Cautiously Digging Up the Mind

Cognitive Archeology and Human Evolution, edited by Sophie A. de Beaune, Frederick L. Coolidge & Thomas Wynn, 2009. Cambridge: Cambridge University Press. ISBN 978-0-5217-6977-8 hardback £50 & US$88.99; ISBN 978-0-5217-4611-3 paperback £16.99 & US$29.99; 200 pp., 17 b&w ills., 2 tables

The Rise of Homo sapiens*: the Evolution of Modern Thinking,* by Frederick L. Coolidge & Thomas Wynn, 2009. Chichester: Wiley-Blackwell. ISBN 978-1-4051-5253-2 hardback £55 & US$79.48; ISBN 978-1-4051-5254-9 paperback £19.99 & US$28.40; 320 pp.

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Cognitive archaeology is a relatively recent inter-disciplinary synthesis where the theoretical framework of cognitive science is applied to the interpretation of archaeological remains. New volumes touting such collaborations sometimes descend into adolescent gushing over all the exciting possibilities, boundless opportunities, and so forth. No one will accuse two recently released books on cognitive archaeology of that indulgence. The books, *Cognitive Archaeology and Human Evolution* and *The Rise of* Homo sapiens*: the Evolution of Modern Thinking*, reflect the tempered scholarly character of two leaders in the field, psychologist Fred Coolidge and archaeologist Tom Wynn. Coolidge and Wynn (hereafter C&W) are co-editors (along with Sophie de Beaune) of *Cognitive Archaeology* and co-authors of *Rise of Homo sapiens*. Behind their obvious enthusiasm, C&W manifest a patient, stoically insistent demand for strict scientific rigour. Inferring the thoughts behind stones and bones is not new, but grounding those inferences in cognitive science is — and getting it right is a formidable challenge. Under their tutelage, what cognitive archaeology lacks in sensual flare it should make up for in intellectual endurance.

Both their chapter in the edited volume and their book (to a much greater extent) provide C&W with a forum for articulating their vision of what good cognitive archaeology entails. They are especially interested in using the archaeological record to chart the emergence of distinctively human (or modern) cognition. For C&W, cognitive archaeology is of little value if it cannot play for all the marbles — when, why, and how did we become human? They begin on a sobering note — the traditional archaeological methods of trait lists or technocultural taxonomies will not do, nor will reverse engineering — evolutionary psychology's favourite tool. The reasons for their inadequacies are varied, but C&W take special aim at archaeologists' habit of starting with fossil remains and working back to mental processes. This, they contend, produces an almost tacit circular logic that is only rarely subjected to scientific scrutiny. Thus, modern cognition becomes whatever it is that allows one to create an Aurignacian tool kit.

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Using beads as a marker for modernity is an especially revealing case study in how to do it wrong. As far as we know, humans are the only creatures that wear body adornments (such as beads) and beads *can* symbolize something (although they don't have to). Thus, recently unearthed beads have been interpreted by some as indicating the presence of modern behaviour dating back as far as 100,000 ybp. But wait a minute, warn C&W, just because beads can symbolize something does not necessarily mean that they did for the hominins who created them, and even if they are symbolic how do we know that symbolic thinking requires modern cognition? Too many steps in this argument are being assumed rather than convincingly demonstrated.

Instead of starting with remains, instruct C&W, start with cognitive science. They have argued in numerous previous publications that modern cognition involved an enhancement of working-memory capacity. They develop this argument using Alan Baddeley's empirically well-founded model of working memory. This enhancement would have produced a number of cognitive abilities that might leave reliable indicators in the archaeological record. These abilities include: resistance to interfering stimuli, inhibition of prepotent responses, contingency planning, behavioural organization across time and space, and engaging in thought experiments. Informed by cognitive science, C&W then scour the archaeological record for evidence of these mental traits. Their standard for what constitutes modern cognition is a strict one, requiring them to reject (or at least be highly suspicious of) any remains (such as beads) that could be the result of a simpler mental process than one requiring enhanced working memory. Technologies requiring heavy investments in time and labour (such as traps, weirs, atlatls), forging systems requiring long-term planning (such as burning, food storage, migration interception), algorithmic or external memory devices (such as the Tai or Lartet plagues), and abstract artefacts (such as the Hohlenstein-Stadel figurine) all pass the test in their view. They conclude that most of the evidence for enhanced working memory accrues after 30,000 ybp and is thus restricted to Anatomically Modern Humans (AMH).

It is telling that C&W's chapter in *Cognitive Archaeology* is near the end — seemingly suggesting that they are willing to wait patiently as others have their say before rolling out their critique. The volume opens guardedly with co-editor, archaeologist Sophie de Beaune, framing some of the key questions motivating the discipline while simultaneously warning that, to date, archaeology has been slow to embrace cognitive science theories. A later chapter by fellow archaeologists Carolina Maestro and Carmine Collina echoes this sentiment pointing out that it is still unclear (to them at least) whether the much-lauded *chaine opératoire* method of analysing tool construction can be meaningfully interpreted by cognitive science. At times the tone seems almost pessimistic.

Indeed, de Beaune's chapter on inventiveness highlights some of the challenges facing cognitive archaeology — especially when it comes to identifying the presence of modern cognition. Inventiveness, she argues, can (generally) be attributed to novel combinations of already existing skills. Neolithic pottery, for example, draws together the idea of a container — long established in the Palaeolithic record in the form of skins, bark or tortoise shells — and clay-baking which was previously used for creating coating for walls and floors. Analogical thinking is probably the cognitive process underlying these inventions. Does using analogical thinking to create novel combinations of technologies (inventiveness) constitute 'modern cognition?' If, as de Beaune contends, evidence of analogical thinking goes back to *Homo erectus*, then it would seem that that aspect of it cannot be modern. All of this highlights the dire scientific necessity of defining precisely what it is that separates a 'modern mind' from a 'non-modern one.' At least one recent study finds some evidence of innovation among Neanderthals (Langley *et al.* 2008). Thus, it may not be innovation or analogical thinking *per se* that distinguishes modernity, but specific types of analogies or inventions. Even so, we must never succumb to the all too simplistic thinking that says 'when *Homo sapiens* show inventiveness — it's modern; when archaics do it — it's not'.

My own chapter exploring the evolution of consciousness may suffer similar definitional challenges. I think you have to be able to engage in conscious deliberate practice to develop the skill necessary for creating a later Acheulean hand axe. This is not, by itself, modern consciousness or cognition — although it is, I think, a necessary step on the way. But I must confess to a bit of convenient vagueness when it comes to specifying exactly what it is that makes 'modern consciousness' different from 'Acheulean hand axe' consciousness (other than the fact that modern consciousness allows you to make cave art and hand axe consciousness does not, but of course, that won't do). If C&W are right about the modern cognition–enhanced working-memory connection, then I have to think more deeply about how an expansion of working memory capacity affects consciousness and how that might show up in the archaeological record. Even if C&W are wrong in the specifics, all of us trying to understand the evolution of the uniquely human mind do well to more precisely define what that uniqueness really is and how it might show itself in archaeological remains.

Not unexpectedly, our continued obsession with language as the *sine qua non* of humanity shows itself in *Cognitive Archaeology*. No less than five chapters address the issue. Archaeologist Michael Walker conjectures that social complexity may have played a critical role in the emergence of language — you have to have a large enough group of people to talk to and something to talk about. Jacques Pelegrin sees possible evidence of propositional logic, 'if I do this to the core, the result should be a shape something like this,' in the Levallois technique — an important conceptual watershed in the evolution of language. Ian Tattersall echoes Derek Bickerton's argument that full-blown language must have emerged discontinuously and catastrophically — especially for all the archaic hominins whose extinction was sealed by its decent upon us and not them.

These authors raise important and interesting issues, but none (with the possible exception of Eric Reuland) directly tackle what C&W would see as the most pressing issue. Why is language necessarily evidence of modern

cognition? Kanzi has language — albeit a limited form. Same for Neanderthals (more than likely). But neither has (or had) modern cognition. What we really need to figure out is what a modern mind can do linguistically that a non-modern mind cannot and how that might show up archaeologically. In *The Rise of Homo sapiens*, C&W expend considerable effort trying to isolate how a modern mind (with enhanced working memory capacity) can deploy language differently from a non-modern one. It could be greater phonological storage capability, which would allow for subjunctive ('what if') or cross-modal (verbally labelling a visual-spatial percept) modes of thought and expression. But what archaeological remains could possibly serve as reliable indicators of 'what if' or cross-modal thinking? Evidence of innovation might work, but (as mentioned earlier) specifying exactly what it is about innovation that requires modern cognition is not simple. Possibly it is the rate of innovation — which would separate *Homo sapiens'* innovation from that reported for Neanderthals. C&W's drive for greater precision and rigour raises its own set of challenges, but it gives scientists something substantial to work with.

While archaeology adds cognitive science to its arsenal, one cannot help but be impressed with the powerful methodological weapons it already possesses. Miriam Haidle's chapter illustrates the use of cognigrams for revealing the extensive decision-making required for creating a Lower Palaeolithic spear. Jacques Pelegrin's chapter describes in detail how refittings can be used to provide evidence that Oldowan tool construction was under perceptual control; hand axe construction was under conceptual control; and Levallois may have required propositional thought. Similarly, Natalie Uomini presents meticulous experimental studies of stone-tool construction which provide insights into the hand-movement patterns used to create different tools. From this we can infer the degree of handedness of hominin toolmakers over the course of evolutionary history (with important implications for lateral asymmetry and language).

This archaeological strength also points to a psychological weakness, both of the edited volume and potentially of the collaboration itself. Despite Tom Wynn's observation in the volume's afterword that neuroscience may provide an important binding link among the disparate theoretical models of cognitive archaeology, only one of the 13 chapters in *Cognitive Archaeology* deals specifically with neuroscience (by Andreas Kyriacou). Indeed, non-archaeologists are hard to find in the volume — only Coolidge and I (psychologists), Eric Reuland (linguist) and the aforementioned neuroscientist can boast of clean fingernails. I have nothing against archaeologists (some of my best friends…), but if cognitive science is to contribute substantively to cognitive archaeology then clearly more cognitive scientists have to get involved.

The Rise of Homo sapiens is a positive step in addressing this imbalance, if only to show that a partnership between an archaeologist and a psychologist is not only possible, but potentially very productive. The book allows C&W to situate their arguments about cognitive archaeology and modern cognition within the larger sweep of both human evolution and cognitive science. The book is largely successful in putting many different theoretical pieces such as neuroscience, brain evolution, working memory and primatology together into a single coherent narrative about hominin evolution and uniquely human cognition. There are a couple of odd pieces, however, that seem not to fit as neatly as one might wish. For example, why they chose to include a section on brain myths ('we only use 10% of our brains, alcohol kills brain cells,' etc.) is not clear nor is its relevance to the book's central theme. Additionally, their insistence on tree to ground nesting — Australopiths nested and slept in trees, *Homo erectus* did so on the ground — as a major cognitive transition is also rather puzzling. It's not that the idea is without merit[1] it's just that the prominence they accord it seems out of proportion to the evidence they cite for it. There appear to be so many other possible, cognitively-relevant early transition points (global migration, hand-axe construction, composite tools, increased meat eating, etc.) with more well-established empirical pedigrees that, as it stands, changes in sleeping patterns may be a player in this drama, but not yet the top bill.

These missteps pale, however, when compared against the superlative job that *The Rise of* Homo sapiens does in describing how the marriage of cognitive science and archaeology can penetrate into the minds of our ancestors. How can we best describe the navigational, technical, and problem solving abilities of *Homo erectus*? How did the language of *Homo heidelbergensis* differ from Neanderthals? For those of us fascinated by the process of becoming human, C&W's careful analysis of our hominin ancestors' mental abilities casts thrilling illumination onto our murky prehistory. This past fall, I used their book in my graduate seminar class. Most psychology students are initially baffled by how archaeology could have any relevance to the human mind. For them, learning about refitting can be as tedious as well … refitting. But the payoff can astound.

The Rise of Homo sapiens takes us to the 400,000-year-old debitage pile at Boxgrove where a *Homo heidelbergensis* tool maker paused briefly to knap a hand axe. The tool maker's ancestral shadow looms over us as we kneel down at the site and allow the stones themselves to breathe life back into his thoughts and actions. No dumb beast left this sign. A mind passed this way. After being struck, each flake was scrutinized — larger, well-shaped ones were set aside to be worked further, later. With a craftsman's touch, the toolmaker skillfully struck the final finishing flakes, polishing the edge to an effective point. In our mind's eye we see a recognizable expression of human pride filling his visage as he gazes upon his handiwork. Before his reflection has vanished from the rippling waters along the Channel shoreline, we can wonder: is this when humanity first experienced beauty in personal creation? Is this when a sense of personal accomplishment was born? Scenes such as this dispel the notion that our ancestors were merely smelly, grunting brutes, lumbering about passing time waiting to become us. Exciting possibilities might indeed be in the offing if cognitive archaeology can capture the imagination of a few more aspiring psychologists. To that end, *The Rise of* Homo sapiens is an admirable start.

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Note

1. Recently Stickgold's sleep lab at Harvard has shown that NREM dreaming appears to facilitate learning on a spatial/procedural task (Wamsley *et al*. 2010). This is a little different from C&W's hypothesis in that they argue for the importance of REM sleep and dreaming in the evolution of memory and motor skills.

References

Langley, M.C., C. Clarkson & S. Ulm, 2008. Behavioural complexity in Eurasian Neanderthal populations: a chronological examination of the archaeological evidence. *Cambridge Archaeological Journal* 18(3), 289–307.

Wamsley, E.J., M. Tucker, J.D. Payne, J.A. Benavides & R. Stickgold, 2010. Dreaming of a learning task is associated with enhanced sleep-dependent memory consolidation. *Current Biology* 10.1016/j.cub.2010.03.027.