must operate through basic behavioral mechanisms which themselves are related to (or, rather, *must* be related to) fitness maximization. The mediatory role of these presumed behavioral mechanisms breaks the problem of the biology of money into two parts: (a) what behavioral mechanisms are involved in money seeking (proximate causes)? and (b) what is the evolutionary rationale of such mechanisms (ultimate causes)? These two distinct problems are not clearly separated by the authors, as evidenced by the mechanisms selected for their synthetic theory of monetary behavior.

According to L&W, money may be metaphorically described as a tool, or as a drug. These two functions are easily mappable to two general behavioral mechanisms familiar to behavior analysts: operant and Pavlovian conditioning. In operant terms, money may serve as the lever that, when properly manipulated, yields reinforcing consequences. In Pavlovian terms, money may serve as the cue signaling the availability of attractive stimuli, eliciting responses of approach and anticipation, among others. The tool versus drug distinction, however, does not fully match the operant versus Pavlovian dichotomy. Tools yield "real" rewards, whereas drugs are "nonfunctional" substitutes for "real" rewards. The tool–drug dichotomy presumably encompasses all possible motivational roles of stimuli like money, which in themselves are not "real" rewards. The terms in quotation marks are defined by their contribution to fitness. Certainly, operant and Pavlovian conditioning, as general mechanisms, are significant contributors to the fitness of complex organisms, and they are demonstrably facilitated by a congruency of stimuli and responses that is only attributable to evolutionary processes (e.g., Garcia & Koelling 1966). But once operational, conditioning is agnostic of the "reality" of the reinforcement process. And so is money: it may work as a tool to obtain fitness diminishers like crack cocaine, and it may work as a "functional drug," signaling incoming food ingestion when we inspect our wallet in a restaurant. It is not clear how either one of these two cases fits the tool versus drug distinction. The completeness of the tool–drug approach is undermined when we consider the possibility of using a tool to obtain a drug, or of using a drug as a tool. The basic metaphors are conceptually close to conditioning mechanisms, but they need to reconfigure their link to selective advantage as a separate problem.

In the target article, the Skinnerian operant approach is described as a "Drug Theory" on the basis of its characterization of money as a conditioned reinforcer. Interestingly, "operant money theory" could be described also as a "Tool Theory" on the same basis, if one is of the persuasion that conditioned reinforcement derives its value from signaling the relative proximity of other reinforcing events (e.g., Preston & Fantino 1991). If such is the case, there is no reason to agree with the authors' claim that conditioned reinforcers must work in the same way as unconditioned reinforcers. Furthermore, positive informative signals may elicit behavior completely unrelated to the signaled reinforcer (e.g., a ringing phone may signal an awaited call, but few would engage in a conversation with the phone), or very similar to the consummatory response (e.g., autoshaping in the pigeon; Allan & Zeigler 1994). In other words, money, qua conditioned reinforcer, may be described as a tool or as a drug, and neither description appears to be exclusive. The compatibility of these descriptions is an issue that goes beyond money and into the discussion of the interaction/identity of operant and Pavlovian conditioning (e.g., Lajoie & Bindra 1976).

Although reciprocal altruism and play may be involved in the interest for money, their invocation as instincts to explain monetary behavior is unwarranted. The connection between behavioral mechanisms and evolution is not examined to such an extent as to rule out the empirically verifiable possibility that both behaviors are derivable from general mechanisms. Consider the situation of cooperating in a prisoner's dilemma game, when playing against a perfectly reciprocating strategy (or tit-for-tat; Axelrod 1984). Sanabria et al. (2003) have demonstrated that pigeons may learn to cooperate in this game, but only if each choice between cooperation and defection produces a stimulus that is predictive of reciprocation (i.e., a conditioned reinforcer or punisher). Pigeons are obviously not hardwired to reciprocate the actions of a computer at the expense of immediate gratification, but they can learn it. Maybe money operates, partially, as an analogue of the cooperation stimulus, bridging over what we give up for money, and what we obtain for it.

The tool–drug metaphors bring economic motivations closer to their biological substratum, but they can be improved. Their symmetry with conditioning mechanisms suggests a fruitful course of action. These mechanisms may well function as mediators between evolution and some socially arranged behavior (Gutnisky & Zanutto 2004; Skinner 1984). Such function, unlike instinctual drives directly linked to evolution, is readily verifiable in nature.

ACKNOWLEDGMENTS
Preparation of this commentary was supported by NSF IBN 0236821 and NIMH 1R01MH066860. Thanks to Peter Killeen for his feedback on early drafts of this commentary.

Memetics and money

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Abstract: Lea & Webley's (L&W's) Drug Theory solves many puzzles surrounding money-related behavior. I explore supplementing the Drug Theory with ideas from gene-culture coevolution theory and memetic theory.

Lea & Webley's (L&W's) discussion of money as a drug represents an ingenious synthesis of disparate literatures. The theory is, however, specifically oriented toward explaining the *origins* of money ("our task is to offer the best account we can of the biological origins of the money motive"; sect. 1.4). I would like to raise the possibility that a theory that moves beyond the origins of money to focus on its ongoing manifestations might find a greater role for culture. That is, once money is in existence, the symbolic aspects of money-related behavior may function in such a way as to make them not simply classifiable as instances of the Drug Theory (as argued in sects. 3.3.2 and 5.2). To account for the ongoing manifestations of money-related behavior, I believe that the Drug Theory will need to be supplemented with ideas from gene–culture coevolution theory and memetic theory.

In L&W's discussion, "function" always refers to biological function. This is true in both their Tool Theory and their Drug Theory. In the former, money gives indirect access to biological rewards, and in the latter, money "covers cases where it gives direct access to the systems that subserve such rewards but in an illusory, nonfunctional way" (sect. 2.3). But what about human goals and desires that have completely slipped their genetic/biological moorings? Neither the Tool nor the Drug Theory would seem to have much to say about such cases, or at least both theories need to be supplemented to encompass this situation. The alternative is to contest a fundamental assumption of most memetic theorists – that memetic goals can become detached from genetic fitness considerations and indeed can become detached from the interests of the vehicle (person) hosting them (Blackmore 1999; Dennett 1995; Stanovich 2004).

A view of money that recognizes memetic goals that are detached from genetic goals does have affinities with views in the modern sociology of money discussed by L&W. However,

https://doi.org/10.1017/S0140525X06439042 Published online by Cambridge University Press

broader notions of symbolization than those represented in the sociological literature might not be as easily subsumed under the Drug Theory – for example, notions of symbolic utility associated with Robert Nozick. Nozick defines a situation involving symbolic utility as one in which an action (or one of its outcomes) "symbolizes a certain situation, and the utility of this symbolized situation is imputed back, through the symbolic connection, to the action itself" (Nozick 1993, p. 27). Money use in highly affluent societies can often have this property. Nozick notes that we are apt to view a concern for symbolic utility as irrational when the lack of a causal link between the symbolic action and the actual outcome has become manifestly obvious, yet the symbolic action continues to be performed. Many dysfunctional interactions surrounding money seem to have this property of being detached from real-world outcomes and becoming attached to very abstract memeplexes (political memeplexes that seem to serve neither personal interests nor genetic interests come to mind). L&W recognize the difficulty here when they acknowledge "that money is essentially a symbol, perhaps multiply symbolic (cf. Lea et al. 1987, Ch. 12), seems hard to reconcile with any kind of biological analysis of money motivation; it leads, furthermore, to a cognitive rather than a motivational analysis of behaviour towards money." This seems right, and the cognitive substrate that it relies upon would seem to be in the domains of simulation and metarepresentation (Carruthers 2002; Currie & Ravenscroft 2002; Dienes & Perner 1999; Nichols & Stich 2003; Sperber 2000) – precisely the domains upon which memetic evolution is dependent.

If the *origins* of money are in the mechanisms outlined in the Drug Theory, then I would argue that a further exaptation has taken place in the service of memetic evolution. An exaptation for memetic purposes would likewise be consistent with the many findings of biological nonfunctionality that L&W find supportive of the Drug Theory, and it would additionally be consistent with many findings in the heuristics and biases literature which show that interactions involving money are instrumentally irrational (Kahneman & Tversky 2000; Raghubir & Srivastava 2002; Shafir et al. 1997; Stanovich 1999), that they do not serve the interests of the individual (whether or not they are consistent with genetic fitness maximization; see Stanovich 2004).

In L&W's Drug Theory, money parasitizes trading that is derived from reciprocal altruism. However, L&W might just as easily (and additionally) have posited money parasitizing trading derived from strong reciprocity (Fehr & Fischbacher 2003) – altruistic acts performed when no reciprocal benefit is possible. This uniquely human form of behavior is increasingly viewed as the product of gene/culture evolution (Fehr & Fischbacher 2003; Gintis 2003; Gintis et al. 2003; Richerson & Boyd 2005). This, in part, puts the Drug Theory on a memetic foundation as well as a biological one.

Money motives, moral philosophy, and biological explanations

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Abstract: Lea & Webley (L&W) provide two alternative biological accounts of human monetary motivations, the Tool Theory and the Drug Theory. They argue that both are required for an adequate explanation. I explore the applicability of these models to philosophical discussions of how we might justify such motivations. I argue their approach is not entirely satisfactory for normative questions, since it precludes the possibility of rational non-instrumental attitudes towards money.

Lea & Webley's (L&W's) target article explores the important question of what the biological basis of our monetary motives might be. One obvious explanation involves their Tool Theory, according to which money is a tool and our reasons for desiring it are to be understood like our desire for any tool in terms of what other goods it is able to help us obtain (sect. 2.1). L&W argue that while this has some intuitive appeal, a Tool Theory of money motivation fails to explain fully the strong pull of money as a motivator. A full explanation requires that we understand money as acting sometimes, in a metaphorical sense, as a drug. According to their Drug Theory, money intrudes metaphorically on the normal functioning of the nervous system: money acquires its incentive power because it mimics the psychological action of some other more natural incentive (sect. 2.2.4). Accordingly, it involves irrationality.

My interest here concerns money motives and morality. What applicability might this have to normative theories regarding the extent to which we should be motivated by money in the way that we so obviously are. For the moral philosopher, any interest here would be in *justification* rather than *explanation*. How well might L&W's template fit onto the history of what R. H. Tawney (1926) called "economic casuistry"? Unlike more radical approaches that would cast all monetary motives as immoral, the economic casuist distinguishes between legitimate and illegitimate monetary motives.

We can discern two central schools of thought regarding money motives in this more moderate tradition. The first of these derives from the work of Immanuel Kant, and sees money as a tool or instrument which is only to be used for buying "tool-like" things. For Kant, money is a pure means. He contrasts this with *persons* who are ends-in-themselves and should be accorded respect in keeping with their status as persons. Kant argues that every thing has either a price or a dignity and if it has a price it cannot have a dignity (Kant 1785/1946). Although it is quite legitimate to regard mere *things* as means and therefore to ascribe to them a price, this is not the case with persons. Clearly, what we have here is a Tool Theory of normative evaluation. Money is a tool and it is wrong to treat persons as if *they* were tools.

The second great tradition is Aristotelian in origin and focuses on the role that money plays in the best possible life. Aristotle, and later philosophers such as Aquinas, regarded money as the very embodiment of an instrument and, as such, it could not be a proper end of activity (Aristotle 1952). However, immersion in commercial life often leads people to regard money as an end-in-itself. For the Aristotelian this is an irrational mistake. In explaining this irrationality, Aristotelians focus on the inability of money to function as an ultimate goal. Proper activities have a realizable goal. When one aims to build a boat, one realizes one's goal when the boat is completed and ready to sail. But in the case of money there is no point at which one realizes one's goal of making money. Having no satisfaction conditions, it endlessly iterates (Walsh 2004). Obviously, this second tradition can be cast as a Drug Theory. According to the Aristotelian tradition, the person who takes the pursuit of money as their fundamental goal is irrational since the very nature of money is such that it cannot function in this way.

It appears, then, that L&W's template fits neatly onto the two main ethical traditions in Western philosophy that seek to distinguish between legitimate or illegitimate money motives. These accounts of the moral difference conform either to the Drug model or to the Tool model, since the normatively undesirable motives here are either understood as cases of "inappropriate tool-treatment" or of irrational drug-like behavior. Built into such a model is the assumption that non-instrumental motives towards money must be irrational. We can see this assumption at work in L&W's discussion of restrictions on money use (sect. 4.5). Money is said to function as a drug in those cases where it is "found to have a value and an emotional charge that are not predicted by its economic use" (sect. 4.11). If not a means, then the behavior belongs to the realm of irrationality.

https://doi.org/10.1017/S0140525X06439042 Published online by Cambridge University Press