

nonfood items that may be displayed in courtship is well documented (e.g., male bower birds). The adaptive value of storing nonperishable food in caches when seasonal variations bring scarcity is obvious (e.g., Sherry 1985; Smith & Reichman 1984). Likewise, the adaptive value of demonstrating fitness by flaunting collections of nonfood items can be construed as a behavioral “handicap,” in the evolutionary sense of the term (Zahavi & Zahavi 1997), similar to phenotypic features such as oversized feathers or other conspicuous and costly ornamental appendages. In archaeology, hoarding is also considered to be an expected behavior in past cultures at least from the Neolithic on (Hamon & Quilliec 2005). However, hoarding behavior appears in L&W’s article only marginally in association with the term “miser,” perhaps because it has come to designate in contemporary psychology a behavioral dysfunction, usually associated with cluttering, and often connected with senescence. But this is a recent semantic change particular to clinical psychology. As noted above, it has kept its functional value as an adaptive strategy in other fields of inquiry.

Anderson et al. (2005) offer a neurologically based model of hoarding behavior that could explain more economically within a single evolutionary theory the two types of behaviors toward money contrastively described by L&W in the target article. Anderson et al.’s investigation of patients with mesial prefrontal lesions who show compulsive collecting behavior suggests that the drive to collect and hoard, which “primarily originates from subcortical bioregulatory nuclei” (p. 208) (i.e., limbic subcortical and mesolimbic cortical structures), is modulated by self-regulatory functions associated with mesial prefrontal regions. Anderson et al. tentatively submit that “the drive to collect would be assisted in part by a weighting system, whereby the neural representation of a stimulus item would be associated with a particular signal value, which would serve as an index of the relative worth of the stimulus” (p. 208). This is all the more relevant to the case of money attitudes in that it does not appear that “the targets of acquisition behavior are specified at a genomic level” (p. 207).

In view of such evidence and plausible assumptions, it is possible to formulate a hypothesis: Natural selection both favored (1) a drive to collect and hoard a broad range of items, as this behavior enhances self-preservation and reproductive fitness; and (2) an inhibitory system that monitors the process and decides when this drive runs the risk of reaching a maladaptive threshold either by overloading the carrying capacities of the organism at the expense of other vital functions, or by collecting and hoarding indiscriminately. The latter could be explained by the fact that the properties of the stimuli should not be too narrowly specified, since excessive specialization would not be adaptive with respect to changing environments. It can also be expected that, if both behaviors are indeed genetically controlled, it will ensue that there will be variations among individuals in congruence with the emerging structural variation theory of the human genome (Check 2005). Therefore, it is not necessary to hypothesize a maladaptive addictive model (the drug metaphor), but simply natural variations and occasional dysfunctions that cause a more or less drastic disinhibition of the hoarding drive. As frontal cortical functions are associated with cognitive competences, such as the representation of the context and the comparative evaluation of stimuli, it is natural that they would appear to constitute the rational norm that is captured by the tool metaphor. From this point of view, money would not be a specific object but a mere cultural index for resources, and the intellectual conundrum created by the discrepancy of the two attitudes identified by L&W would result from the incompatibility between the two root metaphors rather than from the attitudes to which they refer.

But there is more. By using the abstract notion of money as the common denominator of all the forms of behavior they take into consideration, L&W operate a conceptual reduction by creating a kind of epistemological commodity that tends to erase all

cultural, ideological, and socio-economical differences. Thus, they remain within the universalist discourse of the political economy that regulates contemporary globalization, construing capital as a tool to generate profit but ignoring the immediacy of salaries (or food coupons) as a scarce index of threatened livelihood. Hence, their surprising notion of money as a “functionless motivator” (sect. 2.2.2) that can “mimic . . . natural incentives” (see Abstract, sects. 2.4, 5.1) – a case that may perhaps apply to Monopoly type of games or extreme financial speculations, but not to everyday experiences in the greater part of the world.

By shifting the focus toward the evolution of the behaviors concerned and their neurological substrates (which could not have evolved with respect to the too-recent institution of money), the hoarding model seems to be more apt for explaining in evolutionary terms, and more economically, the range of behaviors L&W address in their article. Confronted with this somewhat baroque, two-headed theory, one cannot help thinking that the authors could have made a better use of Occam’s razor.

Money, play, and instincts

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Abstract: The metaphor drug model of money slights the possibility that money may literally tap into and exploit brain systems underlying motivational systems, and it also ignores growing evidence on the common neural substrates of behavioral and “physiological” addictions. Additionally, many objects other than money can gain such drug-like properties. The treatment of play in the evolutionary explanation for the unique role of money in people ignores key conceptual and empirical issues.

One of my professors at the University of Chicago back in the 1960s, the brilliant David Bakan, was very pleased with his definition of money as “a medium of exchange accepted by strangers.” Lea & Webley (L&W) realize, however, that money does not just have an instrumental or tool function; there are constraints on its use. They point out that money is not considered an appropriate gift in some contexts (though, of course, that is also true of any other object). L&W invoke money as a drug, mimicking human instincts, to deal with all those aspects of money that their “tool theory” cannot accommodate. They argue that money readily comes to act as a motivator similar to biologically based instinctive drives.

Skinner and his followers viewed money as the ultimate generalized reinforcer developed through instrumental (tool) conditioning. That the ultimate bedrock of even the most artificial and arbitrary training regimes for rats, pigeons, and people was access to primary or secondary reinforcers (or “drives”) was assumed as obvious, though uninteresting and not in need of an evolutionary explanation beyond the connections made in Skinner (1966). Now we find out that the operant approach was based on money (tokens) as drugs. I rather thought that token economies, when instituted in mental hospitals, were means to wean people from unproductive, destructive, incompetent, impulsive, compulsive, or self-injurious (e.g., drug-like) behaviors we now know to be largely due to malfunctioning neurotransmitters resulting from genetic and developmental events. Are we now to consider token economies as just another drug therapy, a trading of one addiction for another?

Although L&W make much of the fact that money developed late in human history, automobiles appeared even more recently. Like David Bakan, my major professor at Chicago, Eckhard Hess, was also very pleased with one of his definitions: an automobile is merely a means to get from point A to point B safely

and efficiently. To him a car was totally a tool, confirmed by the fact that he rarely drove except to travel out of town. But he, nevertheless, bought his wife, Dorle (a stylish and artistic matron from European wealth), a Mercedes convertible. As she zipped around Hyde Park with the top down and her blond hair blowing in the wind, Hess realized that for his wife a car was far more than a means of transportation, and he felt obliged to humor her “drug” habit. Fast sporty cars are fun, even exhilarating, to drive, and a Mercedes in the 1960s was still an uncommon status symbol as well. Obviously, there were constraints on what one could do with such a vehicle. It was not very useful for transporting more than two persons, had limited trunk space, and insurance and repairs were costly. So, I guess the way to understand automobiles is to invoke both the tool and drug metaphors. But wait, any use of food that does not just provide nutrition and calories should be looked at in this way also – as a drug. Food was also one of the first mediums of exchange and the spice trade a most important early part of international trade.

The point of these examples is to argue that, as formulated, I find this proposed drug metaphor an “emperor” theory of money that has no clothes. Oops, clothing also is both instrumental and a drug of choice for shopaholics, and has been an important means of exchange (cloth, silk, cotton, wool, not to say boutique “rerun” shops).

Does money act as a drug on dopamine receptors in the basal ganglia and related structures or is the drug idea merely a metaphor? The authors opt for the latter, but much of the article seems to argue the former. To them money “intrudes on the normal functioning of the nervous system” (sect. 2.2.1) by mimicking substances involved in basic instincts that are, in fact, centered in these same brain areas. Although still somewhat controversial, these areas seem to contain often overlapping systems involved in basic motivations, cravings, feelings, compulsions, conditioning, and both behavioral and drug-based addictions, including excessive running, gambling, and so forth (references in Burghardt 2001; 2005). I think that the drug word may have shock value, but essentially adds nothing since any behavior not based on rational or instrumentally adaptive behavior is, for L&W, acting as a drug. This dichotomy is just another learning–instinct contrast that neglects the biological processes connecting instrumental and instinctive behavior.

L&W also assert that money is unique in having no intrinsic drive-reducing or instinctive properties based on current or past environments, and thus is an entirely new phenomenon that needs formal incorporation into an evolutionary account of behavior. In doing this they have to deal with the origins of money in our evolutionary past. This they view as a challenge since they claim that money is unique to our species (an interesting assertion itself since tool use, tool making, language, counting, altruism, even moral behavior have fallen by the wayside as qualitative distinctions between humans and other species). So what to do? After going through the first four sections of the target article, I awaited the new ideas that were going to emerge from their evolutionary analysis. Surprisingly, the critical heart of the paper on the origins of money is in but a fraction of the text (sects. 5.2 and 5.3) where we find that reciprocal altruism and play are the roots of the origins of money as drug.

Insofar as altruism as a source of money is concerned, I will focus just on the claim that, while altruism is old, the trading instinct is unique to our species; an assertion that cannot be sustained. We have known for decades of gift-bearing flies and gift exchanges among birds (see Judson 2002). Indeed, these gifts may become divorced from their original reinforcer (food) and become symbolic. Although ethology (Tinbergen 1951) is cited, the seminal concept of ritualization is not. While such “gifts” in other species may not always be explicit payoffs or serve as generalized reinforcers, they certainly are trades. Furthermore, exchanges are the essence of many social insect societies, even interspecifically (aphids pay for protection with secretions).

Mutualism, symbiosis, and similar “trading” phenomena are endemic in organic life. The roots of trading may run deep in our phylogenetic heritage, and the evolution of money may have been a small evolutionary step, albeit with major consequences.

The second instinct that is invoked to explain the origins of money is play. Having just written a treatise on this topic (Burghardt 2005), I was anxious to see how L&W deployed the concept. I was surprised that play is invoked without any consideration of what it is or the nature of its instinctive origins. In fact, the only topic discussed is toy exchange, based on the authors’ own studies published in economic venues. To end their paper on such a thin two-paragraph thread of support is disappointing. First, whether play, even object play, is a separate instinct (or behavior system) or is derived from other systems (such as predatory or fighting), is still an open issue in many species. Second, whether exchanging toys is a means of learning how to manage resources rather than a behavioral relic or a pre-social performance of adult behavior with no important “practice” component, is largely unknown. A just-so story does not constitute data, especially when the adaptive function of play in juvenile animals has rarely been demonstrated experimentally (Burghardt 2005). If play exchange is training for money management, as L&W assert, the problems so many people have with money management makes such play quite ineffective.

Finally, the loose use of the term “instinct” is disturbing and shows that the new style of evolutionary psychology, by largely eschewing engagement with data on other species, is in danger of losing any claim to be a naturalistic evolutionary science. The classical ethologists, along with their critics, made remarkable progress in conceptualizing instinctive behavior and motivational systems. I fear that articles such as this one will make the current incarnation of evolutionary psychology problematic to both evolutionary biologists and social scientists.

Money as epistemic structure

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Abstract: A testable model of the origin of money is outlined. Based on the notion of epistemic structures, the account integrates the tool and drug views using a common underlying model, and addresses the two puzzles presented by Lea & Webley (L&W) – money’s biological roots and the adaptive significance of our tendency to acquire money.

Epistemic structures (ESs) are structures that organisms add to their environment to lower the cognitive complexity associated with tasks (Chandrasekharan 2005). For instance, wood mice (*Apodemus sylvaticus*) distribute small objects, such as leaves or twigs, as points of reference while foraging. Such “way-marking” has been shown to diminish the likelihood of losing interesting locations, and is exhibited even under laboratory conditions, using plastic discs (Stopka & MacDonald 2003). The male bower bird builds colorful bowers (nest-like structures), which are used by females to make mating decisions (Zahavi & Zahavi 1997). Bacterial colonies use a strategy called “quorum sensing” to know that they have critical mass to attack a host. Individual bacteria secrete molecules known as auto-inducers into the environment; when the chemical breaches a threshold, the colony attacks (Silberman 2003).

We have developed and implemented an evolutionarily plausible model of the origin of such external structures, using artificial agents that possess only reactive behaviour (the agents just sense and act, they do no internal processing). The model uses cognitive load reduction in a recursive fashion: it is an effect of