**Prosthetic gestures**

If we could rid ourselves of all pride, if, to define our species, we kept strictly to what the historic and the prehistoric periods show us to be the constant characteristic of man and of intelligence, we should say not Homo sapiens, but Homo faber.

— Henri-Louis Bergson, Creative Evolution (1911/1998, p. 139)

Despite the famous feats of termite-fishing chimpanzees and hook-crafting crows, Bergson's words from his Creative Evolution remain largely unchallenged (for a good review of the evidence, see Seed & Byrne 2010; Tomasello & Herrmann 2010). Even the most highly trained nut crackers could not manage to equal the abilities seen in the earliest hominin stone tool makers (Davidson & McGrew 2005; Iriki & Sakura 2008). There is more to the notion of Homo faber, however. For it is not the sheer variety and sophistication of human technologies, but rather the profound complexity of our engagement with tools and technologies that matters the most: We humans alone define and shape ourselves by the tools we make and use. Inspired from the work of Bernard Stiegler (1998) and André Leroi-Gourhan (1963/1993), I would like to describe human tool use as the prosthetic gesture par excellence (Malafouris 2010a). This is a species-unique and self-transforming human predisposition that leaves very little space for valid relational comparisons with other animals (or so I wish to suggest).

I understand that those committed to the long-held evolutionary ideal of a cognitive “continuum” between human and nonhuman animals would probably take my previous points as ill-conceived and anti-Darwinian: “The difference in mind between man and the higher animals, great as it is, is certainly one of degree and not of kind” (Darwin 1871, p. 105). But I think that so far as the human entanglement with tools is concerned, Darwin's claim is rather misleading. What must have certainly started as a difference in degree soon became one of kind – that is, a difference that makes a difference. No doubt, the lack of conceptual clarity about the use and meaning of terms such as degree, kind, mind, and tool is a major contributing factor for our troubles with the question of “human cognitive autapomorphies” (Suddendorf 2008, p. 147), and I am afraid Vaesen's paper does very little to help us clear the ground.

In any case, the interesting question is not whether human and animal tool-using abilities are different, but rather, why they are, and how did they become so different. Where do we start, then? Mainstream approaches to the comparative study of cognition follow two main paths when it comes to answering those questions: The first seeks to explain apparent discontinuities in human mental function as the natural outcome of the human genome, that is, resulting directly from biological adaptations (e.g., the “supermodule” hypothesized by the relational reinterpretation [RR] hypothesis proposed in this journal by Penn et al. 2008). The second path seeks to account for the differences between human and nonhuman cognitive abilities by way of language, culture, learning, and the external symbolic representational means that these capacities afford (e.g., Tomasello et al. 2005; Tomasello & Herrmann 2010). The former path takes us into the realm of biology; the latter into the realm of culture.

Vaesen's approach combines both paths. His thesis is essentially that humans are born with better-equipped neural systems and cognitive machinery, which is sufficient to account for the discontinuity between human and nonhuman animal tool use capacity even in the absence of culture. He then shows how our superiority with respect to the nine cognitive capacities deemed crucial to tool use can also explain why technological accumulation evolved so markedly in humans. In other words, the aim of his study is not to question the barrier between “individual brain power” and “culture,” (sect. 1) but instead to argue that human superiority is reflected at the former biological level as much as it is in the latter sociocultural level: “[h]uman tool use reflects higher social intelligence (indeed), but just as much greater non-social wit” (sect.1, para.2).

Here is, then, the nub of the problem – at least as I see it: Whilst Vaesen's comparative gaze seems squeezed within the artificial boundaries that separate the cultural from the biological realm, the sort of things we call tools stubbornly inhabit the hybrid realm between – that is, the realm where brain, body, and culture conflate, mutually catalyzing and constituting one another (Malafouris 2008; 2010b). As a result, Vaesen's account leaves out some of the issues that I believe matter the most. For example, the human total reliance on tools (Schiffer & Miller 1999) and their role in what Andy Clark calls “supersizing the mind” (2008), or the possibility that the cognitive discontinuity between us and our closest relatives may be largely the product of the cognitive continuity of human brains, bodies, and tools.

Is there any way out of this? I believe that searching for the neural and cognitive bases of tool use provides useful pointers but cannot in itself explain the unique ways humans and tools bring each other into being – especially when grounded in a strictly “internalist” and “computationalist” view of mind, as is the case of Vaesen's paper. The question of human tool use is not one that can be answered by looking deeper into the human brain; it demands a holistic anthropological stance (in both the philosophical and the cognitive sense). We need to start thinking about human tool use as a transformative constitutive intertwining of neural, bodily, and material recourses, rather than in terms of a pre-specified set of adapted neural structures and cognitive functions (see Malafouris 2010a; 2010b; Wheeler & Clark 2008, p. 3563). This approach to the study of human tool use could also help us to avoid the long-exposed but still engrained anthropocentric prejudices that any discussion of nonhuman animal tool use inevitably embodies (Hansell & Ruxton 2008). Moreover, it will lead us to ask questions not simply about how the mind shapes the tool, but also about how the tool shapes the mind.

REFERENCES

Bergson, H. (1911/1998) Creative Evolution (A. Mitchell, Trans.). Dover Publications. [Google Scholar]

Clark, A. (2008) Supersizing the mind: Embodiment, action, and cognitive extension. Oxford University Press. [Google Scholar]

Darwin, C. (1871) The descent of man, and selection in relation to sex. John Murray. [Google Scholar]

Davidson, I. & McGrew, W. C. (2005) Stone tools and the uniqueness of human culture. Journal of the Royal Anthropological Institute 11:793–817. [OpenURL Query Data] [CrossRef] [Google Scholar]

Hansell, M. & Ruxton, G. D. (2008) Setting tool use within the context of animal construction behaviour. Trends in Ecology & Evolution 23(2):73–78. doi: 10.1016/j.tree.2007.10.006 [OpenURL Query Data] [PubMed] [CrossRef] [Google Scholar]

Iriki, A. & Sakura, O. (2008) The neuroscience of primate intellectual evolution: Natural selection and passive and intentional niche construction. Philosophical Transactions of the Royal Society B: Biological Sciences 363:2229–41. [OpenURL Query Data] [CrossRef] [Google Scholar]

Leroi-Gourhan, A. (1964/1993) Gesture and speech. MIT Press. [Google Scholar]

Malafouris, L. (2008) Beads for a plastic mind: The “blind man's stick” (BMS) hypothesis and the active nature of material culture. Cambridge Archaeological Journal 18:401–14. [OpenURL Query Data] [CrossRef] [Google Scholar]

Malafouris, L. (2010a) Knapping intentions and the marks of the mental. In: The cognitive life of things: Recasting the boundaries of the mind, ed. Malafouris, L. & Renfrew, C., pp. 13–22. McDonald Institute Monographs. [Google Scholar]

Malafouris, L. (2010b) The brain-artefact interface (BAI): A challenge for archaeology and cultural neuroscience. Social Cognitive and Affective Neuroscience 5 (2–3):264–73 (10.1093/scan/nsp057). [OpenURL Query Data] [PubMed] [CrossRef] [Google Scholar]

Penn, D. C., Holyoak, K. & Povinelli, D. J. (2008) Darwin's mistake: Explaining the discontinuity between human and nonhuman minds. Behavioral and Brain Sciences 31(2):109–78. [OpenURL Query Data] [PubMed] [CJO Abstract] [Google Scholar]

Schiffer, M. B. & Miller, A. (1999) The material life of human beings: Artifacts, behavior, and communication. Routledge. [Google Scholar]

Seed, A. & Byrne, R. (2010) Animal tool-use. Current Biology 20:1032–39. [OpenURL Query Data] [CrossRef] [Google Scholar]

Stiegler, B. (1998) Technics and time, 1. The fault of epimetheus. Stanford University Press. [Google Scholar]

Suddendorf, T. (2008) Explaining human cognitive autapomorphies. Behavioral and Brain Sciences 31(2):147–48. [OpenURL Query Data] [CrossRef] [CJO Abstract] [Google Scholar]

Tomasello, M., Carpenter, M., Call, J., Behne, T. & Moll, H. (2005) Understanding and sharing intentions: The origins of cultural cognition. Behavioral and Brain Sciences 28(5):675–735. [OpenURL Query Data] [PubMed] [CJO Abstract] [Google Scholar]

Tomasello, M. & Herrmann, E. (2010) Ape and human cognition: What's the difference? Current Directions in Psychological Science 19:3–8. [Google Scholar]

Wheeler, M. & Clark, A. (2008) Culture, embodiment and genes: Unravelling the triple helix. Philosophical Transactions of the Royal Society B: Biological Sciences 363:3563–75. [OpenURL Query Data] [CrossRef] [Google Scholar]