vations may be missing from the archeological record of tool use in hominids.

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De Beaune provides a useful summary of archaeological evidence regarding prehistoric pounding and grinding technologies, but there are some important problems with her broader theoretical interpretations. Before discussing these problems, however, I feel obliged to point out some inaccuracies regarding the dates of the earliest known tools, which de Beaune lists as "2.7 and 2.4 million years ago" from "the sites of Kada Gona and Kada Hadar" in Ethiopia. In fact, the Gona tools are well dated to between 2.5 and 2.6 million years on the basis of radioisotopic ($^{40}Ar/^{39}Ar$) and magnetostratigraphic evidence (Semaw et al. 1997, 2003). Stone tools from Hadar have a radioisotopic minimum age of 2.33 ± 0.07 million years and a loosely constrained *maximum* age of 2.4 million years based on the presence of *Theropithecus oswaldi* (Kimbel et al. 1996). It is also worth noting in this context that the 2.3-million-year age for the Lokalelei site 2C referred to by de Beaune has recently been questioned and may actually be closer to 2.2 million (Brown and Gathogo 2002).

Putting these dating issues aside, there are positive and negative aspects to de Beaune's "phylotechnical" argument. Her basic point that new technologies do not simply appear but must be actively invented is an important one that does not always figure in evolutionary accounts of human technology. The same may be said about her emphasis on the actual motions and processes involved in tool manufacture and use rather than the static morphology of finished artifacts. Unfortunately, these important points are not carried far enough. In particular, de Beaune's use of Leroi-Gourhan's typology of percussion to construct her evolutionary argument repeats the fallacy of misplaced concreteness (Whitehead 1929) that has been such a problem for more traditional typological approaches to stone tools.

Conventional descriptive typologies are as essential in archaeology as in any scientific endeavor. However, it is a mistake to forget the level of abstraction involved and to treat such classificatory systems as if they were themselves the concrete objects of study. In the present case this has led to a superficial treatment of technological change as nothing more than the recombination of abstract movement types and the consequent neglect of the detailed physical reality of the movements as goal-directed activities by real individuals in concrete ecological and social settings.

For example, de Beaune follows Leroi-Gourhan in asserting that the physical action of flaking stone is essentially equivalent to nut cracking because both may be classified as thrusting percussion. This hypothetical equivalence glosses over potential differences in required force and accuracy, among other things, and should be tested rather than simply asserted on authority. Differences in the perceptual-motor demands of particular forms of percussion are not part of Leroi-Gourhan's typology but may have important social and cognitive implications when the issue of skill acquisition is considered (Stout 2002, n.d. *a*). I agree with de Beaune that Oldowan technology was a "major innovation" but feel that more detailed studies of the bodily movements (Roux, Bril, and Dietrich 1995, Bril, Roux, and Dietrich 2000), neural activity (Stout et al. 2000, Stout n.d. *b*), and social interactions (Stout 2002) involved in stone knapping will be required to assess the true dimensions of this invention.

By narrowly defining technological invention as the transfer of a motion or tool to a new material or intent, de Beaune equates such invention with analogical reasoning. This once again assumes the concrete reality of the abstract categories created by Leroi-Gourhan—this time as concepts in the minds of ancient tool makers. According to this scheme, innovation is said to proceed through the cognitive manipulation and/or recombination of these concepts. Mental capacities such as abstraction, generalization, and "prospective intentionality" are then implicated. Not considered is the kind of concrete experimentation or tinkering that often leads to invention in the real world. Many animals produce innovative behaviors in this fashion, from birds learning to open milk bottles (Fisher and Hinde 1949) to monkey potato-washing (Kawai 1965) and the various tool-assisted foraging techniques of chimpanzee populations (Whiten et al. 1999). If we are to attribute capacities for "conceptual sliding and mental flexibility" on the basis of such innovation, then these capacities are widespread indeed.

As a matter of speculation, it is entirely possible that nut cracking inspired the first stone knappers. Even more plausible is the idea that the use of stones to crack bones for marrow incidentally assembled the various requisites of an adventitious discovery. Perhaps both scenarios occurred one or more times. It is unclear how such ideas might be tested. What researchers *can* do is pursue a more complete understanding of the technological actions preserved in the archaeological record. De Beaune's review of prehistoric pounding and grinding technologies contributes to this enterprise, but it does not adequately support the "phylotechnical" and cognitive conclusions that she reaches.

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De Beaune presents an interesting schema of the evolution of technical actions from the split between apes and hominids to *H. sapiens* and relies on cognitive mod-