Osteobiographies: local biologies, embedded bodies and relational persons

Jo Appleby

School of Archaeology and Ancient History, University of Leicester

University Road

Leicester

LE1 7RH

email: ja253@le.ac.uk

telephone: +44 1162522604

Keywords: local biology, embedded body, relational personhood, Richard III

Abstract

Osteobiography is an increasingly popular approach, but one that can have the effect of producing unproblematised, individualised approaches to the life course with little theoretical underpinning. In this contribution, I explore what osteobiographies represent. Rather than seeing them as the result of processes and events that happen to skeletons, osteobiographies are produced through the continuing interaction of genes, environment, culture and society over time. These four factors combine to produce osteobiographies that are individualised 'local biologies' (Lock 1993) and which are dynamic across the life course. Drawing on this interaction of the biological and the social, I argue that bone itself emerges out of social action as well as biological processes, and after death acts as a fossilisation of a personhood that is dynamic during life. This concept is drawn out through detailed analysis of the skeleton of King Richard III of England. Isotopic analysis of Richard's skeleton illustrates how his negotiation of his personhood as king caused changes in his lifestyle that altered his bone chemistry. Whilst evidence for increased consumption of high-status food and drink could be interpreted as resulting from increased access to these resources, in fact such consumption was a critical part of his approach to building and maintaining alliances. In this case, the skeleton provides a physiological record of political action.

Construction of osteobiographies is an increasingly popular approach for bioarchaeologists keen to move beyond population studies. The focus on the individual famously helps to give identities to previously 'faceless blobs', along with detailed life histories. The most theoretically informed osteobiographies emphasise different perspectives and can help to deconstruct dominant narratives in which groups are portrayed as homogeneous wholes (perhaps at most divided into age, gender and status groups) with shared interests and perspectives. However, I do wonder to what extent osteobiography is popular because its definition is vague.

Osteobiographies can be complex and theoretically informed, but they can also be little more than shopping lists of interesting skeletal features tacked onto descriptions of grave contexts. As an osteoarchaeologist, there is no need for me to buy into theory in order to produce an osteobiography. I can produce one through the lens of Science with a capital S.

Does this matter? In short, yes. Untheorised osteobiographies can easily end up peopling the past with individuals who would fit neatly into 21st century western society, but be unrecognisable to their contemporaries. At the same time, they can involve very reductionist understandings of the 'biological' that do not pay attention to recent developments in scientific thought that emphasise the complexity and recursiveness of organism-environment interactions. In contrast, I would argue that it is only thinking through osteobiographies in a theoretical framework that incorporates *both* the social and the scientific that will allow them to realise their true potential.

A theoretical approach to osteobiography can address one of two factors. Firstly, it can address what osteobiographies *do* (illustrating the life of a single individual; showing the relationships between individual and society; illustrating the time and tempo of lives lived). This is interesting in itself, but is not my focus here. Instead, I plan to focus on what osteobiographies *are*. What is actually going on in bone that makes osteobiography possible? To do this, I focus on the relationship between the biological and the social as they are worked out in bone, arguing that they cannot be separated out, but are entangled at the deepest level. This argument is worked out through the exploration of three key concepts, all of which have been influential in other fields, but which have had differing influences in archaeology. These are local biologies (Lock 1993b), embedded bodies (Niewöhner 2011) and relational personhood (Strathern 1988).

Before moving on to discuss these ideas, it is worth starting at a more basic level, and considering the nature bone itself. What is bone? At one level it is a structural support for our bodies, providing an anchoring point for ligaments and tendons, and reacting to the forces exerted upon it, whilst at the same time providing protection for our soft internal organs. Look a little closer and it is a nursery for red blood cells and a store for fat. Closer still and it is a complex arrangement of cells and inorganic bone matrix, either disordered in its arrangement or organised in concentric lamellar fashion and criss-crossed by constantly changing patterns of osteons. At another level still, it is a chemical store, providing vital nutrients to the body when needed, and hoarding them for future use when it is not. All of these levels are affected both by what we would term the 'biological' and the 'social' (for example, the effects on tendons and

ligaments of gendered patterns of activity or the effects on chemical stores of status-related differences in diet). Whatever bone is, it is not a 'thing', remaining stable across time and the space of the body. Rather it is a site where the biological and the social interact to produce a continual state of change. If we are to engage with the complexity of this most multiple and variable of substances, we need to engage with the idea that bone can be best understood as a process.

By approaching bone as a process rather than a thing, I hope to focus on the ways in which bodies, and hence skeletons, emerge through complex, ongoing and deeply contextual interactions between what we would term the social and the biological. The concepts of local biologies, embedded bodies and relational personhood offer interpretively rich ways of exploring *how* the biological and the social are entangled in bone.

Local Biologies and Embedded Bodies

The concept of local biologies was developed by Margaret Lock (1993b) in her publication *Encounters with Ageing: Mythologies of Menopause in Japan and North America*. This was based on years of study of menopausal women in Japan and elsewhere. Existing explanatory frameworks viewed biology as something essentially universal, with the body as a bounded, biological entity. Lock's work questioned both the boundedness of the body and its physical universality, suggesting instead that it emerged out of interaction of a combination of factors, some of which were biological in the traditional sense (for example genes), whilst others were cultural, social or even historical. Lock's ideas did not develop from a pre-existing theoretical stance, but from long-term fieldwork with menopausal women in Japan and North America.

Lock noted that in contrast to North America, where the concept of menopause is strongly associated with the cessation of menstrual cycling, in Japan an alternative term, 'Konencki', could be applied to both men and women. Japanese women did not associate the process of konencki strongly with the end of menstruation, with some post-cyclical women stating that they had yet to begin konencki. In addition, the symptoms associated with menopause varied between cultures. Japanese women rarely reported feeling hot flushes, but instead reported a series of alternative symptoms, including extreme fatigue, headaches and stiff shoulders. These symptoms are reported by Japanese men at the same, or sometimes higher, rates than by Japanese women (Melby 2006). The tendency in western biomedicine would be to either approach these findings as an anomaly, in which an 'exotic, eastern', body differs from the normative western body, or to dismiss the findings. For example, practitioners might suggest that lack of reporting of hot flushes resulted from a learned inattention to this kind of bodily symptom (Lock and Nguyen 2010:88); essentially, hot flushes are present in all populations, but are only 'noticed' by women from particular cultural background. Lock took a fundamentally different approach, instead arguing that this phase of life is experienced differently by women from different parts of the world not because of underlying variation or cultural differences, but

because biological difference is produced contingently in a constant entanglement of the biological, the environmental and the social under specific historical conditions.

It is now widely acknowledged that the 'normal' body of western biomedicine does not represent a universal, but is itself historically contingent, with its roots in enlightenment and post-enlightenment discourse from the 18th century onwards. Lock (1998:410-11) has been able to trace these processes in the way in which western understandings of menopause have themselves developed, from the traditional idea of the 'climacteric', a period of biological change that affected both men and women, and in which there was no association with the loss of menstruation in women, to the menopause - a period that is unique to women, pathologised, and linked emphatically to the cessation of menstruation and subsequent changes in hormonal regimes. The development of ideas of bodily universality were rooted in new practices, such as systematic anatomical study and the statistical analysis of epidemiological data. These served to create the idea of a 'norm' around which variation could be understood and measured. This approach underlies western medicine to this day, where test results are interpreted in terms of how well they correspond to a statistical average. For example, the growth of fetuses is interpreted by comparison to a growth chart showing the centiles for growth at different weekly stages. A fetus in the middle of the graph guarantees medical approval, whereas a fetus at one extreme or the other is cause for concern, irrespective of other variables that might explain the variation perfectly adequately. Such ideas of norm and variation go far beyond growth charts, and are often associated with moral judgements (for example in ideas of 'normal' and 'deviant' sexual behaviour).

In contrast to western biomedicine, which constructed the body as a normalised type, the physicality of the body has historically been lost in anthropological and sociological approaches, appearing to be constructed entirely (or almost entirely) through discourse (Lock 2015; 153; Niewohner and Beck 2017:64). This has applied even to fields that might logically be expected to take the body as a central focus of enquiry: for example, the first paper to explore the body in social gerontology didn't appear until 1996 (Oberg 1996). Lock (1993a; 2015:153) has noted that this has tended to further relegate the biological to its black box.

Whilst it can certainly no longer be said that the body is ignored in social theory, the amount of attention paid to *biological* difference is still very variable (Warin et al 2016). For example, Niewohner and Beck (2017) note that whilst anthropologists are very comfortable discussing how experiences are embodied, skills are accumulated etc., "how the body manages all this or how the internal organisation of bodies in combination with its material discursive environments affords the orderliness of practices remains mysterious. Anthropological as well as social analyses stop at the skin." (Niewohner and Beck 2017:65). This probably reflects a variety of factors. Most social theorists have limited training in the biological sciences, which makes it difficult to engage with the inter-relationships between biology and culture. At the same time, there remains a disquiet around 'universalising' discourse, and biology still tends to be seen that way by most social theorists, although with notable exceptions. Osteobiography

offers an opportunity to move beyond this universalising biology and 'skin-bound' discourse, through analysis of how bone is affected by interplays of the biological and the social.

The differences between the essentialised biology of biomedicine and local biologies can be seen in the definition of the 'real'. Rather than questioning the idea that there is such a thing as biological reality, local biologies question the universality of that reality (Nguyen and Lock 2010:93). In biomedicine (and western thought generally for the last one and a half centuries), the norm is equated with the 'real', universal, body. Whilst it is acknowledged that there is variation, such variation is itself explained in terms of how it relates back to the underlying reality. In contrast, the idea of local biologies understands variation and difference themselves as the 'real' biological, both historically and culturally contingent, phenomena. Citing Barad (2007), Nguyen and Lock suggest that whilst biologies are real, they are both shifting and contingent (Nguyen and Lock 2010:93). Similarly Lewontin (2003) suggests that we should understand organisms (including humans) as "a changing nexus of a large number of weakly determining interacting forces". Such an interpretation makes the idea of construction of a 'normalised' body not only impossible, but also irrelevant: in order to understand local biologies, we have to delve deep into these shifting and weakly interacting forces.

Seeing the body in this way offers evident potential for osteobiographical approaches, which are perhaps best approached through an engagement with bone itself. Advances in our knowledge of bone structure and behaviour in the past two decades have stressed the way in which this dynamic organ/tissue is continually reacting and changing in a recursive relationship with its environment, which is itself both internal and external to the body. In this view it simply makes no sense to regard the skeleton as a thing to which things happen, since the 'thingness' of the skeleton is itself in a constant state of flux. Bone is constantly laid down and remodelled in response to mechanical pressure, bodily demands for minerals such as calcium etc. These processes occur not through a single stimulus response mechanism, but through a continual interaction between genes regulating bone production and maintenance, epigenetic effects and changing environmental (in its broadest sense) interactions.

The developing field of epigenetics has provided the inspiration for the idea of the 'embedded body' (Niewohner 2011). This shares with local biology the idea that the body is intimately entangled with its social and cultural environment, but unlike the local biology approach, roots this strongly in specific epigenetic mechanisms. These mechanisms are yet to be fully understood (this especially applies to whether they are transmitted between generations through the germ line or not (see Meloni 2014:601; Niewohner 2011:284)), but several have been identified, most notably DNA methylation, but also processes such as alterations to telomeres (see Agarwal 2016 and Gowland 2015 for more in-depth discussions for how epigenetic processes may influence skeletal analyses). Niewohner emphasises that the embedded body is a contextual body, situated both temporally and spatially. Three so-called 'temporal horizons' are identified: evolutionary time, transgenerational/biographical time and the 'real' time of cellular activity (Niewohner 2011, 285). This provides an interesting counterpoint to John Robb's discussion of time in his 2002 paper on osteobiography, which

discussed the different scales of time that were represented in archaeology, but which situated the osteobiography in the area of biographical and inter-generational time. The temporal horizons of epigenetics offer the ability to move beyond the limits of the individual life course through links to events of previous generations as well as to specific events, through detailed study of a single body (cf. Agarwal 2016; Gowland 2015).

In addition to temporal contextuality, the embedded body is also situated in different spatial scales. The impact of epigenetic mechanisms on the gene means that it is porous to the outside environment (Meloni 2015, 139), both influencing and influenced by its surroundings. That environment also encompasses a variety of scales, from the genomic neighbourhood to the socio-material environment (Niewohner 2011:285) or 'milieu' (Meloni 2015, 139). The epigenetic body is thus "open to the world" in a way that the physically bounded body of traditional western biomedicine is not (Meloni 2015, 139).

Lock (2013:302) notes that local biologies and embedded bodies provide complementary perspectives on the ways in which the body and its context are entangled: "Whereas the concept of local biologies argues for an interiority that cannot be readily reduced to the universality of biomedicine *because* the body is inseparable from evolutionary, historical, and sociopolitical contexts, the embedded body provides a vehicle by means of which the molecularized, flexible, biology of epigenetics can retroactively be situated in contexts external to the body: evolutionary, environmental, historical and sociopolitical."

Local biologies and embedded bodies offer a way of exploring how bodies themselves are constructed, but we can also see the body as a locus for the construction of relational forms of personhood, and personhood itself may become entangled with bodily processes that produce local biologies and embedded bodies. It is to how such personhood might be seen in the skeleton that I now turn.

Osteobiography and Personhood

The notion of relational personhood was famously developed by Marilyn Strathern (1988) as a counterpoint to what she saw as an excessive focus on the individual. Strathern argued that the view of the individual as innate and bounded was not a cultural universal, but reflected a specific understanding of the person that had developed in western societies. In contrast to the fixed individual, relational persons were unstable, and composed out of multiple relations. This idea was captured in the notions of the 'dividual'. Strathern's ideas have been widely taken up in anthropology and archaeology, most notably in archaeology by Fowler (e.g. 2001, 2004, 2016). In his 2004 book *The Archaeology of Personhood*, he identified two major forms of dividual personhood. In partible forms of personhood, part of the person could be extracted and given to another; in permeable forms of personhood, the person could be changed by flows and energies moving between persons, but without extracting part of one of them.

Relational personhood is a construct that in archaeology has been seen as having correlates in material practice involving body manipulation, especially as it relates to the potential to fragment and reincorporate bodies (e.g. Appleby 2010; Bruck 2001, 2004; Jones 2005). With occasional exceptions (e.g. Appleby 2010), though, emphasis has remained on using the treatment of the dead body, or on material culture relating to the body, to reconstruct attitudes to the living person. Less consideration has been given to the implications of relational modes of personhood for how we approach bodies themselves as formerly living entities. I would argue that in fact, relational personhood offers significant potential for approaching osteobiographical study.

In a paper published in 2016, Fowler set out significant ways in which his thinking about relational personhood has changed. In particular, and in line with anthropologists such as LiPuma (1998), he argues that rather than seeing relational personhood as something 'other' and existing in *opposition* to the idea of the individual, personhood can have something of the relational about it in all cultural contexts. In Fowler's reading, personhood should be seen as multi-modal, enabling people to move between different modes of personhood depending on activity and context. In this reading, even the most individualistic of cultures incorporates some degree of relational personhood: "personhood is always relational, but the relationships involved vary qualitatively in nature and strength, draw different boundaries and identify different features of personhood as axiomatic, from case to case." (Fowler 2016, 403)

How can ideas of relational personhood, local biologies and embedded bodies be brought together in the form of osteobiographies? The answer is, that all of these concepts are intertwined at the level of bone and of the skeleton. Relational personhood is constructed out of continuing patterns of interaction between persons and between persons and things. Those interactions occur at a variety of scales, from inter-generational transfer of genetic material, through the creation of specific bodily environments, to the deliberate transfer of substances between people. This entanglement of the relational person and the embedded body is constantly materialised in bone. In life this process is dynamic, but after death it becomes fixed in the skeleton. Whilst osteologists are rightly wary of attributing *personality* to skeletons, this entanglement means that we can see skeletons as fossilisations of historic personhood and as inherently relational. That might mean understanding patterns of methylation as materialisation of interpersonal relations (whether nurturing or violent) or understanding isotopic signatures as materialisations of food sharing.

Local biology, embedded bodies and relational personhood in practice: an Osteobiography of Richard III

The skeleton of Richard III was discovered in 2012, lying underneath a carpark in Leicester in the site of the former Greyfriars Friary. Its identification provided a rare opportunity to investigate the inter-play between local biology, the embedded body and personhood for a well-known

historical individual, allowing us to investigate how these concepts might be used to inform osteobiographical approaches. Whilst historical accounts of Richard's life are incomplete (for example, little is known about his early childhood), we do know about the main political events affecting his life, as well as considerable information about where he was living at different periods and his involvement in a major period of civil war in England, the Wars of the Roses. In this section, rather than providing a full osteobiography of Richard, I will investigate how osteobiography could be used to provide a different perspective on two specific periods of his life. Firstly, I will investigate how Richard's growing body was a site of negotiation and entanglement between a local biology of elite males and the specifics of Richard's life. This local biology was partially brought about through the embedding of Richard's body in its social and historical context, which may have been associated with specific epigenetic processes. I will then move on to discuss how the negotiation of personhood during his reign has become fossilised in the isotopic make-up of his skeleton.

Richard III is a controversial figure in English history, best known through Shakespeare's play. He was born in 1452 A.D., the eleventh child of Richard, Duke of York and Cecily Neville. Richard's childhood took place against a background of political instability: his father fell out with the reigning king, Henry VI, during the 1450s and a period of civil war, subsequently known as the Wars of the Roses, ensued. When Richard was seven, he and his mother were captured by Henry's army following the battle of Ludlow and only freed the following summer. His father was killed following the battle of Wakefield in 1460, after which Richard and his brother George were sent by their mother to the Low Countries, returning to England in 1461 after the Yorkist victory at the battle of Towton. Following this victory, Richard's older brother Edward ascended the throne as Edward IV and Richard was made Duke of Gloucester. Richard's later childhood was spent under the care of the Earl of Warwick at Middleham Castle in Yorkshire, where he would have received knightly training. In 1470, Warwick defected to the Lancastrian side in the Wars of the Roses and both Richard and Edward fled to Burgandy. They returned in 1471, defeating the Lancastrians in the battles of Barnet (where Richard was apparently wounded) and Tewkesbury.

On the death of Edward IV in 1483, Richard ascended the throne, deposing his nephew, Edward V, in the process. Edward and his brother Richard were subsequently taken to the Tower of London, where they disappeared. Whether Richard himself was responsible has never been proven, but the potential murder of the princes in the tower has dominated discussion of Richard III ever since.

Richard III's reign was a short one, and he was never really secure on the throne. He faced a constant threat from political opponents and was abandoned by key allies, such as the Duke of Buckingham, who rebelled against him in 1583. A key opponent was Henry Tudor. Although Henry's claim to the throne was a weak one, Lancastrian claimants with stronger claims had been eliminated by this stage. Henry spent Richard's short reign exiled in France, where he acted as a rallying point for Richard's enemies. By summer of 1484, Henry had gained sufficient support to land a military force in Wales. He then marched across to the English midlands,

gaining support along the way. Richard and Henry met at the battle of Bosworth on August 22 1485, where Richard was killed during a cavalry charge that came close to killing Henry. His body was brought into the nearby town of Leicester and buried there in the church of the Greyfriars.

Whilst the above presents a standard view of the 'facts' of Richard's life and reign, an osteobiographical approach offers a way of approaching Richard as a person in whom the biological, the social and the political were interwoven in a way that cannot be easily untangled. We can use the idea of a fifteenth century elite male 'local biology', along with ideas of epigenetic embeddedness to investigate how Richard's skeleton was not merely individualised, but came into being in a way that was "open to the world" (Meloni 2015: 139) and profoundly affected by it. Isotopic analysis of his remains allows us to investigate how Richard's kingly personhood was not purely individual, but was significantly relational; constructed through processes of interaction and transmission of substances between him and his subjects.

Evidence of a medieval 'elite male local biology' can be seen in skeletons from a variety of sites and backed up with evidence from historical sources. Elite male bodies were both deliberately and incidentally modified in a number of ways that would have made them distinct from non-elite groups. Whilst a variety of factors contributed to this, diet and physical training for warfare probably had the greatest impact (there is evidence, for example, that medieval elite males had a different body conformation to non-elite males [Rhodes and Knüsel 2005]). In addition, the relatively restricted patterns of marriage within medieval noble society may have led to a degree of genetic distinction in this group. Epigenetic effects would have been created by elite practices around pregnancy, childbirth and childrearing alongside diet and nutrition. During the Wars of the Roses, episodes of violence and uncertainty in childhood may well also have had effects on the elite male epigenome, for example affecting telomere length (see references in Oliveira et al 2016; Mitchell et al 2017) and methylation patterns (Soares et al 2017). The study of Richard's skeleton can be placed alongside known events from his life to investigate how the local biology of the late medieval elite male, the historical events of the mid fifteenth century and the specific trajectory of Richard's growth and development inter-related to produce a particularised body, but one that was intimately embedded in its milieu.

Unlike many of his subjects, Richard III would never have been at risk of malnourishment due to scarcity or high food prices. Whilst study of skeletons of medieval peasants from Wharram Percy has suggested that they were subject to malnourishment affecting growth (Mays 1996, 147), elite individuals consumed large quantities of food, including significant amounts of protein from animals and fish (Muldnner et al 2007). Isotopic analysis of Richard's teeth shows that he consumed high levels of meat and fish throughout his life, increasing through childhood and then changing again after he came to the throne (Figure 1; see below). It is notable that despite numerous episodes of psychosocial stress (for example, the capture of him and his mother in 1459, or the death of his father in 1460 leading to his exile in the Low Countries), there are no signs of growth interruptions in his bones or teeth, which are free of Harris Lines and enamel hypoplasias. Although we cannot demonstrate cause and effect, his position as an elite male may have buffered him against such stresses. Interestingly, there is also no indication that these

periods caused declines in the protein content of Richard's diet (Figure 1; Lamb et al 2014), as we might expect in periods where he was living under the control of his family's enemies or as a relatively powerless exile.

Whilst methods to identify epigenetic changes from aDNA are only beginning to be applied (Gokhman et al 2017), and have not currently been used to study Richard, it is possible that the periods of violence and instability he experienced would have had a lasting effect on his epigenome. For example, witnessing violence as a child has been associated with shortened telomeres (Oliveira et al 2016), as has the death of a father (Mitchell et al 2017), whilst stressful life events in childhood have been associated with hypermethylation (Soares et al 2017). Such effects may have temporarily or permanently affected Richard's body, including in the way that he responded to stress and the way in which he aged. The political instability of the fifteenth century means that such effects may have been widespread amongst both elite and non-elite individuals. Whilst we are not yet in a position to investigate them, it may well become possible in future work, allowing a reassessment of the recursive relationship between stressors and bodily effects in this period, which may in turn allow us to rethink results of palaeopathological analysis of elite and non-elite populations.

Richard III's body can thus be seen as representative of an elite male 'local biology' in a variety of ways, including through the effects of access to significantly more and more variable foods than the 'average' medieval person, but it was also embedded in its context through the epigenetic impact of events that were specific to his childhood. Richard's skeleton also offers insight into an additional feature of his body that differentiated him from the ideal elite male form: he developed scoliosis at some point during late childhood or adolescence (Appleby et al 2014). This was precisely the same point that he would have begun training to create a 'knightly' body and indicates a tension between the attempt to sculpt the body into an appropriately elite male form, and the progressive nature of his spinal deformity. This may well have in turn had implications for how he was viewed by his fellow apprentices. Richard was placed under the care of the Earl of Warwick to undertake his knightly training. There are no historical sources detailing this aspect of Richard's life, but letters from his older brothers Edward and Edmund during their training do survive, and demonstrate the potential for bullying between the boy apprentices. The letters complain about the 'odious rule and demeaning' of Richard Croft and his brother (Baldwin 2013, 38). Richard would potentially have been made more vulnerable by his increasing spinal curvature during this period.

Richard appears to have been physically capable and later gained a reputation for bravery in battle, but there is no getting away from the fact that whilst the other knightly trainees' bodies progressed towards the knightly ideal, Richard's would have moved away from it.

Richard III's body was thus a location for the formation and working through of local biologies, which were also affected by significant individual differences, but it was also a place where his personhood itself was negotiated and embodied. This is perhaps best expressed through exploration of the changing isotopic composition of his bones. Analysis of Richard's femur,

which represents a composite signature of approximately the last 15 years of his life, shows a different dietary signature than his rib, which due to its higher proportion of trabecular bone and subsequent higher remodelling rate, represents only the last two to three years of his life, co-incidentally but usefully coinciding with the length of his reign. The rib shows elevated ^{18}O levels, which has been interpreted as indicating an increased wine consumption, along with an increase in ^{15}N (Lamb et al 2014; Figure 1). This latter characteristic is consistent with increased consumption of high-status protein-rich foods such as fish and wildfowl. The traditional way to interpret this change in diet would be that Richard's ability to access high-status food and drink increased when he became king. This is not wrong, but obscures the specific processes of negotiation of personhood that led to the changes in Richard's bones.

Kingship is not something that is passively acquired, despite ideologies of divine kingship, but rather requires a relationship of mutual consent between ruler and subjects. Of course this 'consent' is not equally available to all subjects, but the potential for rulers to be deposed is ever present, and periods of civil war such as the Wars of the Roses demonstrate the potential fragility of a king's position. Taken in this way, Richard's kingship is an aspect of his person that must be seen as mutually constituted by Richard and his subjects (in particular the nobility), and which was fossilised into his skeleton through the giving and receiving of food and drink.

After becoming king, Richard embarked upon a progress around his new kingdom. During this progress, he stayed with a series of noble families, both existing allies and families whose loyalty was considerably more dubious. The royal progress was not just a matter of a king imposing his authority, but instead functioned as a way for Richard to create and cement ties with his subjects, and critically for his subjects to create and cement ties with their ruler, and to reassess the degree to which they would provide him with their support. A critical aspect of this process was the provision of banquets, during which social ties were reinforced through the provision of large quantities of high-status food and drink. Subjects needed to provide this, but it was also critical that Richard took part in these banquets. Refusing hospitality could have caused serious offence. Woolgar (2011:13) notes the importance of gifts of food during meals, and in particular the gift of particular high-status food items that were served only to the highest status guests. Feasts during the medieval period included a great variety of dishes, but not all of these were served to everyone present. Instead, food was distributed according to status, with particular delicacies reserved for the highest status person present. Critically, these delicacies were not just eaten by that person, but were distributed to those with whom they wished to create and cement alliances. This approach is demonstrated in a list of rules given to the countess of Lincoln by Robert Grossteste. These advised her to ensure that her dish was kept well supplied with food, especially from the entremets (particular delicacies, which were served between courses). Having her dish supplied in this way would allow her to share food with those on the high table, as well as anywhere else that she wished (Woolgar 2011:13). Richard III would have been familiar with the need for such food-sharing practices and we can assume that once he became king, they would have been an important component of the creation and maintenance of alliances. He would have needed to be seen both as distributing and consuming gifts of food

during frequent feasts at his subjects' tables. High-status foods such as wildfowl would have been particularly appropriate for such practices.

The elevated ^{18}O and ^{15}N levels in Richard's rib can thus be seen not merely as an indication that he took advantage of the opportunity to eat and drink well, but as an osteobiographical manifestation of his continuing negotiation of identity and personhood. A king is not a figure apart, but is created through a series of specific inter-relationships with his subjects, and these have physiological effects. In Richard's case this is best expressed through changes in bone chemistry, but had he lived longer, there may have been additional changes in his skeleton: perhaps DISH associated with the development of type II diabetes, or osteoarthritis associated with obesity.

Richard's ribs also probably shouldn't be seen as expressions of the 'typical' effect of kingship upon the skeleton. His particular circumstances, probably along with his personality, made food sharing a more-than-usually critical part of his inter-relationships with his powerful subjects, during which his personhood was actively shaped and transformed by the ingestion of particular substances.

Richard III is not the 'typical' subject for an osteobiography. Historical accounts mean we know a lot about the events of his life, whereas most osteobiographical studies deal with anonymous individuals (although there are exceptions, e.g. Katzenburg and Saunders 2012; Knüsel et al 2010); however, his skeleton gives us the opportunity to explore in detail how concepts of local biologies, embedded bodies and relational personhood can play out in the individual. Even without historical detail, much of this would still be accessible to us in the study of an unknown archaeological skeleton (for example, the tension between the martial training of an elite individual and the development of scoliosis or the evidence for changes in the negotiation of personhood shown by changes in isotopic signatures during the life course). Incorporating a deep analysis of contextual archaeological evidence (a feature of existing osteobiographical approaches) would provide a meaningful alternative to the historical narrative provided here.

This account also emphasises the role that methodological advances have to play. Epigenetic processes such as DNA methylation are beginning to be explored in aDNA studies, but have as yet been very limited in their application. Just as aDNA itself is changing the way in which we can study the past, epigenetics has the potential to allow us to explore the porosity of bodies to their context, rather than simply searching out cause and effect relationships.

Conclusion

In this paper, I have approached bone not as a substance, but as a process in which entanglements between the biological and the social shape bodies. The porosity of bodies to milieu and vice versa means that the osteobiography offers a unique opportunity to study these entanglements. The concepts of local biology and the embedded body enable us to see how the

osteobiography offers not a counterpoint to large-scale population studies, but a site for investigating the inter-relationship between social commonalities and the effects of specific events, which themselves may have inter-generational effects.

At the same time, we need to recognise the fact that relational modes of personhood described are not purely useful metaphors for exploring social concepts, but may have specific and measurable effects upon the body, and upon the makeup of the skeleton. Even in societies with an emphasis on the individual, personhood is achieved and negotiated through inter-relations between people and between people and things, which are literally embodied in the skeleton through patterns of food sharing, of care or of activity. This skeletonisation of personhood, fossilised after death, can be identified through detailed studies of single skeletons. Whilst investigation of personhood at the level of bone biology and biochemistry are complex to understand for skeletons of people who are not known historical individuals, this does not mean that they are not necessary. Rather, we should understand that this is something we *always* see. We just need to find more effective means of identifying it, whether this involves developing the theoretical underpinnings to our analysis, using existing techniques in new ways, or developing new methods for the study of bone.

Acknowledgements

Many thanks to Lauren Renee Hosek and John Robb for their initial invitation to contribute this paper, and their subsequent patience as a number of unforeseen events and family disasters delayed its submission. Without their continued encouragement, it would certainly never have seen the light of day. Thanks also to the Richard III society and particularly Phillipa Langley for their role in the location of the remains of Richard III (including significant financial support); to the University of Leicester who financed much of the analysis, and to Angela Lamb and Jane Evans of the British Geological Survey who carried out the isotopic analysis of the skeleton. The University of Leicester Archaeological Services carried out the excavation of the Greyfriars site and led the identification process for Richard III's skeleton and I am grateful to them (particularly Richard Buckley and Mathew Morris) for involving me in this exceptional project.

References Cited

Agarwal, Sabrina C. 2016. Bone morphologies and histories: Life course approaches in bioarchaeology. *American Journal of Physical Anthropology* Supplement: Yearbook of Physical Anthropology 159 (S 61): 130–149. DOI: 10.1002/ajpa.22905

Appleby, Jo. 2010. Ageing as fragmentation and disarticulation. In *Body parts and wholes: Changing relations and meanings*, edited by Katharina Rebay, Marie-Louise Sørensen and Jessica Hughes. Oxbow, Oxford, pp. 46–53.

Appleby, Jo, Mitchell, Piers D., Robinson, Claire, Brough, Alison, Rutty, G., Harris, Russell A., Thompson, David and Bruno Morgan. 2014. The scoliosis of Richard III, last Plantagenet King of England. Diagnosis and clinical significance. *The Lancet* 383:1944. DOI:[10.1016/S0140-6736\(14\)60762-5](https://doi.org/10.1016/S0140-6736(14)60762-5)

Appleby, Jo, Rutty, Guy N., Hainsworth, Sarah V., Woosnam-Savage, Robert C., Morgan, Bruno, Brough, Alison, Earp, Richard W., Robinson, Claire, King, Turi E., Morris, Mathew and Richard Buckley. 2015. Perimortem trauma in King Richard III: a skeletal analysis. *The Lancet*, 385(9964): 253–259. DOI:[10.1016/S0140-6736\(14\)60804-7](https://doi.org/10.1016/S0140-6736(14)60804-7)

Baldwin, D. 2013. *Richard III*. Amberley Press, Stroud.

Barad, Karen. 2007. *Meeting the Universe Halfway. Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press, Durham, NC.

Brück, Joanna. 2001. Monuments power and personhood in the British Neolithic. *Journal of the Royal Anthropological Institute* 7(4):649–67.

Brück, Joanna. 2004. Material metaphors: the relational construction of identity in Early Bronze Age burials in Ireland and Britain. *Journal of Social Archaeology* 4:307–33.

Fowler, Christopher. 2001. Personhood and social relations in the British Neolithic with a study from the Isle of Man. *Journal of Material Culture* 6(2):137–163.

Fowler, Christopher. 2004. *The Archaeology of Personhood: An Anthropological Approach*. Routledge, London.

Fowler, Christopher. 2016. Relational personhood revisited. *Cambridge Archaeological Journal* 26(3):397–412.

Gokhman, David, Malul, Anat and Liran Carmel. 2017. Inferring past environments from ancient epigenomes. *Molecular biology and evolution* 34, 10: 2429–2438.

Gowland, Rebecca L. 2015. Entangled lives: Implications of the developmental origins of health and disease hypothesis for bioarchaeology and the life course. *American Journal of Physical Anthropology* 158(4):530–540.

Jones, Andrew. 2005. Lives in fragments? Personhood and the European Neolithic. *Journal of Social Archaeology* 5:193–224.

Katzenburg, M. Anne and Shelley R. Saunders. 2012. Life and Death of a Mother and Child in Nineteenth-Century Ontario, Canada. In *The Bioarchaeology of Individuals* edited by Anne L.W. Stodder and Palkovich, Ann M. University Press of Florida, Gainesville, pp.217–228

Knüsel, Christopher J., Catherine M. Batt, Gordon Cook, Janet Montgomery, Gundula Müldner, Alan R. Ogden, Carol Palmer, Ben Stern, John Todd, and Andrew S. Wilson. 2010. The identity of the St Bees Lady, Cumbria: an osteobiographical approach. *Medieval Archaeology* 54(1):271–311.

Lamb, Angela L., Evans, Jane E., Buckley, Richard and Jo Appleby. 2014. Multi-isotope analysis demonstrates significant lifestyle changes in King Richard III. *Journal of Archaeological Science* 50:559–565.

Lewontin, Richard C. 2003. Science and Simplicity. *New York Review of Books* 50:39–42.

LiPuma, Edward. 1998. Modernity and forms of personhood in Melanesia, in *Bodies and Persons: Comparative views from Africa and Melanesia*, edited by Michael Lambek and Andrew Strathern. Cambridge University Press, Cambridge, pp. 53–79.

Lock, Margaret. 1993a. Cultivating the Body: Anthropology and Epistemologies of Bodily Practice and Knowledge. *Annual Review of Anthropology* 22:133–155 .

Lock, Margaret. 1993b. *Encounters with Aging: Mythologies of Menopause in Japan and North America*. University of California Press, Berkeley.

Lock, Margaret. 1998. Menopause: lessons from Anthropology. *Psychosomatic Medicine* 60(4):410-419.

Lock, Margaret. 2013. The epigenome and nature/nurture reunification: a challenge for Anthropology. *Medical Anthropology* 32(4):291–308. DOI:10.1080/01459740.2012.746973.

Lock, Margaret. 2015. Comprehending the body in the era of the epigenome. *Current Anthropology* 56(2):151–177.

Lock, Margaret and Vinh-Kim Nguyen. 2010. *An Anthropology of Biomedicine*. Wiley-Blackwell, Oxford.

Öberg, Peter. 1996. The absent body – a social gerontological paradox. *Ageing and Society* 16(6):701–20.

Mays, Simon. 1996. Age-related cortical bone loss in a Medieval population. *International Journal of Osteoarchaeology* 6:144–154. DOI:[10.1002/\(SICI\)1099-1212\(199603\)6:2<144::AID-OA261>3.0.CO;2-G](https://doi.org/10.1002/(SICI)1099-1212(199603)6:2<144::AID-OA261>3.0.CO;2-G)

Melby, Melissa K. 2006. Climacteric symptoms among Japanese women and men: comparison of four symptom checklists. *Climacteric* 9(4):298–304.

Meloni, Maurizio. 2014. How biology became social, and what it means for social theory. *The Sociological Review* 62:593–614. DOI:10.1111/1467-954X.12151.

Meloni, Maurizio. 2015. Epigenetics for the social sciences: justice, embodiment and inheritance in the postgenomic age. *New Genetics and Society* 34(2):125–151.

Mitchell, Colter, McLanahan, Sara ,Schneper, Lisa, Garfinkel, Irv, Brooks-Gunn, Jeanne and Daniel Notterman. 2017. Father loss and child telomere length. *Pediatrics* (2017): e20163245.

Müldner, Gundula and Michael P. Richards. 2007. Diet and diversity at later medieval fishergate: the isotopic evidence. *American Journal of Physical Anthropology* 134:162-174.

Niewöhner, Jörg. 2011. Epigenetics: Embedded bodies and the molecularisation of biography and milieu. *BioSocieties* 6(3):279–298.

Niewöhner, Jörg. and Stefan Beck. 2017. Embodying Practices: The Human Body as Matter (of Concern) in Social Thought. In *Methodological Reflections on Practice Oriented Theories* edited by Michael Jonas, Beate Littig and Angela Wroblewski. Springer, Cham, pp. 63–77.

Oliveira, Bruna Silva, Zunzunegui, Maria Victoria, Quinlan, Jacklyn, Fahmi, Hassan, Thanh Tu, Mai and Ricardo Oliveira Guerra. 2016. Systematic review of the association between chronic social stress and telomere length: A life course perspective. *Ageing research reviews* 26: 37–52.

Rhodes, Jill A. And Christopher Knüsel. 2005. Activity-related skeletal change in medieval humeri: cross-sectional and architectural alterations. *American Journal of Physical Anthropology* 128:536–546.

Robb, John. 2002. Time and biography: Osteobiography of the Italian Neolithic lifespan. In *Thinking Through the Body: Archaeologies of Corporeality* edited by Yannis Hamilakis, Mark Pluciennik and Sarah Tarlow. Springer, New York, pp. 153–171.

Soares, S., Rocha, V. and S. Fraga, S. 2017. Childhood violence, inflammation and DNA methylation: a systematic review. *European Journal of Public Health* 27(suppl_3):269–270.

Strathern, Marilyn. 1988. *The gender of the gift: problems with women and problems with society in Melanesia*. University of California Press, Berkeley.

Woolgar, C.M. 2011. Gifts of food in Late Medieval England. *Journal of Medieval History* 37(1):6–18.

Figure captions

Figure 1. Collagen carbon and nitrogen isotope data and phosphate oxygen isotope data on samples taken from Richard III. Symbols as follows: Δ , dentine; $\bullet$, enamel; $\blacksquare$, femur; $\diamond$, rib. X-axis represents estimated mean age of Richard III at time of formation of skeletal samples. For all isotopes precision is better than ± 0.15 (1 σ). Figure reproduced from Lamb et al. 2014:Figure 1, licensed under a Creative Commons Attribution Licence and available from <https://doi.org/10.1016/j.jas.2014.06.021>.

DRAFT