pêtre 2001; Varela et al. 2002) or butchery (Jones 1980). Experimental *replication* has been used to study aspects of human behaviour (Isaac 1981) and cognition (Bell 1994: 312–25) and has been applied to issues of migration and movement of peoples over broad spatial and chronological episodes (Zubrow 1990, 2002: 143).

Zooarchaeologists have used replication to address issues of taphonomy (Costamagno et al. 2005), hunting strategies (Frison 1989) and subsistence activity (Outram 2002) with research carried out both within an ethnoarchaeological framework (i.e. Yellen 1977) or independent of this approach (Thompson 2002, 2004). Subsistence has been a particular focal point and this has led to a much improved appreciation, for example, of the significance of fats within diets (Speth and Spielmann 1983; Outram 2001). Aside from the direct application of experimental methodologies to study subsistence strategies, for example Binford's utility index (1978) which has subsequently been adopted by others (Outram and Rowley-Conwy 1998; Savelle and Friesen 1996; Savelle et al. 1996; Brink 1997; Bar-Oz and Munro 2007), research into food culture has benefited from theoretical perspectives developed within an experimental framework. An important contribution has been the application of the *chaîne opératoire* to study subsistence. This term has traditionally been applied to experimental research into European lithic technology denoting an 'incorporation of the process of production and use into classification and interpretation' (Andrefsky 2005: 38). However, as Miracle suggests, 'the study of food would profit from use of the *chaîne opératoire* since food is material culture created by technical and social acts' (2002: 67).

Experimental archaeology and butchery data meet at a juncture where replication, modern analogy and cultural theory converge. As with the study of food, using the theoretical underpinnings of experimental research as well as a replicative methodology, butchery can be viewed as a form of socio-technological material culture, the process of carcass dismemberment acting as a series of stages that generate a product. This perspective allows us to study cut marks from a stronger theoretical standpoint, one that makes better use of experimental research and that goes beyond the simple replication of the observed marks. The goal of future research should be to move beyond mark replication to issues of wider significance that situate the role of faunal resource acquisition within economic, cultural and technological contexts.

Experimental replication and butchery analysis

Butchery data have been recognized as being an important indicator of cultural behaviour (White 1956; O'Connell et al. 1988; Grant 1987) and economic transition (Maltby 1984,

1985; Grant 1989). Looking at cut marks *per se* as opposed to butchery (distinguishing the *evidence* from the *processes* involved in resource acquisition) brings in research that addresses issues of cannibalism (Andrews and Fernandez-Jalvo 1997; Degusta 1999; Hurlbut 2000; Seetah 2007b), early human adaptation (Lewin 1981) and research linking tools and cut marks but where the material does not truly relate to the process of butchery (Ambrose 2001).

If we approach the subject from the perspective of the wider role of meat in the diet, economy and society (Fiddes 1991) we once again extend the scope of research within which an understanding of butchery plays a role. For example, the significance of meat eating for brain development (Aiello and Wheeler 1995), the role played in food sharing (Mooketsi 2001), cuisine (Goody 1982), gender roles (Gifford-Gonzalez 1993), divisions of labour (Ferguson and Zukin 1995), as a symbol of status (Grant 2002) and within a religious paradigm (Chakravarti 1979; Wilson 1991: 92–3; Brumberg Kraus 1999). From this we can conclude that *butchery* has a different meaning for different analysts (Lyman 1994: 294) and that cut-mark data can provide information to address a range of research agendas. Therefore, implementing a degree of standardization in the way butchery is recorded and analysed may prove beneficial for those interested in studying cut marks (explicitly defined as 'a taphonomically distinct carcass processing modification, demonstrating recognizable characteristics, caused through human agency' – with the caveat that, unlike previous use of 'cut mark' as a generic term, here it is subject to further sub-categorization, e.g. slice marks, scoops, nicks, etc., cf. Seetah forthcoming). However, this leads to two questions: is there scope for standardization considering the wide range of research interests that need to be addressed and what are the benefits?

Before addressing standardization of methods it is worth emphasizing the need for standardization of terminology. In this instance we need to refine our use of butchery terms and, as importantly, we need to define butchery itself. Definitions range from the very short and succinct – butchery 'is the removal of meat' (Russell 1987: 386) – to more in-depth appraisals such as Lyman's description of butchering as 'the human reduction and modification of an animal carcass into consumable parts' (1987: 252). However, two key aspects are missing from the above and other definitions. First, there is no reference to the cognitive component of the butchery process – what butchery *is* as well as its *outcomes*. Butchery is a *concept* encompassing and dependent on culturally specific attitudes. Thus, reference to the tiers of complexity that influence the decision-making process, to the principles and embodied techniques denoting *why* the actions were performed, is needed. Second, and crucial to achieving a more pragmatic definition, is the need to recognize the relationship between butchery and tools. Butchery in its conceptual form begins only when we see evidence of tools created specifically for this activity. Tools indicate the depth of complexity, the thought processes and time span needed for the range of activities involved in 'butchery'.

Thus butchery is 'the range of processes, employing implements, by which humans are able to disarticulate a carcass into units depending on ultimate use'. This definition has borrowed from preceding work with a few significant additions. The term 'range of processes' is very much the 'series of acts' highlighted by Binford (1978: 63) but with a subtle difference. A series of acts implies individual actions; a range of processes incorporates not just the individual cuts but also the tiers of complexity incorporating the

cuts, the techniques and the principles. 'By which humans' indicates a planned and cogently thought out series of processes; 'disarticulate a carcass into units depending on ultimate use' brings in functionality and the intended use of carcass parts; inclusion of the term 'implements' potentially forms the most important addition.

The first step towards methodological standardization is the need to recognize that butchery analysis is in effect the study of two separate lines of evidence: the actual cut marks and the implement signature (incorporating tool technology, morphology and manufacture). The 'cut mark' is recorded, but integrated into the record are data regarding the implement used. For more effective *quantitative* standardization we must achieve a degree of separation between these factors. Furthermore, there are shared idiosyncrasies of cut-mark analysis that are common to all those interested in looking at butchery data; methodological developments in one area may be beneficial to another and we should take a more integrative approach to zooarchaeology (Maltby 2004) and specifically butchery (Seetah 2004).

How then do we advance this research methodology? Linking tools and marks is not without precedent and has been noted within the context of both prehistoric (Shipman and Rose 1983; Domínguez-Rodrigo et al. 2005) and historic (Grant 1987) research. The key additional point proposed here is that this needs to be incorporated into the *recording* of the raw butchery data. Greenfield laments the lack of importance attributed to tools, noting that there were 'few attempts to discern the type of instrument making the cut mark, and even fewer attempts based on systematic experimental studies' (2002: 35). The accurate identification of the type of tool employed is imperative (cf. Greenfield (1999) for distinguishing stone vs. metal tools; Seetah (2004: 112–13) for a discussion of historic metal cleavers) and the need to identify the cut marks accurately from other taphonomic modifications has been well documented (i.e. Sadek-Kooros 1972; Hill 1979; Blumenschine et al. 1996; Phoca-Cosmetatou 2005: 137). However, to move butchery analysis forward we must build on research that distinguishes and identifies different tools and take steps to understand how these implements were used within a socio-technological framework. This may seem to be a highly inaccurate task at best and impossible at worst: how can we be sure of how the tools were employed? The actual experimental and methodological aspects of this proposal are outlined fully elsewhere (Seetah forthcoming). In brief, marks were recorded from a series of pre-selected sites and experimentally replicated in a controlled environment to test the feasibility and accuracy of the initial interpretation. Tools were reproduced based on archaeological models and used within the analytical process to mimic past butchery techniques.

Methods aimed at standardizing how butchery data are recorded, such as that proposed by Lauwerier (1988: 40–2), while theoretically informed and well structured methodologically, are missing an important component. In the absence of experimentation these models are detached contextually from the pragmatics of the activity in question. Although it is often impossible to qualify practical tasks performed in the past, we are, as discussed shortly, better able to do this for butchery. The main concern of the present paper will focus on issues that arose out of the aforementioned research (Seetah forthcoming) and that have implications for the way tools are used and how this is influenced by wider factors. Cut marks relate how the butchery was performed; understanding the *modus operandi* of the tools offers a clearer understanding of how the

cut marks were created; the most apposite way of achieving this deeper understanding is through experimental research.

Theodore White, credited with being one of the first archaeologists to emphasize the value of butchery analysis, employed an experimental approach in some of his early work (1952, 1953). This was reinforced by Yellen (1977), Binford (1978) and more recently by van-Wijngaarden-Bakker (1990), Egeland (2003) and Dewbury and Russell (2007). Allied to the direct study of the cut marks themselves, experimental research is employed to distinguish the type of tools responsible for creating the marks (Walker and Long 1977; Olsen 1988; Greenfield 1999, 2000, 2002). This is a crucial component and one that has considerable bearing on future standardization. Distinguishing between specific tool signatures is not only important methodologically but has also extended the experiential and scientific basis for the way butchery data are recorded. The inclusion of SEM technology has led to increased accuracy in the identification of cut marks versus other taphonomic modifications (Shipman 1981). This, combined with ethnographic and actualistic investigations, has laid the foundation for the development of new approaches for the study of carcass processing and indeed holds promise for a standardized text/handbook on the subject.

Appraising the way a tool has been used requires that we take into account the material from which the implement is produced, the underlying skeletal structure of the animal, the resources sought from the carcass and the socio-cultural and economic factors that influence the butchery process. It also requires that we include the physiological hand-eye coordination of the practitioner necessary to manipulate the carcass and cutting tool; if we include issues of aesthetics, waste, cuisine (discussed below) and the actual slaughter of the animal (Rixson 1988) we see cognition must also be factored into the equation. The resources that are required from the carcass are identified from the outset within the mind of the person performing the butchery and can dictate how the process of carcass dismemberment is executed. It is imperative that we see the butchery procedure as a continuum (or at least a set of linked stages) rather than single isolated actions (e.g. a chop). Untangling these complex relationships is an essential step in order fully to appreciate the significance of the observed butchery and gain a more complete appraisal of the recorded cut marks. The value of this approach has been demonstrated in recent research on some of the oldest butchered material (Domínguez-Rodrigo et al. 2005), although this type of investigation is the exception rather than the rule. We need to understand how one mark relates to others on the carcass, both within the immediate region and over the remainder of the animal. Furthermore, we should attempt to decipher the order and sequence of cut marks, the *chaîne opératoire* of butchery. Although initially the combination of factors involved would seem impossible to deconstruct, we are assisted by certain fundamental tenets. At the most basic level we have concrete evidence, in the form of the mark itself, from which to commence our appraisal of how the cut was inflicted. Furthermore, there is a finite number of ways in which the mark could have been made and from this we can infer the most plausible method used, for example, based on the direction from which the cut was created. By using an experimental approach we are able to control specific aspects of the task performed and reproduce isolated 'cut marks' or replicate a *chaîne opératoire* for a particular mode of butchery, e.g. tailored towards the removal of meat from major limbs only in the shortest amount of time, a mode that might

be observed following a mass kill where meat was in abundance. In this scenario an understanding of how the tools were employed could lead to a clearer appraisal of whether meat was subsequently processed for mid- to long-term storage.

The skeletal blueprint imposes constraints on how certain tools can be employed and these constraints have progressively been removed with the advent of metal axes, metal cleavers, as used for example in the Roman period, and modern saws. Although hand-axes and other stone 'cleavers' may have been capable of 'chopping', the archaeological evidence does not support this *modus operandi* for this tool (Roberts 1996). Therefore, we have an underlying tenet from which to appraise how the butchery was performed: the tool must follow the basic morphology of the animal. This point is reinforced if we take into account the material from which the tool is made. Metal tools allow for the greatest flexibility (and therefore variability) for carcass dismemberment; lithic tools, whether flakes or hand-axe, are restricted within the context of edge wear (Walker 1978), while bamboo (West and Louys 2007) and shell (Choi and Driwantoro 2007) tools will be entirely restricted by the skeletal structure. The distinction here is that of whether the tool can cut through bone or is forced to work around it, resulting in different modes of butchery. Furthermore, focusing the discussion on metal tools, it is important to link changing tool morphology with wider issues. In Britain, there is a tangible development towards increased tool effectiveness as we progress from the later prehistoric through to the historic periods (Seetah 2007a). This is probably as a result of advancements in weapons technology and metallurgy (Tylecote 1987) finding their way into more commonplace implements.

While this first proposed tenet is relatively straightforward, other issues that have implications for how the butchery task is executed are more subjective and have benefited from the inclusion of modern 'industrial' as well as ethnographic analogy. Focusing on historic periods, we can potentially gain a clearer appreciation of the butchery process ('the actions involved in butchery' (Lyman 1987: 252)) if we analyse the butchery performed from the perspective of desired outcome and include issues such as aesthetics, waste and cuisine.

Aesthetics, from a contemporary perspective, can be regarded as both a standardizing visual element and a means of turning a carcass from 'flesh' into a 'joint'. The aesthetics of meat presentation plays an important role in the processing and dispersal of meat products: our modern British perception of 'good meat' centres on the vivid red/pink colouration of (most) cuts, a reduction in visible fat and the removal of bone. This method of presentation depends on an animal being suitably endowed with flesh for bone removal to be both economically and aesthetically viable. Meat aesthetics was also of importance in past societies. The presentation of meat and game were crucial aspect of banquets and feasting (with the caveat that this is a specific setting and one that would have required time and status) during the medieval period (Lehmann 2003) where animals, particularly birds, were presented in a life-like manner as a centrepiece for the course (van Winter 2003). This must have been preceded by 'visual considerations' during the process of butchering the animal.

The above demonstrates that one of the reasons for our current (and this may extend back to the late- to post-medieval period) attitude towards carcass aesthetics potentially relates to morphological 'improvements' in the animal itself. These physical changes have

customized the animal to meet our economic, as well as aesthetic, requirements. A relatively thin domestic animal, which carried little meat, would not prove profitable if it was de-boned. Thus the dismemberment process of meat and bone occurred as a continuum with subsequent culinary preparations developed around this mode of butchery. It should also be remembered that the idea of meat without bone is a modern, and predominantly Western, predilection. It is unlikely to have been the normal practice within the majority of the historic past simply because there is considerable nutrition to be gained from marrow and grease (Outram et al. 2005). It is interesting to note that within a historic and a contemporary context the removal of meat is a technique that truly gains precedence once butchers have designated tools, in the form of cleavers and, more recently, mechanized saws to process bone easily. It is also worth reiterating that de-boning, especially when the bone itself is discarded, is highly wasteful and possible only within specialized societal situations.

The question of efficiency and waste in butchery is also of importance. While research has addressed the effectiveness of meat procurement from the perspective of speed or amount of meat removed using a specific technique (Seetah 2004: 111–12) this does not do justice to the full gamut of issues involved. Once again, modern analogy provides a useful balance point for a fuller appraisal of this issue. Waste in contemporary butchery practice is a complex issue where processes that may seem wasteful to the non-specialist have more to do with market strategy than with poor technique or inefficient practice. Certain parts of the carcass are discarded on the basis of health or saleability (which can lead to an index of a society's overall view of carcass usefulness). More cynically, specific parts are not sold in order to maintain the value and 'status' of other portions. A case could be argued that internal organs have fallen from favour and from supermarket shelves as much to maintain the value of muscular flesh as because of concerns regarding health or issues of processing. Furthermore, while we might assume that this is a prejudice specific to the modern industry, this is not the case. Ethnographic studies show that certain parts of a carcass will be discarded outside the village in order to satisfy ritualistic norms as well as notions of sanitation and hygiene. This is illustrated by the Huaulu, a group of forest-dwelling hunter gatherers from Indonesia, who butcher and discard viscera prior to bringing a carcass into the settlement (Valeri 2000: 314). Issues of waste have also been highlighted within historic archaeological contexts from the perspectives of both waste following the processing of animal bodies (Dobney 2001: 41) and the much larger-scale management of waste disposal. This latter topic was the subject of much debate and extensive political legislation during the medieval period, particularly in urban centres (Billington 1990; Sabine 1933), and demonstrates how the processing of meat can have much wider implications for society and how the act of butchery can become the focus of extensive social control.

Allied to aesthetics and efficiency are the implications for butchery of culinary practice and preference. Butchery data have tended to be couched in terms of production and processing, often from the perspective of tools used within the dismemberment process. However, even when we are able to appraise whether meat has been filleted from the bone, or gross dismemberment has taken place at joints, this is not actually the reason for the techniques observed. The motivation will invariably lie in subsequent processing, for either storage or immediate consumption through a range of culinary practices. Yellen (1977),

based on studies of the !Kung, has suggested that initial butchery (gross disarticulation) and choice of tools have a less significant role in terms of constructing bone assemblages than the processing that takes place for cooking. Gifford-Gonzalez points out that 'how an animal is disjointed and filleted depends on whether a butcher aims to produce joints of meat to roast on a fire, segments of bones and flesh to boil in a pot, boneless cuts to be sliced and dried as jerky, or manageable and quickly frozen segments for winter storage' (1993: 185). We need no clearer example of this than the methods described above, such as de-boning, to produce lean, bone-free, cuts of meat for the modern Western palate.

Recognition of the culinary practice is an important starting point in order to link butchery with cuisine. This takes the form of recognition of changes to the structure of bone as a consequence of cooking (Koon et al. 2003), heat (Subías 2002: 10–11) and fragmentation as a result of deliberate breakage (Gifford-Gonzalez 1993: 182). The latter is more relevant to this article and has been noted in a number of cases. At a medieval monastic site in Nievre, France, butchery techniques were linked to subsequent cooking practice as it was noted that cuts were made to remove a section of meat from between the neck and shoulder, which contemporaneous literary sources considered ideal for either roasting or boiling. The marks indicated that this region had been deliberately removed from carcass parts that were of 'inferior quality'. At the same site, it was noted that techniques to avoid splintering the bone were in evidence, particularly the 'cut-crack' method for breaking ribs. This involved using a heavy knife, or the back of a blade, to score or 'cut' the bone (without actually breaking it), then applying pressure to 'crack' it (Audoin-Rouzeau 1987). Thus, the resulting segments of ribs (and other bones as this method was noted from other carcass parts too) would not contain the splinters that might have been present if heavy chopping had been employed; there would also have been considerably less wear to the cutting edge of the tool.

The actual cooking technique is not the only cuisine-related factor that has implications for the way butchery is performed. The size of cooking vessels available, the preservation technologies in use by the group and the storage capabilities, all play a role in how the animal will be dismembered (Lyman 1987: 253; Gifford-Gonzalez 1993: 185). Studies of the Hadza for example demonstrated that 22 per cent ($n = 194$) of deliberate bone breakage was as a consequence of reducing the size of carcass units in order to fit metal pots, and to a lesser extent small hearths (Oliver 1993: 210).

The examples used above have hopefully demonstrated that the appraisal of butchery from prehistoric and historic sites would benefit from a more holistic approach to the study of cut marks, and in particular the development of techniques to analyse how the tools were used and what was governing the processes involved. While it is not my intention to situate this topic within a context of polemics, it is nonetheless important to recognize that different approaches and research questions are used to study cut marks depending on the perspective of the analyst and purpose of the research. Most important of these is chronology: the separation between those analysts working on prehistoric versus historic material. Even within this dichotomy there are tiers of separation: Greenfield (2002: 35) identifies a distinction between the use of cut-mark evidence in the prehistoric (Plio-Pleistocene) and late prehistoric/early historic (Holocene). Within a prehistoric context cut marks and tools are often the primary source of evidence for addressing crucial questions of human technological development: evidence for butchery

pre-dates that for the use of fire (Smil 2002). Within a historic framework butchery data have tended to be used to address issues of economics (i.e. Maltby 1984, 1985, 1989; Dobney et al. 1996; Dobney 2001; Lignereux and Peters 1996) with less emphasis on cultural factors (though these have been addressed by some researchers, cf. Grant 1987; Audoin-Rouzeau 1987). While prehistoric research attempts to situate the importance of butchery within a social, technological and cultural paradigm, and there is greater emphasis on the economics of a trade in meat in historic periods, it is rare that the approaches used by either camp address the driving force behind the butchery performed. The driver will invariably be specific to the period or landscape in question and may range from the quick removal of choice carcass units from a kill site to large-scale processing for military purposes. At the heart of the temporal division outlined above (and indeed sub-divisions) are the tools employed to perform the butchery task; thus it is imperative that we improve our ability to infer how these tools have been used.

Conclusion

Carcass butchery provides tangible evidence for one of the earliest known human behaviours. In essence butchery has remained largely unchanged as a technological exercise since its inception; what differ among regions, periods and groups are the socio-economic and socio-technological drivers behind the observed practice.

Modern analogy (even with industrial practices) has much to contribute and offers important perspectives on how evolving tool technologies influenced their mode of use. Furthermore, contemporary practice, both ethnographic and industrial, offers useful insights into past butchery methods. As Knight (2002: 28–33) has demonstrated on material from Danebury, using this approach can lead to the identification of similarities and differences between modern and, in this case, Iron Age practices, which in turn led to conclusions regarding the wider social significance of meat for different settlement types.

In theory at least, placing emphasis on how the butchery was *performed* rather than focusing on the minutiae of the cut mark would allow for the development of predictive models that could then be applied to an archaeological setting. Within a prehistoric context this approach could be used to address issues of meat storage or contribute novel interpretation to debates on whether early humans were predominantly hunters or scavengers. For historic research these models could provide valuable corroboration for written and artistic sources. The models would initially be based on an underlying principle of removing the greatest quantity of meat in the fastest time and progress to include other resources (desired outcomes) and other drivers, such as least amount of cuts (quickest need not necessarily equate to least amount of cutting). This 'driver/outcome' paradigm would provide the basic hypotheses taking into account the specific research agenda under investigation. The initial focus on 'efficiency' is one employed to allow us to fit our butchery interpretation into an accessible framework, particularly for prehistoric research where there is limited alternative evidence. This should not be seen as precluding models in the future based on non-efficiency-driven paradigms that allow us to address the socio-cultural attitudes inherent in the processing of carcasses.

While the inclusion of perspectives from modern analogy and cultural theory helps to fill gaps in our knowledge and is equally applicable within a historic (Peck 1986; Seetah 2004, forthcoming) or prehistoric (White 1953; Knight 2002) context, much future work still remains. In particular we need to extend the groups from whom we draw this analogy. While the inclusion of modern industrial butchery and contemporary ethnographical studies (Yellen 1977; Binford 1978; Jones 1980) is well documented, we need to include the perspectives of gamekeepers, furriers, knackers and modern huntsmen. Essentially, we must recognize that butchery is more than just a means to an end: it is a craft specialism, an expression of culture and a tool that has played a role in economic development. In order to appraise its many roles in the historic and prehistoric past fully, not only do we need correct identification of the marks, we should endeavour to reproduce accurately the tools involved and use these to replicate the marks themselves. This needs to be combined with a more complete overview of the many facets and perspectives from which past peoples have approached the task of butchery whether that occurs from a need to acquire specific resources on a subsistence level or within a more developed economic market system. This last point raises an important caveat that needs to be kept at the forefront of future research. Studies where the analyst has used the services of a professional butcher and 'encouraged' the trained individual to perform the task in a specific manner are fundamentally flawed. Although the use of professionals is to be encouraged (particularly in light of the depth of knowledge potentially available), by imposing preconditions we undermine a true interpretation of the butchery process and it is this parameter, coupled with the underlying patterning (Lyman 1987: 252), that we are ultimately attempting to understand.

The above illustrates the value of using analogues; however, it also highlights why it important to use these within an experimental framework. Analogues are themselves finite and limited/limiting, indeed an appropriate analogue may be absent contextually for the archaeological question under investigation. Within an experimental paradigm the proposed premise is more flexible and open to greater creativity. More important than this however is the experience gained by the analyst beyond the proposed hypothesis. Using butchery as an example, in terms of deciphering the intricacies of hand and eye coordination needed to perform specific butchery tasks (and ultimately better understand archaeological practice), there can be no substitute for actually performing the task itself. Not only does the experience gained within an experimental setting provide practical corroboration, it also helps to forge new research agendas and hypotheses. These in turn are addressed from a more informed position, with increased competency, particularly where a pilot study has formed part of the protocol, allowing for rigorous evaluation of recording methods and to refine logistics. Experimentation, whether combined with analogues or not, offers the analyst an opportunity to implement suitable controls and importantly (particularly in light of current directions in archaeological analysis towards scientific methods) to design projects that are repeatable and are thus more adept at testing posited hypotheses.

Acknowledgements

I would like to express my sincere thanks to Preston Miracle, Bryan Hanks and Aleksander Pluskowski for offering insightful comments on earlier drafts of this paper.

Many thanks also to Alan Outram and two anonymous reviewers for clear commentary and discerning guidance in fine-tuning some of my discussion. I would also like to thank Robert Foley with whom I had a discussion that led to thoughts on predictive models, Annie Grant for advice on tailoring specific aspects of my current work, for which funding was gratefully received from Peterhouse, and Mark Maltby for guidance on earlier research.

Grahame Clark Zooarchaeology Laboratory,
Department of Archaeology, Cambridge, UK

References

Aiello, L. and Wheeler, P. 1995. The expensive-tissue hypothesis: the brain and the digestive system in human and primate evolution. *Current Anthropology*, 36(2): 199–221.

Ambrose, S. H. 2001. Paleolithic technology and human evolution. *Science*, 291(5509): 1748–53.

Andrefsky, W. 2005. *Lithics*. Cambridge: Cambridge University Press.

Andrews, P. and Fernandez-Jalvo, Y. 1997. Surface modifications of the Sima de los Huesos fossil humans. *Journal of Human Evolution*, 33: 191–217.

Ascher, R. 1961. Analogy in archaeological interpretation. *Southwestern Journal of Anthropology*, 17: 317–25.

Audoin-Rouzeau, F. 1987. Medieval and early modern butchery: evidence from the monastery of La Charite-Sur-Loire (Nievre). *Food and Foodways*, 2: 31–48.

Bar-Oz, G. and Munro, N. D. 2007. Gazelle bone marrow yields and Epipalaeolithic carcass exploitation strategies in the southern Levant. *Journal of Archaeological Science*, 34: 946–56.

Bell, J. A. 1994. *Reconstructing Prehistory*. Philadelphia, PA: Temple University Press.

Billington, S. 1990. Butchers and fishmongers: their historical contributions to London's festivity. *Folklore*, 10: 97–104.

Binford, L. R. 1978. *Nunamiut Ethnoarchaeology*. London: Academic Press.

Blumenschine, R. J., Marean, C. W. and Capaldo, S. D. 1996. Blind tests of inter-analyst correspondence and accuracy in identification of cut marks, percussion marks and carnivore tooth marks on bone surfaces. *Journal of Archaeological Science*, 23: 493–507.

Brink, J. W. 1997. Fat content in leg bones of *Bison bison*, and applications to archaeology. *Journal of Archaeological Science*, 24: 259–74.

Brumberg-Kraus, J. 1999. Meat-eating and Jewish identity: ritualization of the priestly 'Torah of Beast and Fowl' (Lev 11: 46) in Rabbinic Judaism and medieval Kabbalah. *Association for Jewish Studies Review*, 24(2): 227–62.

Chakravarti, M. 1979. Beef-eating in Ancient India. *Social Scientist*, 7(11): 51–5.

Choi, K. and Driwantoro, D. 2007. Shell tool use by early members of Homo erectus in Sangiran, central Java, Indonesia: cut mark evidence. *Journal of Archaeological Science*, 34(1): 48–58.

Coles, J. 1979. *Experimental Archaeology*. London: Academic Press.

Costamagno, S., Théry-Parisot, I., Brugal, J. and Guibert, R. 2005. Taphonomic consequences of the use of bones as fuel: experimental data and archaeological applications. In *Biosphere to Lithosphere* (ed T. O'Connor). Oxford: Oxbow, pp. 52–64.

Degusta, D. 1999. Fijian cannibalism: osteological evidence from Navatu. *American Journal of Physical Anthropology*, 110: 215–41.

Dewbury, A. and Russell, N. 2007. Relative frequency of butchering cutmarks produced by obsidian and flint: an experimental approach. *Journal of Archaeological Science*, 34: 354–7.

Dobney, K. 2001. A place at the table: the role of vertebrate zooarchaeology within a Roman research agenda for Britain. In *Britons and Romans: Advancing an Archaeological Agenda*, Vol. 125 (eds S. James and M. Millett). York: CBA Research Report, pp. 36–46.

Dobney, K., Jaques, D. and Irving, B. 1996. *Of Butchers and Breeds: Report on Vertebrate Remains from Various Sites in the City of Lincoln*. Lincoln: City of Lincoln Archaeology Unit.

Domínguez-Rodrigo, M., Pickering, T. R., Semaw, S. and Rogers, M. J. 2005. Cutmarked bones from Pliocene archaeological sites at Gona, Afar, Ethiopia: implications for the function of the world's oldest stone tools. *Journal of Human Evolution*, 48: 109–21.

Egeland, C. P. 2003. Carcass processing intensity and cutmark creation: an experimental approach. *Plains Anthropologist*, 48: 39–51.

Ferguson, P. and Zukin, S. 1995. What's cooking? *Theory and Society*, 24(2): 193–9.

Fiddes, N. 1991. *Meat: A Natural Symbol*. London: Routledge.

Frison, G. C. 1989. Experimental use of Clovis weaponry and tools on African elephants. *American Antiquity*, 54(4): 766–84.

Gifford-Gonzalez, D. 1993. Gaps in zooarchaeological analysis of butchery: is gender an issue? In *From Bones to Behavior: Ethnoarchaeological and Experimental Contributions to the Interpretation of Faunal Remains* (ed J. Hudson). Carbondale, IL: Southern Illinois University, pp. 181–200.

Goody, J. 1982. *Cooking, Cuisine and Class*. Cambridge: Cambridge University Press.

Grant, A. 1987. Some observations of butchery in England from the Iron Age to medieval period. *Anthropozoologica*, Special(1): 53–9.

Grant, A. 1989. Animals in Roman Britain. In *Research on Roman Britain 1960–89*, Vol. 11 (ed. M. Todd). London: Britannia Monograph Series, pp. 135–47.

Grant, A. 2002. Food, status and social hierarchy. In *Consuming Passions and Patterns of Consumption* (eds P Miracle and N. Milner). Cambridge: McDonald Institute for Archaeological Research, pp. 17–25.

Greenfield, H. J. 1999. The origins of metallurgy: distinguishing stone from metal cut-marks on bones from archaeological sites. *Journal of Archaeological Science*, 26: 797–808.

Greenfield, H. J. 2000. The origins of metallurgy in the Central Balkans base on the analysis of cut marks on animal bones. *Environmental Archaeology*, 5: 93–106.

Greenfield, H. 2002. Distinguishing metal (steel and low-tin bronze) from stone (flint and obsidian) tool cut marks on bone: an experimental approach. In *Experimental Archaeology: Replicating Past Objects, Behaviours, and Processes* (ed J. R. Mathieu). Oxford: Archaeopress, BAR S1035, pp. 35–55.

Hill, A. 1979. Butchery and natural disarticulation: an investigatory technique. *American Antiquity*, 44: 739–44.

Hurlbut, S. A. 2000. The taphonomy of cannibalism: a review of anthropogenic bone modification in the American southwest. *International Journal of Osteoarchaeology*, 10: 4–26.

Ingersoll, D., Yellen, J. E. and Macdonald, W. (eds) 1977. *Experimental Archaeology*. New York: Columbia University Press.

Isaac, G. 1981. Archaeological tests of alternative models of early hominid behaviour: excavation and experimentation. *Philosophical Transactions of the Royal Society of London*, 292(1057): 177–88.

Jones, P. R. 1980. Experimental butchery with modern stone tools and its relevance for palaeolithic archaeology. *World Archaeology*, 12(2): 153–65.

Knight, S. 2002. Butchery patterns from Danebury. In *Re-searching the Iron Age* (ed. J. Humphrey). Leicester: Leicester Archaeology Monographs, Vol. 11, pp. 25–34.

Koon, H. E. C., Nicholson, R. A. and Collins, M. J. 2003. A practical approach to the identification of low temperature heated bone using TEM. *Journal of Archaeological Science*, 30: 1393–9.

Lauwerier, R. C. G. M. 1988. *Animals in Roman Times in the Dutch Eastern River Area* (Neaderrlandse Oudheden 12). Amersfoort: ROB.

Lehmann, G. 2003. The late medieval menu in England: a reappraisal. *Food & History*, 1(1): 49–83.

Lewin, R. 1981. Protohuman activity etched in fossil bones. *Science*, 213(4503): 123–4.

Lignereux, Y. and Peters, J. 1996. Techniques de boucherie et rejets osseux en Gaule Romaine. *Anthropozoologica*, 24: 45–99.

Lyman, R. 1987. Archaeofaunas and butchery studies: a taphonomic perspective. In *Advances in Archaeological Methods and Theory*, Vol. 10. London: Academic Press, pp. 249–337.

Lyman, R. L. 1994. *Vertebrate Taphonomy*. Cambridge: Cambridge University Press.

Maltby, J. M. 1984. Animal bones and the Romano-British economy. In *Animals and Archaeology 4: Husbandry in Europe* (eds C. Grigson and J. Clutton-Brock). Oxford: BAR International Series, pp. 125–37.

Maltby, J. M. 1985. Assessing variations in Iron Age and Roman butchery practices: need for quantification. In *Palaeobiological Investigation* (eds N. R. Fieller, D. D. Gilbertson and N. G. Ralph). Oxford: BAR International Series, p. 131.

Maltby, J. M. 1989. Urban and rural variation in the butchery of cattle in Romano-British Hampshire. In *Diets and Crafts in Towns* (eds D. Serjeantson and T. Waldron). Oxford: BAR British Series, pp. 75–107.

Maltby, J. M. (ed.) 2004. *Integrating Zooarchaeology*. Oxford: Oxbow.

Mathieu, J. R. (ed.) 2002. *Experimental Archaeology: Replicating Past Objects, Behaviours, and Processes*. Oxford: Archaeopress, BAR S1035.

Miracle, P. 2002. Mesolithic meals from Mesolithic middens. In *Consuming Passions and Patterns of Consumption* (eds P. Miracle and N. Milner). Cambridge: McDonald Institute for Archaeological Research, pp. 65–88.

Mooketsi, C. 2001. Butchery styles and the processing of cattle carcasses in Botswana. *PULA Botswana Journal of African Studies*, 15(1): 108–24.

O'Connell, J. F., Hawkes, K. and Jones, M. B. 1988. Hadza hunting, butchering and bone transportation and their archaeological implications. *Journal of Anthropological Research*, 44(2): 113–61.

Oliver, J. 1993. Carcass processing by the Hadza: bone breakage from butchery to consumption. In *From Bones to Behavior: Ethnoarchaeological and Experimental Contributions to the Interpretation of Faunal Remains* (ed. J. Hudson). Carbondale, IL: Southern Illinois University Press, pp. 200–28.

Olsen, S. 1988. The identification of stone and metal tool marks on bone artifacts. In *Scanning Electron Microscopy in Archaeology* (ed. S. Olsen). Oxford: Archeaopress BAR International Series 452, pp. 337–60.

Outram, A. 2001. A new approach to identifying bone marrow and grease exploitation: why the 'indeterminate' fragments should not be ignored. *Journal of Archaeological Science*, 28: 401–10.

Outram, A. 2002. Bone fracture and within-bone nutrients: an experimentally based method for investigating levels of marrow extraction. In *Consuming Passions and Patterns of Consumption* (eds P. Miracle and N. Milner). Cambridge: McDonald Institute for Archaeological Research, pp. 51–65.

Outram, A. and Rowley-Conwy, P. 1998. Meat and marrow utility indices for horse (*Equus*). *Journal of Archaeological Science*, 25: 839–49.

Outram, A. K., Knüsel, C., Harding, A. F. and Knight, S. 2005. Understanding complex fragmented assemblages of human and animal remains: a fully integrated approach. *Journal of Archaeological Science*, 32(12): 1699–710.

Peck, R. W. 1986. Applying contemporary analogy to the understanding of animal processing behaviour on Roman villa sites. Doctoral dissertation, University of Southampton.

Phoca-Cosmetatou, N. 2005. Bone weathering in the early European Neolithic: a taphonomy perspective. In *Biosphere to Lithosphere* (ed. T. O'Connor). Oxford: Oxbow, pp. 137–48.

Rixson, D. 1988. Butchery evidence on animal bones. *Circaea*, 6(1): 49–62.

Roberts, M. 1996. Man the hunter returns to Boxgrove. *British Archaeology*, 18: 8–9.

Russell, M. D. 1987. Mortuary practice at the Krapina Neanderthal site. *American Journal of Physical Anthropology*, 72: 381–97.

Sabine, E. L. 1933. Butchering in mediaeval London. *Speculum*, 8(3): 335–53.

Sadek-Kooros, H. 1972. Primitive bone fracturing: a method of research. *American Antiquity*, 37(3): 369–82.

Savelle, J. M. and Friesen, T. M. 1996. An odontocete (Cetacea) meat utility index. *Journal of Archaeological Science*, 23: 713–21.

Savelle, J. M., Friesen, T. M. and Lyman, R. L. 1996. Derivation and application of the Otariid utility index. *Journal of Archaeological Science*, 23: 705–12.

Seetah, K. 2004. Multidisciplinary approach to Romano-British cattle butchery. In *Integrating Zooarchaeology* (ed. M. Maltby). Oxford: Oxbow, pp. 111–18.

Seetah, K. 2007a. The Middle Ages on the block: animals, guilds and meat in medieval Britain. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages* (ed. A. Pluskowski). Oxford: Oxbow, pp. 18–31.

Seetah, K. 2007b. A zooarchaeological contribution to biological anthropology. In *Proceedings of the 6th Annual BABAO Conference* (eds K. Robson-Brown and A. Roberts). Oxford: Archaeopress BAR S1623, pp. 118–28.

Seetah, K. forthcoming. The importance of cut placement and implement signatures to butchery interpretation.

Shipman, P. 1981. Application of scanning electron microscopy to taphonomic problems. *Annals of the New York Academy of Science*, 276: 357–85.

Shipman, P. and Rose, J. 1983. Early hominid hunting, butchering, and carcass processing behaviours: approaches to the fossil record. *Journal of Anthropological Archaeology*, 2: 57–98.

Smil, V. 2002. Eating meat: evolution, patterns, and consequences. *Population and Development Review*, 28(4): 599–639.

Soriano, S., Villa, P. and Wadley, L. 2007. Blade technology and tool forms in the Middle Stone Age of South Africa: the Howiesons Poort and post-Howiesons Poort at Rose Cottage Cave. *Journal of Archaeological Science*, 34: 681–703.

Speth, J. D. and Spielmann, K. A. 1983. Energy source, protein metabolism, and hunter-gatherer subsistence strategies. *Journal of Anthropological Archaeology*, 2: 1–31.

Stone, P. G. and Planel, P. G. (eds) 1999. *The Constructed Past: Experimental Archaeology, Education and the Public*. London: Routledge.

Subías, S. M. 2002. Cooking in zooarchaeology: is this issue still raw? In *Consuming Passions and Patterns of Consumption* (eds P. Miracle and N. Milner). Cambridge: McDonald Institute for Archaeological Research, pp. 7–17.

Thompson, T. J. U. 2002. The assessment of sex in cremated individuals: some cautionary notes. *Canadian Society of Forensic Science Journal*, 35(2): 49–56.

Thompson, T. J. U. 2004. Recent advances in the study of burned bone and their implications for forensic anthropology. *Forensic Science International*, 146S: S203–S205.

Tylecote, R. F. 1987. *The Early History of Metallurgy in Europe*. London: Longman.

Valeri, V. 2000. *The Forest of Taboos: Morality, Hunting and Identity among the Huaulu of Moluccas*. Madison, WI: University of Wisconsin Press.

Van Wijngaarden-Bakker, L. H. 1990. Replication of butchery marks on pig mandibles. In *Experiment and Reconstruction in Environmental Archaeology* (ed. D. E. Robinson). Oxford: Oxbow, pp. 167–74.

Van Winter, J. M. 2003. Festive meals in the late Middle Ages: an essay on dining as a means of communication. *Food & History*, 1(1): 95–102.

Varela, S. L. L., Vangijn, A. and Jacobs, L. 2002. De-mystifying pottery production in the Maya Lowlands: detection of traces of use-wear on pottery sherds through microscopic analysis and experimental replication. *Journal of Archaeological Science*, 29: 1133–47.

Walker, P. L. 1978. Butchering and stone tool function. *American Antiquity*, 43(4): 710–15.

Walker, P. L. and Long, J. C. 1977. An experimental study of the morphological characteristics of tool marks. *American Antiquity*, 42(4): 605–16.

Wallaert-Pêtre, H. 2001. Learning how to make the right pots: apprenticeship strategies and material culture, a case study in handmade pottery from Cameroon. *Journal of Anthropological Research*, 57(4): 471–93.

West, J. A. and Louys, J. 2007. Differentiating bamboo from stone tool cut marks in the zooarchaeological record, with a discussion on the use of bamboo knives. *Journal of Archaeological Science*, 34: 512–18.

White, T. 1952. Observations on the butchering techniques of some aboriginal peoples: 1. *American Antiquity*, 17(4): 337–8.

White, T. 1953. A method of calculating the dietary percentage of various food animals utilized by aboriginal peoples. *American Antiquity*, 18(4): 396–8.

White, T. 1956. The study of osteological materials in the Plains. *American Antiquity*, 21(4): 401–4.

Wilson, A. 1991. *Practical Meat Inspection*. Oxford: Blackwell Scientific.

Yellen, J. E. 1977. Cultural patterning in faunal remains: evidence from the !Kung bushmen. In *Experimental Archaeology* (eds D. Ingersoll, J. E. Yellen and W. MacDonald). New York: Columbia University Press, pp. 271–332.

Zubrow, E. B. W. 1990. Modelling and prediction with geographic information systems: a demographic example from prehistoric and historic New York. In *Interpreting Space: GIS and Archaeology* (eds K. M. S. Allen, S. W. Green and E. B. W. Zubrow). London: Taylor & Francis, pp. 307–18.

Zubrow, E. B. W. 2002. Experimenting with continental migration. In *Experimental Archaeology: Replicating Past Objects, Behaviours, and Processes* (ed. J. R. Mathieu). Oxford: Archaeopress, BAR S1035, pp. 143–58.

Krish Seetah received his PhD on comparative distinctions between butchery practices in the Romano-British and medieval periods from the University of Cambridge. He is currently a Research Associate at the McDonald Institute for Archaeological Research on a Leverhulme-funded project studying the domestication of the horse and is involved in a number of projects spanning Eurasia and Africa.