The archaeology of the social brain revisited: rethinking mind and material culture from a material engagement perspective

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Abstract
The social brain hypothesis (SBH) has played a prominent role in interpreting the relationship between human social, cognitive and technological evolution in archaeology and beyond. This article examines how the SBH has been applied to the Palaeolithic material record, and puts forward a critique of the approach. Informed by Material Engagement Theory (MET) and its understanding of material agency, it is argued that the SBH has an inherently cognitivist understanding of mind and matter at its core. This Cartesian basis has not been fully resolved by archaeological attempts to integrate the SBH with relational models of cognition. At the heart of the issue has been a lack of meaningful consideration of the cognitive agency of things and the evolutionary efficacy of material engagement. This article proposes MET as a useful starting point for rethinking future approaches to human social cognitive becoming in a way that appreciates the co-constitution of brains, bodies and worlds. It also suggests how MET may bridge archaeological and 4E approaches to reconsider concepts such as the ‘mental template’ and Theory of Mind.

Keywords
Social brain hypothesis, Material Engagement Theory, cognitive archaeology, Palaeolithic, material agency, human evolution

I. Introduction
Since its rise to prominence in the late 1990s, the social brain hypothesis (SBH) has captured the attention of disciplines in academia and beyond (e.g. Bennett, 2013; Gladwell, 2000). It argues that encephalisation and the emergence of the intelligence we exhibit is deeply rooted in the complex nature of primate social lives (Dunbar, 1998, 2009, 2016b). Instead of being geared towards solving ecological problems, the nature of our intelligence is seen as being fundamentally social, developing out of a need to understand, track and maintain a growing number of relationships. This conclusion derives from the observation that across many primate species, the relative neocortex size scales predictably with the size of the social group. Subsequently, the suggestion is that brain size increases were driven by pressure to integrate more and more individuals into mental schemata (Dunbar, 1992). The hypothesis has found considerable support, being applied to investigate a range of topics including human social networks and institutional organisation (e.g. Dunbar, 2014; Mac Carron et al., 2016; Webber & Dunbar, 2020), digital social networking (e.g. Dunbar, 2016a; Gonçalves et al., 2011; Mac Carron et al., 2016), schizophrenia (Burns, 2006), the emergence of language (e.g. Aiello & Dunbar, 1993; Dunbar, 2003a, 2003b, 2017a; Dunbar & Gowlett, 2014) and the evolutionary basis of religion (e.g. Dunbar, 2017b, 2020).

From the period of 2003 to 2010, the SBH formed the basis of an ambitious collaborative project by the British Academy to unify evolutionary psychology with Keble College, University of Oxford, Oxford, UK

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the material remains of the human past. ‘From Lucy to Language: The Archaeology of the Social Brain’ (the ‘Lucy Project’) was headed by the archaeologists Clive Gamble, John Gowlett and the evolutionary psychologist Robin Dunbar, constituting one of the largest UK-based research projects on human evolution (James, 2017). Although revolving around the core work of Gamble et al. (2014), the project resulted in hundreds of cross-disciplinary research articles which have been summarised in several publications, namely, *Thinking Big: How the Evolution of Social Life Shaped the Human Mind; Social Brain, Distributed Mind* (Dunbar et al., 2010a); and *Lucy to Language: The Benchmark Papers* (Dunbar et al., 2014). The archaeological focus of this work has been the Palaeolithic, the period between about 3.3 million years ago (Mya) and 10 thousand years ago (Kya). In the context of an incomplete material record, the SBH has been an invaluable tool to access the archaeologically invisible (e.g. language, story-telling, music) and to contextualise the ‘bones’ and the ‘stones’ within a larger evolutionary narrative (Gamble et al., 2011; Gowlett et al., 2012). Moreover, it has provided a welcome emphasis on the social and affective context of human evolution, considering not just individual brains in isolation, but how minds evolved alongside other minds, landscapes and technology. This is a shift that Gamble (2007) refers to as a move away from a ‘rational’ to a ‘relational’ understanding of the mind.

The social brain framework in archaeological work has not stayed static since the official ending of the Lucy Project in 2010, and these elaborations will be examined in what follows. However, the last decade or so has also seen some important developments in archaeology, neuroscience and philosophy of mind. Of particular note has been the rising prominence of work that critiques the so-called ‘Cartesian’ or ‘cognitivist’ paradigm prevalent both within and without cognitive science and archaeology. This paradigm takes cognition to be a brain-bound affair, a process of creating and manipulating internal, mental representations out of external stimuli. It also rests on a separation of the mental and material, internal and external, body and brain. The rapidly growing field of ‘4E’ cognition has been challenging this classical view, providing new ways of thinking about the nature and location of the mind, as well as the importance of the material world in constituting and shaping thought (see Newen et al., 2018 for overview). These new models see cognition as *extended* (not limited to the brain, but distributed to the environment), *enactive* (constituted in action), *embedded* (environmentally situated) and *embodied* (shaped by the body) – this comprises the four ‘E’s. Running alongside this has also been an increased engagement in archaeological and anthropological thinking with the idea of material agency, and specifically how it relates to cognition (Gosden, 2005, 2008; Ingold, 2011b; Ingold & Pálsson, 2013; Knappett, 2005; Knappett & Malafouris, 2008; Malafouris, 2013; Malafouris & Renfrew, 2010).

Together with the decade that has elapsed since the Lucy Project ended, these developments provide an apt opportunity to reflect on the place of the social brain framework in cognitive archaeology (and indeed, beyond). 4E approaches were not as widely recognised 10 years ago, but their rising prominence speaks to their ability to offer us something novel and useful about the emergence of the human mind. What are the implications of these new ideas for the SBH moving forward? To begin answering this question, the present article provides an overview of the hypothesis and its applications to the Palaeolithic record. However, the aim is also to put forward a productive critique of the approach. It will be shown that the SBH, and its neo-Darwinian basis, has a cognitivist core that has not been fully resolved by attempts to couple it with relational frameworks. By relying on the representational logic of Theory of Mind (ToM) to explain social cognition, and seeing material culture as an epiphenomenon of ‘social’ evolutionary forces, the SBH prevents us from meaningfully considering the cognitive agency of the material world. To develop this argument, I draw on insights offered by Material Engagement Theory (MET; Malafouris, 2013, 2019), and its understanding of material agency. Allied with 4E viewpoints, MET is chosen to showcase what a framework emerging specifically from archaeology can contribute to the present discussion. It is also proposed as a useful starting point from which to rethink the SBH, and a way to bridge archaeological and 4E perspectives to reconsider concepts such as the ‘mental template’ and ToM.

2. The SBH

Less a unified theory, the SBH (sometimes referred to as ‘the social intelligence hypothesis’) is more accurately described as a set of related ideas about social complexity and its cognitive demands in evolutionary perspective. Originating in primatology, it emerged from the observation that compared to their body size, primates possess much larger brains than other vertebrates (Jerison, 1973). Some had already proposed that the complexity of primate sociality may be behind this (Chance & Mead, 1953; Jolly, 1966), but it was with Nicholas Humphrey’s (1976) paper on *The Social Function of Intellect* that the idea really took hold. Humphrey argued that since primates inhabit environments which are not cognitively challenging in terms of resource extraction or survival, their intelligence must be related to the need to navigate complex social dynamics. He reasoned that primates inhabit groups in which individuals can reap benefits from both the preservation of the social structure (e.g. reduced risk of
predation) and its manipulation (e.g. access to more food and mates). This requires them to be calculating: one constantly needs to balance the costs and benefits of pursuing personal goals or suppressing them in favour of group approval and maintenance. In effect, ‘if intellectual prowess is correlated with social success, and if social success means high biological fitness, then any heritable trait which increases the ability of an individual to outwit his fellows will soon spread through the gene pool’ (Humphrey, 1976, p. 9). This idea was built on throughout the 1980s, resulting in the ‘Machiavellian intelligence hypothesis’ (Byrne & Whiten, 1988; Whiten & Byrne, 1997). This posits that human evolution was driven by competition to develop increasingly sophisticated abilities to ascertain the intentions of and outmanoeuvre other group members.

Since the 1990s, Robin Dunbar has been the most well-known proponent of the core thesis, and it is his version of the SBH that has become the most popular. Notably, he introduced the finding that there is a quantitative relationship between the relative size of the neocortex and the social group of primates, a positive correlation that is unique to this taxon (Dunbar, 1998; Dunbar & Shultz, 2007; Shultz & Dunbar, 2007, 2010). For humans, the correlation predicts an extended community size of about 150 individuals (‘Dunbar’s number’), a number that has been identified in contexts ranging from hunter-gatherer communities to the number of people in business organisations (Dunbar, 1993, 2008). At the same time, Dunbar (1992, 1998) found that relative neocortex size does not correlate with measures of ecological complexity (as indexed by the proportion of fruit in the diet, foraging style, the home range size and the day journey length), leading him to reject ecological hypotheses of human evolution. Note that the SBH does not deny the importance of ecology per se; rather, its stance is that primates deal with ecological problems (e.g. predation) by first solving the issue of group cohesion (Dunbar, 2016b, pp. 3–4). The resultant ‘bonded sociality’ that primate groups exhibit is seen as cognitively challenging because individuals need to attend to both dyadic relationships and larger group dynamics (Dunbar & Shultz, 2010).

The SBH proposes that in a social world characterised by shifting alliances, the ability to keep track of these changes while also improving one’s status is vital. This seemingly requires individuals to understand the intentions and emotions of others, and to appreciate that these can differ from their own. The SBH explains this in terms of intentionality (Dennett, 1987) and the development of a ‘Theory of Mind’ (ToM) or the ability to ‘mindread’ (Premack & Woodruff, 1978). This capacity forms a recursive hierarchy of belief states about an increasing number of other minds (known as levels or orders of intentionality). Beginning with first order (‘I know’), progressing to second order (‘I know that you know’), to third order (‘I know that you know that she thinks’) and so on, a basic ToM is said to have been achieved upon the possession of second-order intentionality (as this is the first level at which reasoning about other minds begins). It has been proposed that human adults are able to reach seventh-order intentionality (O’Grady et al., 2015), but Stiller and Dunbar’s (2007) analysis suggests that fourth to fifth order is more common in everyday use; levels beyond fifth-order intentionality are cognitively challenging. The question of whether non-human primates (and indeed other non-human animals) possess a ToM remains controversial. O’Connell and Dunbar (2003), for instance, suggest that some great apes such as chimpanzees can understand the minds of others as competently as 3- to 4-year-old human children. Other studies draw more conservative conclusions: non-human animals may have some understanding of the knowledge and intentions of others, but they do not have human-like ToM capabilities (Call & Tomasello, 2008; Krupenye et al., 2017; Penn & Povinelli, 2007). In any case, the SBH holds that a basic ability to ‘mentalise’ must have been a commonality among australopiths which then grew more sophisticated during the existence of Homo (Gowlett et al., 2012, p. 117).

Increases in group size also posed new challenges in terms of integrating multiple social layers, and led to an intensification of the ‘fission-fusion’ dynamic that characterises primate (including human) groups (see Grove & Dunbar, 2015). Barrett et al. (2003) have argued that this kind of group organisation is cognitively demanding: temporary group dispersals require absent individuals to be considered as being ‘virtually present’, meaning that ‘the key to survival in dispersed societies is the ability to work with a social world that is partially virtual, rather than purely physically instantiated’ (p. 496). More populous groups presented additional problems in terms of bonding. Social cohesion among primates is strongly dependent on grooming, but its temporal element means that time acts as a constraint on the number of relationships that can be made and maintained (Dunbar et al., 2009). Dunbar (1993, 2017a) consequently suggests that language (potentially preceded by laughter) emerged as a solution to this issue: as a more efficient strategy that could ‘groom’ several individuals at the same time, language aided the maintenance of larger social networks.

3. The archaeology of the social brain

The social brain framework has been taken up by a number of researchers looking to apply it to the Palaeolithic record. In keeping with the primacy of the social context, such work has used the SBH both as a heuristic to access past cognitive abilities, and to reinterpret the creation of material culture in ‘social’ rather
than ‘technical’ terms. In other words, instead of seeing the computational demands of toolmaking as the driver of cognitive changes, more sophisticated material forms are seen as products of socially derived changes in cognitive structures.

In this regard, the link between ToM and technological competencies has garnered interest, especially with regard to stone tools. Gamble et al. (2011, p. 123) make this connection when they suggest that the transition from Oldowan (‘Mode 1’, c.2.6–1.4 Mya) to Acheulean (‘Mode 2’, c.17.5–0.25 Mya) biface forms reflects a shift towards a higher order of intentionality, since Mode 2 industries have more complex imaginative and planning requirements. Recent work has focused on taking this connection further, and on developing more robust methodology for identifying ToM in the technological record. For example, Cole (2019) has noted that the SBH does not account for intra-populational differences in cognitive abilities (see also van Schaik, 2013), nor does it provide an explicit way of connecting orders of intentionality to specific material complexes. Taking into account the role that material culture plays in the creation and communication of identities, he has suggested the ‘identity model’ (Cole, 2014, 2017, 2019) to redress this. Instead of relying on brain size, this framework infers the cognitive abilities by relating different technological modes and their behavioural implications to increasingly complex identity types (themselves correlated to increasing orders of intentionality). Thus, Mode 1 tools are connected to the most basic ‘internal’ identity type and first-order intentionality: they imply a basic sense of self in reflecting goal-directed behaviour. Mode 2 tools, then, imply the addition of another layer of identity, ‘external’, and correspond to second-order intentionality. Acheulean knapping techniques likely had to be passed on through social learning, and there is supposedly imposition of a deliberate form onto the stone, and a capacity for ‘abstract’ thought. To Cole, these aspects imply that in addition to having a sense of self, the hominins who made these tools could also appreciate that others may have an opinion of them (Cole, 2017, Table 8.4). Cole (2019) therefore concludes that the SBH predictions for ToM based on brain size can act as a good measure of cognitive potential, but the material record can better demonstrate the extent of the ‘realised’ ToM abilities (p. 367).6

The use of fire by hominins, especially in the form of hearths, has also been interpreted in the context of the SBH. Gowlett (2010, 2016) argues that fire has played an integral part in human evolution, not only providing the means to access more energetically dense food to ‘fuel’ encephalisation but also enabling a functional daytime extension which had important repercussions. A longer working day opened up more time for socialisation and afforded better group defence. But it also necessitated integration of the varying sleeping patterns of different age groups into social life, and the collective co-ordination of labour and materials. The complexity involved here in terms of forward planning, task delegation and community co-operation has led Gowlett and colleagues (2012) to suggest that the hominins who made hearths may have possessed at least third- or fourth-order intentionality (p. 705). Dunbar and Gowlett (2014) have further postulated that the origins of language may lie in the social time spent gathering around fires, potentially emerging as a more efficient ‘grooming’ strategy, as mentioned earlier (Dunbar, 1993).

Approaching the dynamics of change within the Palaeolithic as a whole, Gamble et al. (2011; see also Gamble, 2013; Gowlett et al., 2012) have offered an impressive synthesis of archaeological material with the SBH. The ‘shape’ of the Palaeolithic is visualised in terms of three temporal movements (2.6–1.6 Mya, 1.5–0.4 Mya and 300–25 Kya), each one unfolding at a different scale, tempo and level of social complexity. Following the SBH, the authors see evolutionary changes as socially driven, creating pressure to ‘amplify’ the emotional and material core of hominin lives into novel social forms. Increasing social complexity exerted computational burdens which were eased by the extension of social and cognitive functions via language, music, social institutions and material culture. This social and cognitive distribution did not only aid community cohesion, but also allowed for social groups to scale up in a way that would have been impossible without ‘external’ resources to scaffold the process (Coward, 2016). For example, by acting as a material anchor for bonds with absent individuals, material culture enabled a ‘release from proximity’ which facilitated the global distribution and population increase of hominins c.300–25 Kya (Coward & Gamble, 2008; Gamble, 1998, 2010; Grove & Dunbar, 2015). Thus, biological and cultural forms are said to have co-evolved, but not necessarily at the same rate: at times, it was the emotional basis that was being amplified, and at others, it was the material (Gamble et al., 2011, p. 128). This can explain why there may be apparent ‘mismatches’ in the archaeological record, whereby cultural responses seem to ‘lag’ behind biological ones (Gamble et al., 2011; Gowlett et al., 2012).

Notably, much of the archaeological work surrounding the SBH emphasises the relational nature of human existence. Instead of taking cognition to be a purely ‘internal’ and individual process, it sees it as an extended (Clark & Chalmers, 1998) and distributed (Hutchins, 1995) system that involves relationships between agents, other agents and things (e.g. Dunbar et al., 2010a; Gamble, 2013, 2015; Gamble et al., 2011; Gowlett et al., 2012). Spikins (2012, 2017), for example, has argued that Acheulean handaxes played an important role in displays of trust and the formation of alliances. Her ‘trustworthy handaxe theory’ holds that the morphological similarity of the stone tools was not
simply a matter of striving for an aesthetic ideal of symmetry. Rather, the conformity to a specific shape is better understood as a way of signalling one’s self-control, patience and willingness to collaborate. Stade and Gamble (2019) have proposed that the SBH can add an important social, affective and relational dimension to evolutionary cognitive archaeology, and help reframe concepts such as ToM which are often used in a cognitivist sense. They stress that thought does not just happen in individual minds; it unfolds in a socio-cultural context and involves objects which channel joint attention and scaffold our understanding of others. In this way, ToM can be seen as an ability which fostered the emergence of a shared ‘mindscape’ (Stade, 2020, p. 62) of collective and public thoughts, knowledge and feelings. In other words, ‘[i]f emotions are the bonds that bind, objects are the enticement that draws minds out of the world and brings them together into a shared material landscape’ (Stade and Gamble, 2019, p. 323).

Adopting this view emphasises the spaces between multiple minds, and builds a more anthropological understanding of cognition.

4. Individual brains, Cartesian minds?

Archaeological work utilising the SBH has undoubtedly provided numerous insightful and novel contributions. It has firmly established the need to consider the affective and material elements of human interaction, and has been a useful gateway towards an interdisciplinary, and therefore more holistic, approach to human evolution. The application of relational models of cognition has likewise been a productive direction. However, I argue that there remain several issues that prevent this work from making a more effective breakaway from cognitivist understandings of mind and world.

The root of the problem traces back to the SBH itself. It is already undermined by a critical literature from fields closer to its origins which is important but beyond the scope of this article; just a handful of the issues raised include the formulation of ‘Dunbar’s number’ (de Ruiter et al., 2011), whether social complexity actually requires cognitive complexity (Barrett et al., 2007) and whether diet may be a better predictor of brain size than sociality (DeCasien et al., 2017). More important to the present discussion is a deeper issue with the neo-Darwinian paradigm in evolutionary psychology in terms of which the SBH is couched: it takes material culture to a be a physical derivative of cognitive structures. In brief, the neo-Darwinian view posits that there are two parallel processes of inheritance at play: on one hand, the ‘biological’, which operates via gene transmission, and on the other hand, the ‘cultural’, which reproduces by means of social learning (Ingold, 2007, 2013). Within this, the mind is seen as consisting of domain-specific (i.e. functionally specialised) modules in the brain which operate by means of representational mechanisms; these are shaped by natural selection to produce computational systems able to solve adaptive problems with increasing efficacy and efficiency (Cosmides & Tooby, 2013). Put more simply, what we call ‘mind’ is a brain-bound, content-processing entity – a ‘cognitivist’ mind. The concomitant assumption is that ‘culture’ belongs to the domain of information which is socially transmitted between minds and is ‘externalised’ through behaviour, including the making and use of lithic industries and other material culture.

These foundational premises set us up with a number of unhelpful dualisms and constructs when it comes to approaching the material record. Although the relationship between innovations in biological and material forms is described as ‘co-evolutionary’ (Gamble et al., 2011, p. 118), the two are certainly not equal partners in this process, as ‘behaviour and ecology’ are ‘the real motors of evolution’ (Gowlett et al., 2012, p. 710). Developments in material forms are thus ‘co-evolutionary’ with biological ones in the sense that they are expected to correspond to and reflect ongoing changes in brain architecture (e.g. Shultz et al., 2012). Within the SBH framework, material culture has been interpreted as a realisation of cognitive potential (e.g. Cole, 2017, 2019) or an expression of a ‘spare’ technological capacity developed as a by-product of increasingly sophisticated social brains (Gowlett et al., 2012, p. 704). From this point of view, the ‘Acheulean gaze’ (Foley & Gamble, 2009) – the ability to maintain prolonged focus on a task – is the result of attention skills and a developed working memory that come out of dyadic infatuation (Dunbar, 2010; Gamble, 2010), and appears to have little to do with the process of making a handaxe itself. It is also unclear how or why such ‘spare’ capacity would emerge, considering the significant energetic costs of encephalisation. Seen as secondary to biological developments, material culture is left with little room to play a meaningfully active role in shaping human cognitive and social evolution.

The internalist logic of the SBH is also exemplified by its reliance on ToM to explain social cognition. The hypothesis presumes the need to create internal representations to model the mental states of others, and takes ToM as the primary mechanism of ‘true’ social understanding that goes beyond ‘superficial’ observations of behaviour (see Leudar & Costall, 2009, p. 8). By doing so, the SBH is able to boil social cognition down to ‘a hierarchical sequence of mentalizing states’ (Gamble et al., 2011, p. 117), which presents not only an individualistic view of interaction but also a rather simplistic view of sociality. As Ingold (2010) has remarked,

on the one hand, it [the SBH] reduces the social to the operative, and on the other hand, it elevates the brain to
the executive, making social life look like the aggregate effect of brains telling their owners what to do.

Aston (2019) has also addressed this issue, showing how ToM (in the context of the SBH) presents an account that is rooted in methodological individualism and makes social cognition primarily about passively simulating the behaviour of others. The ability to represent mental states that ToM entails has also been connected to the vague category of ‘abstract’ thought and the capacity for creating ‘mental templates’ of artefacts in the head before realising them in the world (Hodgson, 2015). Cole (2017, 2019) argues that this is a requirement for the creation of Acheulean bifaces: ‘in order to knap a handaxe, the knapper must have had the ability for abstract thought – to conceive of the artefact and knapping strategy before removing the first flake from the nodule’ (p. 367). In a similar fashion, Gamble et al. (2011) have suggested that the making of Mode 2 lithics necessitated the ability to detach oneself from the immediacies of the physical world and envisage the tool in one’s ’mind’s eye’. This creates a theoretical disconnect between hominins and the things they made, reducing the material to a substrate onto which human intentionality is imposed.

At the heart of the ToM concept is an assumption that the minds of others are inherently opaque and cannot be perceived directly, and this is why, according to Dunbar (2016b), the ‘social world is more complex to handle than the physical’ (p. 6). In a later section, I will discuss why this is not necessarily the case, but for now, the statement begs the following question: what exactly do we mean when we speak of ‘the social world’? By limiting the social sphere to the realm of conspecifics, the SBH creates a distinction between hominins and their physical surroundings that perpetuates a society/ecology dualism which is just as misleading as that of mind/matter. This leads to the construction of some unhelpful and artificial categories, such as the splitting of the hominin day into ‘social’ and ‘ecological’ time, and dividing language into ‘social’ or ‘technical’ topics of conversation (Dunbar & Gowlett, 2014). Sociality appears to originate and operate on a (mental) plane of its own: ‘social intelligence is often practised without reference to artifacts, as is much other problem solving and, indeed, language’ (Gowlett et al., 2012, p. 704). This is a claim that plenty of anthropologists, archaeologists and those working in the field of 4E cognition would strongly dispute, and one that unnecessarily delineates ’artefacts’ from the rest of the material world. Drawing a line between natural and cultural objects is a fruitless endeavour, as anthropology and related disciplines have long attested (Descola, 1994, 2013; Ingold, 2000, 2011a; Latour, 1999, 2005).

The application of relational frameworks of cognition, while progressing the SBH in a more productive direction, does not entirely succeed in resolving these underlying issues (Garofoli, 2019). The kind of embodiment/extension/distribution that is applied generally represents a ‘weak’ (see Newen & Gallagher, 2018) or ‘conservative’ (see Malafouris, 2017) approach, whereby extra-bodily features may scaffold, support and distribute cognition, but do not constitute cognitive processes per se. In fact, this kind of approach is still broadly compatible with a computational framework in retaining the primacy of the brain as the originator of cognitive content, which is subsequently extended to material features to aid information processing (Aydin, 2015). In this way, material culture has been considered a physical substrate that ‘encoded’ symbolic information (Gamble et al., 2011) or onto which cognitive processing has been ’off-loaded’ to enable the expansion of social networks (Coward, 2016; Coward & Gamble, 2008). Cole (2019) even suggests that the makers of Mode 2 bifaces did not progress to third-order intentionality because they did not ‘realize the full potential of the Acheulean gaze to consciously off-load social communications and culturally meaningful symbols onto the material culture with which they interacted’ (p. 176). At other times, the application of non-internalist frameworks is far more superficial. The claim that the distributed cognition of hominins is illustrated ‘by their involvement with a range of materials, stone, bone and meat’ (Gamble et al., 2011, p. 121), for example, offers little by way of explanation as to how this distribution is meaningful in any cognitive or social sense.

However, it would be building a straw man argument not to acknowledge the emphasis that has been placed on the active role that material culture plays in hominin lives; this much is clear from an overview of the literature. Much of the work echoes Gamble’s (2015) call to adopt an outlook on the past that ‘bundles up the agency of people, places, and materials’ (p. 154). A notable example is Stade and Gamble’s (2019) paper, which explicitly acknowledges that ‘people and things can be seen as thinking jointly together, with objects having their own agency to guide interactions’ (p. 322). The meditational role that material culture plays in the construction of social realities and enactment of people, activities, memories and places has likewise been well developed in the literature. I argue, however, that while this version of agency certainly considers the social life of things (Appadurai, 1986), it does not exploit the full potential of considering their cognitive lives (Malafouris & Renfrew, 2010). This leaves us with a view of agency which often retains an anthropocentric stance, whereby it is not so much that the things themselves that are active, but are rather actively used by people to achieve certain ends. The statement that material culture is ‘integral to the negotiations of social practices’ (Dunbar et al., 2010a, p. 8 original emphasis) exemplifies exactly this kind of
argument. Undoubtedly, things play a crucial part in our lives, but there is arguably room to take the constitutive, and transformative, role of the material in our cognition much more seriously. To show how we may begin to do this, we now turn to the insights offered by MET.

5. Active artefacts and metaplastic minds: MET and material agency

Emerging out of dissatisfaction with the Cartesian heritage of cognitive archaeology, MET has been put forward by Lambros Malafouris (2013) as a way of reassembling mind, body and world back into ontological unity. As an archaeological research programme, it is concerned with the relationship between cognition and material culture through time, and what the consequences of this interaction are for the formation of past and present minds (Malafouris, 2013, p. 35). Rather than reducing it to a neural activity, MET draws on extended (Clark, 1997; Clark & Chalmers, 1998), distributed (Hutchins, 1995, 2008; Kirsh, 1995, 1996) and embodied (Clark, 2008; Gallagher, 2005, 2017) understandings of cognition to reframe it as mediated action that unfolds in the course of material engagement. More than being a reflection of cognition, the material world consequently becomes ‘co-extensive and consubstantial with mind’ (Malafouris, 2013, p. 77 original emphasis). The constant, and inseparable, interaction between brains, bodies and things is not only the basic condition of being-in-the-world, but it is also the space in which cognition can be found: it is not a “within” property; it is a “between” property (Malafouris, 2013, p. 85).

In seeking to redress the anthropocentric bias in the cognitive equation, the argument for material agency thus forms a fundamental building block of the material engagement approach. In the social sciences more broadly, the notion of ‘agency’ has most commonly featured in the context of practice theory – that is, the dialectics of individual human choice and action on one hand and the established social structures on the other hand (Bourdieu, 1977). As such, it has generally been associated with human intentionality, individuality and power (Dobres & Robb, 2000). Within archaeological and anthropological thinking, the human origin and boundaries of agency began to be challenged by the ideas that there is fluidity between persons and things (Mauss, 1954), that things can lead social lives (Appadurai, 1986) and that they can index social agency (Gell, 1998). Especially with the rise of the post-processual movement in archaeology, agency became a central feature of interpretation: post-processualists asserted the importance of considering the physical world an active part in constituting social realities (Hodder, 1982, 1986, 1992; Shanks & Tilley, 1987; Tilley, 1989). Archaeology and anthropology have also drawn on science studies and Latour’s Actor–Network Theory (ANT; Latour, 2005), as well as looking at agency ethnographically within the ontologies of fetishism and animism (see Jones & Boivin, 2012 for overview).

However, the kind of agency that MET presents is of a different kind. Malafouris (2013, p. 122) argues that many approaches that attribute an active disposition to matter actually do so within narrow, anthropocentric constraints. Things are considered to be ‘active’ only in relation to how they are used by humans or how they participate in human lives. Gell’s (1998) formulation, for instance, divides agents into primary (people) and secondary (objects created by people) agents. The latter possess agency by virtue of being ‘containments’ of primary agency. Even Latour’s ANT traces the origin point of a socio-technical network to the prime mover of the intentionality, belief or ideology of a human agent or institution (Malafouris, 2013, p. 128). The key issue, Malafouris (2008a, 2014) argues, is what he calls the ‘agency problem’: the conflation of a sense of agency with agency itself. While having awareness of being an agent could very well be a uniquely human property, agentive capacity per se is not. Thus, rather than expanding the world of human agentive capacity to the realm of things, MET posits that agency is, in fact, neither a property of humans nor things (in this sense, ‘material’ agency is somewhat of a misnomer). It has no a priori, atemporal existence. Rather, it is an emergent phenomenon of material engagement, a process that arises out of situated activity. Consequently, the question we should be asking of agency is not ‘what’ but ‘when is an agent?’ (Malafouris, 2013, p. 147). The ability to have causal efficacy emerges in action, as a kind of ‘dance’ between all the constituent elements, but one where there are no predetermined agentive roles, and where at times, some elements may be leading the dance more than others (Malafouris, 2008, p. 25). From this vantage point, the Palaeolithic handaxe becomes less a manifestation of the mental, and more the result of ‘dynamic coupling’ (Malafouris, 2013, p. 219) of the stone and the knapper’s body. The knapper is not the sole active agent in this formulation: the affordances (Gibson, 1977, 1979) of the stone provide opportunities and constraints to the knapping trajectory in relation to the knapper’s body and skills. The intention to knap is not pre-formed in the head, but emerges in action and is at least partially constituted by the stone itself – the decision of where to place the next blow cannot be made in isolation from the physical stone (Malafouris, 2010a).

Just like agency, ‘mind’ is consequently better seen as a process rather than an entity, or perhaps even as a verb rather than a noun (Malafouris, 2019, p. 5). Being in a constant state of becoming rather than being, the mind is an unfinished product which is continuously
brought forth and shaped by our interactions with the world. It is the contingencies of material engagement which offer novel cognitive opportunities, and have the potential to bring about changes on a variety of temporal scales. Take, for example, the case of literacy. On an ontogenetic level, learning to read and write elicits changes in the functionality of certain brain areas such as the fusiform gyrus, but the process of developing the ability to read and write non- iconic symbols took some 1500 years of co-influential changes in brain and material structures (Overmann, 2016a; Overmann & Wynn, 2019a, 2019b). On an evolutionary timescale, material engagement has the potential to bring about even more significant changes in the cognitive architecture. Our brains show an extraordinary capacity for flexibility and learning, and it is this feature, according to MET, that should form the core of our approach to the mind: our brains are not just plastic, they are ‘metaplastic’ (Malafouris, 2010b, 2015). The concept of ‘metaplasticity’ emphasises the constitutive intertwining between neural and cultural plasticity (Malafouris, 2010b, p. 56); in other words, the distinctive feature of human minds is the dynamic and recursive relationship between a plastic mind and a plastic culture. The human mind displays a lively propensity for and openness to Bergsonian creative evolution (Bergson, 1911). As Malafouris (2016) puts it,

humans are embodying and self-bounding creatures able to influence our developmental paths by changing our means of material engagement and by altering, mediating and regulating the flows of energy and matter. Human beings evolve by creating material things and assemblages which scaffold the ecology of our minds and shape the boundaries of our thinking. (p. 290)

6. Putting ‘mattering’ back into matter: the implications of MET for the archaeology of the social brain

MET presents us with a challenge to reconsider how we think about the relationship between mind, body and material world. It offers a more radical alternative to Cartesian views of mind in holding that cognitive processes are not simply extended beyond the brain, but are constituted by the interaction between brains, movements, bodies and ‘things’. In the context of MET, the mind has no set location; ‘thinking’ emerges in action, thereby erasing the distinction between what we deem to be ‘cognition’ and ‘behaviour’. It also emphasises that the mind is an unfinished entity; it is continuously shaping and being shaped by material engagements with a dynamic world. If we are to take the postulates of MET seriously, we need to commit to a ‘process’ ontology (Gosden & Malafouris, 2015) which prioritises human becoming rather than being. The social brain framework certainly attempts to ‘enliven’ matter by looking at the ‘underlying’ forces of change, but MET suggests that these ‘forces’ must be located in acts of material engagement, not before or after them.

Re-evaluating our approach in light of these insights is not necessarily an easy task. MET questions many of our deep-seated and familiar constructs, and its conclusions can be difficult to grapple with. In particular, there is a need to consider how the notion of material agency, taken as an emergent property of situated action, fits into the narrative of human social and cognitive evolution. ‘Things’ have certainly suffered from being under-theorised in the humanities and social sciences; this is not for lack of importance, but instead the result of a particular intellectual history and the tendency of things to become ‘transparent’ to us as we go about our lives (Hicks, 2012; Latour, 2007; Miller, 2010). This is why I propose that the notion of material agency can be a useful grounding concept moving forward. It reminds us that materiality matters, and that specific material engagements are able to bring about changes on ontogenetic, developmental and evolutionary timescales. If stones, hearths, beads, trees, lakes, caves and so on were part of past hominin minds, then understanding the properties of these entities brings us closer to understanding the properties of past cognitive systems.

A key stumbling block for the SBH is that it was not created with the archaeological record in mind. As a model, it maintains coherence without the inclusion of material culture. In fact, in a recent overview of the hypothesis, Dunbar makes hardly any mention of the 3.3 million year record of hominin craft (Harmand et al., 2015), noting only that ‘processes of evolution, and human evolution in particular, do not proceed through material culture as such but through the behavior and minds of the people who made the material culture’ (Dunbar, 2016b, p. 16). This undermines statements that ‘things’ play a meaningful role within the evolutionary narrative the SBH constructs, and to my mind, makes it unlikely that the hypothesis can ever be successfully reconciled with a view that prioritises material engagement. Recent work which has extended agency, sociality and cognition out of the hominin mind and into the material has undoubtedly taken a step in the right direction, but there is room to further dismantle unhelpful and pervasive divisions. Sociality, like cognition, is not simply ‘promiscuous’ (Coward, 2019), spreading out from the human to the non-human realm. The cognitive, social, ecological and technological are inseparable elements of the ‘bio-psycho-social’ totalities that we are (Knappett, 2005, p. 23). If we dissolve the boundaries between minds and worlds, and the social and the ecological, then it is no longer so clear what exactly we mean when we refer to the ‘social’ drivers of human evolution. The core of sociality is not
humans, but activity, which is an inherently hybrid process (Malafouris, 2013, p. 149).

In practice, how would adopting a material engagement perspective change our interpretation of the Palaeolithic record and human evolution? MET represents a fairly young view, and its implications are not yet fully understood (Malafouris, 2016). However, there have already been several promising applications that showcase its utility in Palaeolithic archaeology and beyond: it has been used to problematise the notion of behavioural modernity (Roberts, 2016), understand the emergence of material signs (Froese, 2019; Iliopoulos, 2019) and examine the origins of numerical cognition (Overmann, 2016b) and conceptual thinking (Overmann et al., 2011; Overmann & Wynn, 2019a, 2019b). These are only a handful of examples beyond Malafouris’ own explorations (e.g. Malafouris, 2008b, 2010a, 2013). In what follows, I offer some further suggestions about where future work may focus, and how MET may usefully bridge archaeological and 4E approaches.

To begin with, MET calls into question the extent to which the neo-Darwinian paradigm is able to explain the human story. Our understanding of evolutionary processes is being constantly updated, and newer models suggest that other forms of inheritance that are not based in genetics must be considered (Jablonka et al., 2014; Laland et al., 2014, 2015). It has been demonstrated that organisms can modify their environments to create new ecological niches, thereby reshaping the selection pressures at hand and co-directing their own evolution (Laland et al., 2016; Sterelny, 2003, 2007). These changes create new ‘cognitive ecologies’ (Hutchins, 2010) and landscapes of affordances (Rietveld & Kiverstein, 2014) which are inherited by future generations and guide their future development.

In fact, the notion of affordance (Gibson, 1977, 1979) and the field of ecological psychology from which it derives could potentially offer a useful and complementary approach to MET. It rejects the need to appeal to representationalism, helps to break down the body/world distinction and prioritises an action-centred approach (Lobo et al., 2018). For example, it has already been usefully applied to stone tool manufacture to show that Oldowan knapping proficiency cannot be reduced to either mental or biomechanical properties; rather, knapping skill is more about being able to co-ordinate whole brain–body–environment mechanics and identify relevant morphological features of the stone for subsequent knapping actions (Nonaka et al., 2010). Acheulean biface industries have been demonstrated to be more complex to produce than Oldowan ones: they involve a larger degree of symmetry as well as ‘opaque’ stages of manufacture – that is, it may not be immediately apparent how certain actions in the present relate to the end product (Shipton, 2019). As we have seen, the social brain framework (and indeed work outside of it too) suggests that this requires the knapper to create a mental sequence of sensorimotor routines, and ‘visualise’ the final product as well. However, an interesting alternative take on this may be offered by an ecological-enactive perspective on so-called ‘representation-hungry’ cognition (Clark & Toribio, 1994). Kiverstein and Rietveld (2018) have proposed that it may be possible to account for phenomena such as imagination, memory and planning without resorting to representational schemata. This account is based on an understanding of skilled interaction as simultaneous attunement to multiple affordances. These are nested within a wider landscape of affordances available to a form of life (Rietveld & Kiverstein, 2014). In constituting possibilities for actions to be performed in the future, affordances already possess an anticipatory character. Van Dijk and Rietveld (2018) suggest that we can extend the temporal element of affordance engagement to also encompass longer term anticipation, including of things or events that do not yet exist. The key to this ability is participation in practices, which are relatively stable socio-material activity patterns that form the relevant history in terms of which future practices can continue (e.g. the practice of knapping). That is, the previous activities that have been performed over time provide certain (material) opportunities and constraints for how the practice can continue. The nested structure of affordances allows us to think about activities such as knapping as unfolding in terms of smaller scale action possibilities to engage with; these smaller scale affordances in turn make up the larger affordance of knapping a handaxe. Through continued immersion in a practice and responsiveness to the unfolding affordances of the situation, an individual can gain an experiential sense of the process as having ‘direction’, and thus anticipate how the larger scale process may unfold (van Dijk and Rietveld, 2018, p. 14). Consequently, what may look like ‘abstract’ thought at work in the Acheulean making process could be reconsidered as an increased capability to co-ordinate more complex (and temporally expansive) structures of nested affordances (Kiverstein and Rietveld, 2018, p. 157). In emphasising the importance of practices, this stance retains a ‘social’ focus and would accommodate the roles that other individuals play in participating and transmitting knapping skills. It can also find productive kinship with Goshen’s (2005) notion that objects create stylistic worlds which shape their own reproduction. Moreover, it tessellates well with the core propositions of MET by stressing the capacity of continued material engagement to bring about new abilities.

This interpretation could be complemented by alternative understandings of social cognition that do not rely on mechanisms of recursively hierarchical mentalising. It has been argued that ToM overplays the
The importance of ‘simulation’ of others’ minds and underplays the role that direct social perception plays in everyday interaction (Gallagher, 2008, 2015). We rely on gestures, posture, eye movements, clothes, facial expressions, voices and tones to gain an understanding of other people, and this is something that we do from infancy to adulthood. Indeed, we heavily utilise ‘external’ resources, especially when attempting to make sense of behaviours that confuse us: we may ask others, draw on our previous experiences with a person and attend to the socio-material situation as a whole to help us work it out. Keeping this in mind, enactive and embodied perspectives to intersubjectivity (i.e. the interaction between ‘subjects’) therefore argue that others’ intentions can be perceptible, and that interaction itself plays an important role in understanding others (e.g. De Jaegher, 2009; De Jaegher & Di Paolo, 2007; De Jaegher et al., 2010; Fuchs & De Jaegher, 2009). By introducing a more robust material dimension into such an approach via MET’s emphasis on material agency, we can, for instance, get a better understanding of the dynamics of joint action (Gallagher & Ransom, 2016) and the emergence of multi-scalar social relationships from an evolutionary perspective (Aston, 2019). In any case, there is certainly room for cognitive archaeologists to engage with debates that complicate the standard ToM view and its connection to ‘abstract’ thought. As a tool, ToM has been useful to investigate notions of identity, language and social transmission in the Palaeolithic (e.g. Cole, 2014; Lombao et al., 2017; Morgan et al., 2015; Shipton, 2019; Stade, 2017, 2020), but it is worth re-evaluating whether matching so-called ‘ToM’ abilities to elements of the material record is as straightforward as previously thought.

7. Conclusion

Ten years on from the Lucy Project, what is the place of the SBH in our studies of past human thought and sociality? By revisiting the archaeology of the social brain, I have shown that it embodies an approach to the archaeology of mind that is ripe for some reconsideration. It is clear that in the context of Palaeolithic archaeology, the SBH has been a useful tool for filling in the gaps of the archaeological record and contextualising it within a broader, comparative, evolutionary framework. Informed by anthropological and non-Cartesian perspectives on mind and world, the SBH has also been fruitfully imbued with relational nuance. My aim has not been to disregard this work, but rather to draw attention to how we may improve it moving forward. This article adopted a particular focus on MET to show what a framework emerging specifically out of archaeology can offer by way of a future direction. However, the broader realm of 4E scholarship is growing quickly, and although it may be unfamiliar to archaeologists, it is certainly worth engaging with more deeply.

The future of the SBH in archaeology and beyond remains to be seen. I maintain scepticism about its utility, but do acknowledge that the language of the ‘social’ has been helpful in moving cognitive archaeology away from simplistic typologies towards an approach that is more ‘human’, an archaeology that considers memories, relationships and feelings. Perhaps now that this shift has been accomplished, we can turn more of our attention back towards the material, but this time with a different perspective that does not negate this change. If we are to retain the SBH, this article has highlighted some issues inherent to the hypothesis that those wishing to work with it ought to be aware of. If not, then archaeology, with its detailed focus on the material and processes of long-term change, is uniquely well placed to make a meaningful contribution to the study of human cognitive becoming. Indeed, Malafouris (2018) has observed that even 4E viewpoints often neglect to really consider the active role of materials in shaping intentions, cognition, attachment, self-hood and so on. Beyond providing the substrate against which evolutionary hypotheses can be tested, an archaeological perspective is therefore paramount (if not essential) to developing alternative narratives that involve the material from the outset. We need to accept MET’s challenge to take both mind and agency out of the conceptual, internal, ‘social’ terrain and embed them firmly in the realm of material engagement.

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Notes
1. The use of the term ‘cognitivist’ throughout this article encapsulates internalist, computational and representa-
tionalist accounts of cognition.
2. Note that despite being unified in opposition to Cartesian
models, the umbrella term of ‘4E’ encompasses a range of
varying, and sometimes conflicting, views about the
nature of cognition.
3. This assumption has been challenged by several competing
hypotheses, namely, the sensorimotor intelligence
hypothesis (Melin et al., 2014; Parker & Gibson, 1977)
and the necessity hypothesis (Fox et al., 2004).
4. Here, group size acts as a measure of social complexity,
with the assumption that the larger the group, the more
relationships there are to manage. Relative neocortex size
has also been correlated to other measures of social com-
plexity such as mating strategies, grooming clique size,
creation of alliances and the frequency of tactical decep-
tion (Byrne & Corp, 2004; Dunbar & Shultz, 2007; Kudo
& Dunbar, 2001; Pawlowski et al., 1998).
5. See Krupenye and Call (2019) for an overview of recent
work on Theory of Mind (ToM) in non-humans.
6. The connection between ToM, language and the social
transmission of toolmaking techniques in a Palaeolithic
context has been a topic of interest in recent years (e.g.
Lombao et al., 2017; Morgan et al., 2015; Shipton, 2019;
Stade, 2017, 2020). This work has not always been
explicitly related to the social brain hypothesis (SBH), so it is
not included in this overview.
7. Note that although the authors integrate ToM with a
more relational understanding of cognition, they do not
actually abandon the representational mechanisms of
ToM.
8. For a much more extensive discussion of the mechanisms
at play in this interpretation, and in particular the impor-
tance of action readiness and tendency towards optimum
grip, see Bruineberg and Rietveld (2014); Rietveld et al.
(2018); van Dijk and Rietveld (2018).

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