

But should we accept this last assumption? In moral philosophy the suggestion that non-instrumental attitudes are fundamentally irrational is highly controversial. Value pluralists, such as Raz (1986) and Anderson (1993), have argued persuasively for the existence of forms of moral value that arise from the ideals and attitudes expressed in action itself, rather than its consequences. Anderson, in particular, explores how our use of money might express ideals and attitudes that in certain circumstances might be inappropriate. She claims that in such cases it is rational to refuse monetary exchanges on grounds which are fundamentally non-economic and which reflect the basic values of the agent concerned. This seems right, for surely one can refuse money for some good, no matter how much money is on offer, without being thought irrational. If this is correct, then there would appear to be cases in moral theory not covered by the Tool and Drug Models, at least as described – namely, those where one might rationally choose, on non-instrumental normative grounds, to avoid certain monetary transactions.

Although the account is insightful, my concern is that if it were to be applied in its current form to the normative realm, it would exclude rational non-instrumental attitudes towards money from the possible set of human motives in this area. This would be an undesirable outcome. A further question, which might be pursued elsewhere, concerns the extent to which rational non-instrumental attitudes towards money could have a role in biological explanations of our desire for money.

Authors' Response

Money: Motivation, metaphors, and mores

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Abstract: Our response amplifies our case that money is best seen as both a drug and a tool. Some commentators challenge our core assumptions: In this response we, therefore, explain in more detail why we assume that money is an exceptionally strong motivator, and that a biological explanation of money motivation is required. We also provide evidence to support those assumptions. Other commentators criticise our use of the drug metaphor, particularly arguing that it is empirically empty; and in our response we seek to show how it can be submitted to test – aided by some commentaries which suggest such tests. In addition, we explain, with evidence, why we do not think that the notion of money as a generalised conditioned reinforcer provides a satisfactory alternative to the tool/drug account. The largest group of commentaries suggests alternative instincts on which the drug-like effects of money might be based, other than the reciprocity and play instincts we propose; in our response, we explain why we still prefer our original proposals, but we accept that alternative or additional instincts may indeed underlie money motivation. A final group of commentaries carries the argument further, suggesting extensions to the tool/drug model, in ways with which we are broadly in sympathy. The purpose of the tool and drug metaphors is to encourage reflection on the biological origins of money motivation, and to that extent at least we believe that they have succeeded.

R1. Introduction

Our target article started from four core assumptions (sect. 1): (1) For humans (but not for other species), money has an extraordinary incentive power, similar to that of other motivators such as food and sex. (2) Whereas the incentive power of food, sex, and most other motivators is easily understood in biological terms, that of money is not. (3) A biological explanation of the incentive power of money therefore needs to be provided because “the science of money is still disconnected from the science of life” (to use **Sanabria**'s elegant expression), and the gap needs to be bridged. (4) This task has hitherto been neglected.

From those assumptions we argued, through a consideration of past theories and current data, to three conclusions (sect. 5.4): (i) The “obvious” Tool Theory of money motivation, according to which money is valued because it enables us to fulfil other biologically explicable instincts, is inadequate; (ii) the inadequacies of a Tool Theory can be overcome by combining it with a Drug Theory, according to which money provides illusory fulfilment of other instincts; and (iii) the instincts for which money particularly provides illusory fulfilment are the instincts to trade and to play.

We predicted (sect. 5.4) that our three conclusions would find decreasing levels of acceptance, and a reading of the commentaries bears this out. Similarly, not all of our assumptions were challenged: everyone pretty much agrees that the biological explanation of the money motive has been neglected. However, by no means does everyone agree that such an explanation is needed; some commentators clearly feel that the biology of money has been neglected, is continuing to be neglected, and ought to be neglected further.

Hence, we can divide the arguments in the commentaries into those that challenge our assumptions; those that (broadly) agree with our assumptions but challenge our conclusions, because they challenge the arguments by which we reached them; and those that accept our assumptions and our conclusions as far as they go, but seek to extend them in various ways. Naturally, several of the commentaries involve elements of all three of those positions. In responding to the commentaries, therefore, we reflect on these three approaches in succession, rather than taking each commentary in turn. We start with a response to critiques of our assumptions.

R2. Money is an important human motivator

Several commentators (e.g., **Burghardt**, **Glassman**) challenge our assumption that the money motivation is unique. To some extent these challenges miss the point of our article. For example, we have no problem with the fact that human sexual motivation is decoupled from procreation (**Ross & Spurrett**); that does not undermine its biological continuity in the terms in which we define it (sect. 1.4). A more serious challenge, however, is **Furnham**'s claim that money is not in fact a very powerful motivator. Furnham argues that money is actually a hygiene factor (in the sense of Herzberg et al. 1967) rather than a motivator. In support of this claim, he points out that at least some affective associations with money are in fact negative,

and that this is not what one would expect from a cognitive drug, nor from something that is a strong motivator.

It is fundamental to our argument that money is a powerful motivator. Accordingly, at the risk of belabouring the obvious, we need to briefly review some of the evidence that supports our position. Such evidence comes from everyday discourse, the stylised facts of the ordinary labour market, empirical studies of some less usual markets, and finally from direct experiment. The culturally invasive nature of money, which we discuss in section R4.1 of this response, provides additional evidence.

R2.1. Everyday discourse: Proverbs, aphorisms, and familiar quotations

Both formal literature and traditional wisdom contain large numbers of aphorisms and comments referring to money. Indeed, there are so many that Furnham and Argyle (1998) are able to open each of their chapters with a list, and Jackson (1995) has collected a comprehensive anthology. Formal analyses of such lists have been carried out: for example, Doyle and Li's (2001) comparison of Chinese and Japanese proverbs about money.

Examination of lists of such aphorisms suggests that they fall into two types, which we call the cynical and the sceptical. Cynical aphorisms assert the power of money, in the face of explicit or implicit protestations to the contrary. Sceptical aphorisms assert the limitations of the power of money, in the face of an assumed consensus that such limitations barely exist. It might be thought that the two groups cancel each other out. However, given the social function of aphorisms, it is clear that both types are evidence that there is a widely held belief in the power of money.

Examples of cynical aphorisms include: "[Money] is the sovereign queen of all delights: for her the lawyer pleads; the soldier fights" (R. Barnfield, spelling modernised from the 1598 original); "What makes all doctrines plain and clear? – About two hundred pounds a year" (Butler); "Wine maketh merry; but money answereth all things" (Ecclesiastes 10:19) (all quotations from Benham 1935).

On the more sceptical side we have, from the same collection (Benham 1935): "No man's fortune could be an end worthy of his being" (F. Bacon); "A good name is rather to be chosen than great riches" (Proverbs 22:1); "Honour and money are not found in the same purse" (Spanish proverb).

Of course, literature as such is not evidence. But these sayings are evidence that people have long believed money to be a powerful force, and that some people have believed it to be a dangerously powerful force in people's lives.

R2.2. Stylised facts: The labour market and crime

The second line of evidence for the power of the money motive again comes from the realm of everyday experience, though it belongs to the academic disciplines of labour economics and occupational psychology and partly to criminology. Put crudely, there is no job so unpleasant, hazardous, or immoral that no one will take it if the pay is right.

This generalisation may seem questionable. In any society, there are some people who refuse to take the

only jobs offered them for the pay they are offered, preferring to become marginalised or outcast, or to work in the subsistence economy. There are jobs that people take only with great reluctance, and where the pay has to be at a premium because of their non-pecuniary disadvantages: prostitution and related occupations such as topless dancing are the obvious examples (see Reynolds 1986; Thompson et al. 2003). But the evidence of labour market history is that there is no job that absolutely no one could be induced to do, if sufficient money was offered. And beyond legitimate employment, it is clear that if a crime is apparently profitable, there is no level of punishment, up to and including death, that will completely eliminate it so long as there is some chance of escaping detection. In the right circumstances, then, money has the capacity to overwhelm all other motivations.

We are not saying that the money motive is all-powerful. We are not saying that anyone can be persuaded to perform any act for enough money: some people are able to resist bribery. But the same is true of other powerful motives; the power of hunger or sex are not disputed because some people manage to fast and many people are sexually faithful.

R2.3. Empirical studies: Unusual markets

Just as some people will, under some circumstances, do almost anything for money, so also some people, under some circumstances, will sell almost anything for money. The most discussed example in the recent literature is the sale of organs for transplantation, particularly kidneys, and there is extensive discussion in the medical ethics and policy literature as to whether this should be encouraged or not (e.g., Kahn & Delmonico 2004). Significant numbers of people have made this kind of sale: Goyal et al. (2002) found more than 300 individuals who had done so in one city in India – about .05% of the population.

In everyday speech, someone who would do anything for money is described as being ready to sell his grandmother. There is no formal evidence that people do exactly that, but they will certainly sell their children. The widespread tradition of brideprice is, objectively, a matter of selling a daughter, though it might be thought a relatively innocuous example. The public concern about international adoption in recent years has partly been driven by the possibility that it can lead to the sale of children (Hollingsworth 2003). It is also claimed that child prostitution in developing countries often involves the sale of children by their parents. Some widely circulated stories (see, e.g., Flowers 2001) are hard to document, but even authors who are sceptical of them recognise that there are parents in some of these countries who are willing, however reluctantly, to be supported by their adolescent daughters' earnings from the sex trade (Bagley 1999).

As in the case of crime, the existence of these markets does not mean that people are universally or even commonly willing to sell their body parts, or their children, for money. What it does show is that in the right circumstances, the money motive will overwhelm even the motives to preserve one's own body and one's own descendants. Biologically speaking, that places the money motive at the highest level there is.

R2.4. A formal demonstration of the strength of the money motive

Few experimental psychologists have thought it necessary to demonstrate the strength of the money motive. However, Schwab (1953) has reported an experiment in which he asked patients to hang from a horizontal bar in a gymnasium for as long as they possibly could, which turned out to be about 45 seconds. If he subjected them to “suggestion and strong urging (hypnosis in some cases),” they managed to hang on for somewhat longer, about 75 seconds. But if he held out a \$5 bill (worth around \$30 at today’s prices), and told them they could have it if they beat their previous records, they managed to hang on for an average of 110 seconds. Any incentive that enables someone to perform at tasks at 250% of their previous best level has, we argue, some right to be regarded as strong.

R2.5. Is money a uniquely human motivator?

While not questioning the strength of the money motive for humans, **Ross & Spurrett** raise the possibility that animals other than humans can also acquire the motivation to use money. They cite the results of Chen et al. (in press), showing that capuchins would trade tokens with an experimenter in exchange for food reward. Impressive as these results are, they do not add anything in principle to other demonstrations of conditioned reinforcement in animals. A number of other commentators have also suggested that conditioned reinforcement provides an adequate alternative biological explanation of the money motive. We respond to this argument later, in section R6.2.

R3. Money motivation is unusually difficult to explain biologically

Few if any commentators suggest that money is easy to explain biologically. However, some commentators question whether it poses a special or unique difficulty. Essentially they argue that many or even all human motivations are so transformed by our uniquely cultural biology that they are as detached from any obvious function as money is. As we have pointed out in the preceding section (R2), however, this is to misunderstand what we mean by biological continuity. Continuity does not require that a human function is identical to that of other primates. It does require that there should be a plausible path of evolutionary and historical development from the kind of motivations seen in other animals (and, therefore, presumably shown by our prehuman ancestors) to those seen in modern humans. There is a plausible path from chimpanzees’ monkey hunting (Teleki 1973) to “Laughing Stock Farm pork cooked two-ways with winter squash and red wine panade and Belgian endive” at Chez Panisse; but there is no such path to the platinum American Express card with which we might pay for the dish. We do not even know where such a path would start.

R4. The culture and biology of money

Commentators differ sharply on whether there is a real need for a biological explanation for money in the sense

in which we mean such an explanation. A number of commentators express concerns about our biological approach to money, feeling that in taking this approach we had paid insufficient attention to cultural and social explanations. This view is expressed most forcefully by **Belk**, who claims that money motivations are learned along with civilising rituals that overcome rather than indulge basic motivations. Others (**Jorion, Kniffen**) have drawn attention to the significance of money as a marker of status. The general issue here is the nature of the relationship between biology and culture: behaviours may be largely determined by genes, there may be gene–culture coevolution, or behaviours may be “off-the-leash” and basically culturally determined.

R4.1. Is money purely cultural?

The most radical alternative to our kind of biological explanation is the one that we identified early in the target article (sect. 2.3): money must be understood purely at a cultural level, detached from human biology except insofar as biological evolution has given humans the capacity to be cultural beings. The position taken by **Belk** seems to us to fall within this camp; where we see drug-like effects, he sees the effects of social ritual. The trouble with this position, as we have argued elsewhere (Lea & Webley 2005), is that, like nineteenth- and twentieth-century economic theory, it “abolishes the body” (Gagnier & Dupré 1999). Of course, we cannot abolish culture either: we are not proposing, as **Belk** seems to suggest, that children come into the world desiring money. We entirely agree that they have to learn the desire for money – that is precisely why it is biologically problematic. As economic psychologists we have a responsibility to account for tastes, in Becker’s (1996) phrase: we have to explain why this particular desire is learned when other possible desires are not, and why this desire becomes so strong. If money motivation is indeed learned in the same way as manners are learned (as **Belk** argues), then either people should be a lot less interested in money, or we should be a lot better mannered. To put it another way, if money is a pure cultural artefact and behaviour towards it a pure function of ritual, then its presence or absence in societies, the forms it takes, and the taboos about it, would be essentially arbitrary, constrained only by history. They are not, and the evidence on the cultural history of money shows that they are not.

Money is not an inevitable result of human culture. A great many of the world’s cultures did not use any form of money until they came into contact with the European or East Asian cultures that had invented the kinds of money we are familiar with. Complex economies could be sustained by other means, such as systems of ritual (see, e.g., Dole & Carneiro 1958) or barter (Chapman 1980; Humphrey & Hugh-Jones 1992). A large number of “primitive” societies did use money, however, and studies in economic anthropology have shown that their moneys included a wide range of materials. Some examples are listed by **Einzig** (1966) and they include familiar examples such as cows and cowrie shells, but also less likely sounding objects such as bolts of cloth, granite boulders, pearl necklaces, and woodpecker scalps. Compared with this rich array of different money substances, the number of independent inventions of money seems to have been quite small, probably fewer than twenty

(Grierson 1978). So all the different money-using societies must have acquired the idea of money from this relatively small number of roots, with subsequent cultural radiation of the actual substances used as money. This shows that the money idea is culturally highly contagious, or, to put it another way, powerful. If a money-using society and a non-money-using society come into contact, it is likely that the non-money-using society will adopt money; it is unheard of for a money-using society to stop using money. Furthermore, the developed world's style of money, using coins, notes, and bank accounts, seems to be as dominant within money use as money use is over other exchange systems. When modern money makes contact with a more primitive money system, even though there may be some initial resistance, the modern form quite quickly displaces its primitive competitor.

We conclude from this evidence that money in general, and modern forms of money in particular, are culturally invasive. This in turn suggests that they are not arbitrary; rather, they are peculiarly compatible with enduring features of human nature, and it follows that if we are to understand money fully, we must understand its biological as well as its cultural history.

R4.2. What kind of biological explanation should we have?

Some commentators accept, to a greater or less extent, that a biological explanation is needed, but disagree with the particular kind of biological explanation we seek to provide. We are accused of peddling a style of evolutionary psychology which is universalistic (**Agassi**), or intellectually feeble; of relying on modular explanations (**Ross & Spurrett**); of not being part of a naturalistic evolutionary science (**Burghardt**); or of believing that brains can use coins as neurotransmitters (**Booth**).

We will turn to **Burghardt's** and **Booth's** comments in sect. R4.4 below. On the issue of modularity in human cognition (or motivation), our target article takes no explicit position. As a matter of fact, we prefer to construe evolutionary psychology in the broad sense rather than the narrow sense: we are much more persuaded by the assumption that modern human behaviour can be interpreted in the light of evolutionary theory, than by the details of Tooby and Cosmides' "adaptive toolbox" (Lea, in press; for the distinction between broad and narrow constructions of evolutionary psychology, see Buller 2005). We might argue that the idea of a restricted set of pre-cultural modules is more plausible in the motivational than the cognitive realm, but we would be quite happy with the idea that money motivation arose as a flexible extension from some other human motivation that has a convincing biological basis. However, the case for that idea has yet to be made. We argued in the target article (sect. 5.1) that the Drug Theory of money is feeble unless we can specify what biologically-grounded motives money mimics. The same is equally true of any alternative that is offered: If money motivation is to be explained as a result of the flexibility and situation-dependency of human motivation (cf. **Ross & Spurrett**), that argument needs to be filled out with specific and testable proposals as to what flexibility, applied to what motivations, in what situations, has produced modern levels of motivation towards money.

R4.3. Gene–culture coevolution

Stanovich takes a more radical, and to us a more interesting, approach to biological explanation: he argues that, in order to explain current behaviour with money, a biological approach needs to be *supplemented* by a cultural approach (specifically ideas from gene–culture coevolution and mimetic theory). He believes that there are a number of human goals and desires that have "slipped their genetic/biological moorings," that money is one of these, and that this leads to situations where money becomes attached to abstract "memeplexes." Although we might wish to disagree with some of the details of **Stanovich's** proposals, we agree with the general position that human behaviour has to be understood in terms of gene–culture coevolution, and that this applies to economic behaviour as much as to any other behaviour (cf. Lea & Newson 2005). In our view, nature-nurture arguments are sterile, and in arguing for a biological basis for money motivation we certainly are not arguing against a cultural basis for the expression of that motivation. Neither could exist without the other. Therefore, we agree with **Jorion's** position that analysing money as a cultural phenomenon does not preclude tracing it back to its biological basis, though we disagree with his conclusions from that position (see sect. R5).

R4.4. The problem with instinct

Finally, and inevitably, we need to explain again our use of the term "instinct." Both **Behrendt** and **Burghardt** seem to misunderstand it. Although we have no quarrel with the Lorenzian concept of fixed action patterns, or with ritualisation as a possible account of their emergence, we are not talking about this kind of microinstinct (cf. Lea 1984) but about instinct in the sense of a reasonably universal human motive of plausibly biological origin. **Behrendt** has no problem with a biological approach as such; for other commentators (e.g., **Booth**), using the term "instinct" seems to suggest that our argument can be dismissed as biological determinism. But, as we point out repeatedly (e.g., sect. 1.4 of the target article and sect. R4.3 above) and as most commentators (e.g., **Agassi**) understand, we are fully of the view that culture plays an essential and co-determining role in human behaviour. It is hard to understand how **Booth**, for example, can think that we would deny that acculturation is involved in pornography, when we proceed to discuss pornographic texts. Does he think we believe that children are born with an instinct to speak English or French? The idea of an instinct, however, remains essential for distinguishing between motivations like hunger, that do have obvious biological origins and are universal or nearly so, and those like the desire for money, that are not universal and have no obvious biological origins.

R5. Is Tool Theory enough?

We turn now to those arguments that (to a greater or less extent) accept our initial assumptions, but reject our conclusions. We consider first a set of critiques that essentially argue that a tool theory, suitably modified, can provide an adequate biological account of money motivation.

Among these arguments we classify those put forward by **Jorion**. He makes three main claims: (a) that “for anyone below the poverty line, cash remains foremost the means to the essential end of subsistence,” and therefore, that no explanation of the desire for money is needed for the very poor; (b) that the drive to acquire money is a special case of the drive for recognition (for the desire of desire); and (c) that people who are admired (desired) extend the range of their partners – in other words, that cash is a universal tool for reproductive advantage. It is useful to consider **Kniffen’s** complementary commentary at the same time. He claims that the distinction between money and status cannot be made easily and that the importance of status in an evolutionary context deserves looking at (status can motivate individuals, relatively high status then translates into reproductive fitness).

We disagree with the first of **Jorion’s** points. The fact that money is spent on food does not mean that no explanation of the desire for money is needed – in our terms, what **Jorion** is saying is that among very poor people, the desire for money is fully explained by its use as a tool. We do not find this convincing because for most of history money has not been used by poor people to obtain subsistence, nor was it even very useful for doing so. Until the mass urbanisation of the twentieth century, for most people in the world (and especially for most poor people) cash was not in fact important for subsistence. Food was something one farmed or hunted, and most other things that provided for people’s basic needs were not part of the cash economy. This is still true in many parts of the world, if not for the majority of the population. So the desire to have money seems to have no necessary connection with the need for subsistence. Furthermore, **Jorion’s** second and third points (and those of **Kniffen**) essentially claim that money equals status. Put simply, people want money for the goods they can obtain, goods give them status, and status leads to higher inclusive fitness. This is very clearly a tool theory of money. In the target article we devoted much space to showing that tool theories as a class are not wrong but inadequate, because money has an emotional value that is not predicted by its role as a tool.

We agree with the idea that status leads to greater inclusive fitness, and money (representing overall assets) obviously plays a part both in signalling status and in securing its benefits. But we find it hard to believe that this is where the biological roots of the desire for money are to be found. Two points are relevant here: the idea of spheres of exchange (discussed in the target article) and the role of money in subsistence societies. On spheres of exchange, it is arguable that money does not provide access to women, whereas other status markers do (**Bohannon 1959**). On the role of money, there are many societies that have had money in some form for centuries or even millenia, but where the cash economy is a very recent development. Polynesia is a good example: the core of Polynesian society was land and the sea (and their products), not cash. And it was chiefs, not the market, who controlled and distributed land and produce.

R6. Critiques of Tool/Drug Theory

The majority of commentators accept that a pure Tool Theory will not do. However, many do not agree with

our second conclusion, that its inadequacies are best remedied by supplementing it with Drug Theory (of course, some welcome this conclusion, e.g., **Ainslie; Dewitte; Markman, Blok, Dennis, Goldwater, Kim, Laux, Narvaez & Rein [Markman et al.]** and some others share our belief that money is valued for more than its exchange value even if they do not find the tool/drug dichotomy helpful, e.g., **Behrendt**). Two classes of critique emerged: attacks on the tool/drug metaphors as such, and alternative proposals for overcoming the deficiencies of Tool Theory, of which by far the most significant is the proposal that operant conditioning could bridge the gap between biology and money motivation.

R6.1. The use and abuse of metaphor

The most trenchant comments on the tool and drug metaphors are those from **Ross & Spurrett** and **Burghardt**. Both claim that the distinction between tool-like and drug-like motivators is vacuous and could be applied to virtually anything that is desired (e.g., automobiles, clothing, sex, food). **Furnham** claims that anyway, Tool/Drug Theory is simply a classificatory device for all other theories and has very limited incremental validity; furthermore, he disputes our classification of historic theories as “tool” or “drug,” implying that the distinction is not well defined. Other commentators feel that our notion of a cognitive drug is poorly specified (**Belk**) or incoherent (**Booth**).

It is important to be clear about what we are claiming in the target article. Tool Theory and Drug Theory are indeed broad classes of theories rather than theories in themselves. (**Furnham** is right that this is a classificatory device.) They are two distinct general ways of explaining money and, as **Walsh** says, this is a distinction that fits neatly into the two main ethical traditions in Western thought as they try to distinguish between legitimate and illegitimate uses of money. On the one hand, **Kant** asserts that money is a “pure means” – in our terms, a tool – whereas persons are “ends in themselves,” and ethical rules about the roles of money in society derive from the fact that, in **Walsh’s** words, “Money is a tool and it is wrong to treat persons as if *they* were tools.” On the other hand, **Aristotle** recognises that some people pursue money as an end in itself (as **Walsh** notes, a Drug theory), but condemns such people as irrational because in reality money can only be the means to an end and not the end in itself. According to a **Kantian** analysis, therefore, drug-like uses of money are wrong because money is a tool and to use it as a drug offends against the dignity of persons. And according to an **Aristotelean** analysis, money can be a drug but to use it as one is wrong because it is irrational. We are not claiming that these classes of theory are unique to money, and in fact it would be surprising if they were. Just like money, clothing and cars can be either a means to an end (clothes might help you get a job, a car might help you get a partner) or an end in themselves (clothes keep you warm or dry, cars get you from A to B as **Burghardt’s** professor pointed out). So we agree that our tool/drug distinction could be applied to other areas; indeed, in the target article we cite **Mintz’s** (1986) argument that sugar should be regarded as a “drug food.” But we are not aware of a wide range of car or clothing behaviour that needs to be explained, or car

and clothing theories that need to be classified, whereas money motivation is in serious need of deeper explanation than it currently receives.

The idea of a cognitive drug was felt by some to be weak. According to **Booth**, the only cognitive drug we mention is pornographic pictures and text – and “there is little or no evidence for innate sexual arousal at the sight of the real thing.” What we actually say (sect. 2.2.3) is that we can be emotionally engaged by many kinds of text and that any such *text* can be thought of as a cognitive drug. Pornography is just an extreme example. Fiction and film are more general examples: these elicit responses (tears, laughter, fear) without the effects that make these responses adaptive.

On one point, we entirely agree with these critiques of Drug Theory. As we argue in section 5.1, a drug theory of money is only useful if one can specify what the natural incentives are that money mimics (see sect. R4.2). Tool/Drug Theory as such may well be difficult to falsify, an issue that bothered **Bouissac** and **Ross & Spurrett**, though **Kemp & Grace** manage to derive a testable prediction from it. However, what Drug Theory does is to direct attention to the question: What more ancient motivations is money motivation related to? Hypotheses of this kind – specific drug theories, if you will – are potentially falsifiable, though, like all evolutionary hypotheses, they need to be specified in a disciplined manner.

R6.2. Is operant psychology enough?

Three commentaries (**Romanowich, Fantino & Stolarz-Fantino [Romanowich et al.]**; **Sanabria**; and **Kemp & Grace**), in rather different ways, make the case that operant psychology could provide the necessary link between evolution and socially maintained behaviours, such as those associated with money. For these commentators, the idea that money functions as a powerful generalized conditioned reinforcer is not a pure drug theory (as we claim in sect. 3.2.2 of the target article) but can encompass all the phenomena we attribute to both drug and tool theories – especially if the phenomena of negative reinforcement and extinction are properly taken into account. If this argument is correct, it would make our tool/drug distinction redundant. The argument of these commentators is attractive because it appears to place the biology of money within a well-established framework of experimental facts about conditioned and token reinforcement. However, the evidential base for the claim that conditioned reinforcement can explain human interest in money is in fact much weaker than is often claimed. It rests on unproved assertions about animal behaviour, and unproved generalisations from animal behaviour to human behaviour.

The basic assumptions required to underpin the assertion that conditioned reinforcement can provide a biological account of human money motivation are the following:

1. Arbitrary stimuli (including physical tokens) associated with reinforcers can acquire reinforcing power, and are then called *conditioned reinforcers*.
2. When stimuli such as tokens are paired with multiple unconditioned reinforcers, they can become associated with all of them.
3. Conditioned reinforcers associated with multiple unconditioned reinforcers will show a reinforcing effect

regardless of whether the subject is motivated to obtain any particular associated unconditioned reinforcer.

4. Such functionally autonomous conditioned reinforcers will be unusually powerful.

5. These phenomena are shown in a wide range of species and thus result from biological processes that are common to humans and our prehuman ancestors.

If all these assumptions were true, conditioned reinforcement would indeed do the job that the commentators want it to do. **Kemp & Grace** furthermore point out that if the conditioned reinforcing effect was based on avoidance learning, we might expect it to be highly resistant to extinction, and we agree that that could happen. Nor do we question proposition (1): conditioned reinforcement is a real phenomenon (and both **Kemp & Grace** and **Chandrasekharan** present physiological data that offer a mechanism by which it might work). The problem is that (1) is the only one of the five propositions that is well supported by data from any species other than humans. Virtually all studies of token reinforcement (or other kinds of conditioned reinforcement) involve pairing the token with a single type of unconditioned reinforcer. Under these circumstances, the incentive value of the token then varies as a function of deprivation states that affect the incentive value of the unconditioned reinforcer. This is as true of modern demonstrations of token exchange in an avowedly economic context (e.g., Chen et al., in press) as it is of the classic operant experiments on token reinforcement described, for example, by Kelleher (1957; 1958). Even proposition (2) fails: it has proved very difficult to link conditioned reinforcers to more than one unconditional reinforcer at all (Lea & Midgley 1989; Midgley et al. 1989). Consequently, there is no evidence to support (3) or (4).

Furthermore, in relation to proposition (5), the simple application of principles of animal operant psychology to human behaviour has been proved to be highly problematic (e.g., Horne & Lowe 1993). We therefore need to look for direct evidence of functional independence in human conditioned reinforcement. But the evidence for conditioned reinforcement from studies with human participants is slender. It is certainly true that token reinforcement systems can work very powerfully with humans, as in the classic studies of token economies (e.g., Ayllon & Azrin 1968); however, in all such studies, it is entirely possible that it was the clients' prior understanding of money that allowed the token economy to work, rather than the success of token economies providing evidence for a Skinnerian explanation of money. In sum, the explanation of money as a generalised conditioned reinforcer is at present no more than a plausible speculation.

For these reasons, we do not believe that the conditioned reinforcement theory can replace the Tool/Drug Theory, at least in the present state of the evidence. Nonetheless, it remains one of the best articulated accounts of money motivation, and because it is strongly grounded in empirical ideas it does lead to interesting elaborations and falsifiable hypotheses.

R6.3. In support of Tool/Drug Theory

Some commentators provided additional evidence in support of Tool/Drug Theory. For example, **Kemp & Grace** reinterpret our tool/drug distinction as an analogy to that between discriminative and hedonic properties of

conditioned reinforcers (and give some recent neurophysiological evidence to support this). They also deploy the tool/drug distinction to make a prediction about behaviour towards near monies, and furthermore the prediction turns out to be correct: people do in general overvalue money (as when they are willing to pay £23 for 100 air miles that are actually worth £7–12). **Kniffin** agrees that users of near-moneys may pay more than they are worth. Similarly, **Lefebvre** interprets the well-established “contrafreeloading” phenomenon to argue that for animals (like humans) certain forms of utility are different (Lefebvre uses the term “sacred”) in that the animal will work in some areas for smaller rewards than in others. He thus argues that “the sacral aspect of money has deep biological roots”; while we would not necessarily agree with his interpretation of contrafreeloading, if it is accepted, it tends to support the idea of a dual motivational role for money.

R7. Human instincts: Some alternative candidates for the biological underpinnings of money

In a key section of the target article (sect. 5) we proposed two instincts (or motives) that we believe are universal among humans and that are manifested in modern culture as a desire for money. We do not claim, and we certainly do not take for granted (*pace* **Agassi**), that these are the only possibilities. The commentators have enthusiastically put forward several additional or alternative specific candidates. We shall explain in this section why we prefer our original choices to these specific alternatives, but we should say at the outset that if the general structure of our argument is accepted, it is more likely than not that there will be changes or additions to be made to the list of more basic instincts on which the drug-like aspects of the money motive depend. In the end we may even arrive at a list as long as that offered by **Ainslie**, though he basically argues that there need not be any specific underlying motives, so we leave discussion of his proposal to section R8.

At the outset, too, it is important to note **Mouras**'s observations on the neural correlates of monetary award. Mouras provides an fMRI perspective and reviews a range of imaging data to show that neural circuits linked to natural addictive/rewarding processes are involved in monetary reward. In other words, money has been found to induce brain activations in areas that overlap those induced by cocaine, and several brain areas are involved in both monetary reward and sexual motivation. Studies have also shown different areas being activated at different phases of a task. What one can deduce from this (though this is not spelled out by Mouras) is that money mimics a *range* of natural incentives, some of which are clearly “drug-like” in form (the cocaine example). If this is the case, further fMRI work may help clarify what are the natural incentives that money mimics.

Some of the commentators put forward objections to our two proposed underlying instincts. **Burghardt**, for example, argues on the one hand, that trading is not as we suggested unique to humans, and on the other, that the question of whether play is an independent motive is still open. We agree with both these arguments up to a

point. Indeed, we pointed out (sect. 5.2) that barter can be induced in laboratory animals. But we are not convinced that either this, or the examples of ritual presentation that Burghardt gives, really constitute the integration of division of labour into a system of trade, which is how we characterised human trading (sect. 5.2). On play, our own reading of the evidence is that, however much the adaptive value of play may come from other motivational systems such as aggression, within the life of the individual organism it is motivationally independent from them.

An impressive list of alternative instinctual origins for the drug aspects of money is produced. We consider first the proposal that a wholly asocial motivational system may be a sufficient explanation. **Bouissac** and **Booth** both argue that natural selection favoured the evolution of a hoarding “instinct” and an inhibitory system, and both point out that such instincts are found quite widely in the animal kingdom and commonly show a dissociation from their obvious functions. Here they diverge, however, with Bouissac making money essentially a cultural index for resources (corresponding to other commentators who seek to explain money motivation in terms of status and power), and Booth linking money motivation to the general tendency of humans to collect things for their own sake. This idea seems strange to us: most people are not collectors of money – in general, as Katona (1975) pointed out, we save less than we intend or think desirable. Misers are interesting, but as **Ross & Spurrett** point out, they are also unusual.

Several commentators seek to root a money instinct in social motivations other than the trading instinct that we propose. There are many differences among these approaches, but we draw them together here because they all point to instincts that are more competitive than cooperative. **Agassi** claims that people desire wide options (and that is what they want money for), and also that money provides power. What Agassi appears to be proposing is that the natural incentives that money mimic are not just trading and play, but curiosity and power. Curiosity seems to us to be rooted in the play instinct, so this does not add to our synthetic account, though it might provide an alternative way of looking at it. Agassi's emphasis on power, however, allies him with other commentators who see the major origin of money motivation in the drive to social status (e.g., **Jorion**, **Kniffin**; see also **Dewitte**'s idea that money serves as a signal for the intrinsic quality of the owner). Dewitte argues for a second similar motivation, the need for autonomy. **Behrendt** proposes that the pursuit of money is a “culturally ritualised expression of the aggressive instinct.” He further suggests that money is used as a tool to obtain status, which in turn allows the aggressive instinct to be expressed, and he suggests that the function of money may be related to suppressed envy in a psychoanalytic sense. Kniffin argues that status itself has many drug-like properties.

Status, power, and the desire for freedom from constraint and control over one's own behaviour and fate are certainly powerful human motivators, and money undoubtedly facilitates them in a modern society. But we are not convinced that their links with money transactions are direct enough for them to be plausible as the origins of money motivation. For an instinct to underlie money motivation, it is not enough for it to be strong;

there also has to be a reasonable evolutionary and historical pathway from it to the money motivation. Money is directly concerned with trading, but only indirectly with power, status, or autonomy, and this is why we favour a trading instinct as the most likely candidate to underlie the money motive. As for **Behrendt's** arguments from Lorenzian drive-depletion theory and psychoanalysis, we do not find these persuasive as general systems and there seems no particular reason to apply them to money.

To us, the most interesting suggestion for an alternative instinct on which the money motive might be based comes from **Dewitte**. Like us, he argues for multiple instincts underlying the drug effect of money. We have noted his argument for an autonomy instinct earlier, and we are not persuaded by it. However, like us, Dewitte sees reciprocity as also involved. But he makes the interesting observation that giving and receiving, credit and debt, though logically interdependent, are not psychologically equivalent. This is undoubtedly true; when we first started to investigate the psychology of debt (see Lea et al. 1993), we expected it to be the mirror image of the psychology of saving (see Wärneryd 1999), but we found little relation between the two. Furthermore, Dewitte's observation gains support from evidence cited by **Mouras** that monetary gain and loss have different neuro-physiological effects. However, we disagree with Dewitte's interpretations of the observations he lists (which partly depend on his idea that the key instinct for understanding money is the need for autonomy). To take in turn three of the observations he draws attention to:

(a) The persistent asymmetry in monetary gifts between parents and children, which Dewitte argues continues until children gain psychological autonomy from their parents. We would argue that the asymmetry is based (in the first instance) simply on the fact that there is an asymmetry between the amount of money parents and children have. If the relative financial situations are reversed (as when a young adult wins the lottery), giving money to parents is perfectly acceptable.

(b) Intrinsic savings motives, which Dewitte argues do not make sense from a reciprocity perspective but are easily explained by a need for autonomy. A number of distinct savings motives have been identified. Some are indeed related to autonomy: Canova et al. (2005) found that autonomy was one of three superordinate goals for saving. But people also save in order to provide money for their children and in order to be able to lend money to friends (which makes a lot of sense from a reciprocity perspective).

(c) Borrowing whilst owing money. We disagree with Dewitte's view that this is hard to understand from a reciprocity perspective. Since both borrowing and lending build up social networks and patterns of obligations, we would expect people to both borrow and save.

Dewitte also argues that people are willing to live on credit, and that this disagrees with the reciprocity principle. However, this observation is at odds with the data marshalled by Prelec and Loewenstein (1998) showing that people generally prefer to prepay, at least for ephemeral commodities, and hence that they like to keep their mental accounts in credit. Prepay cards are in fact quite common, though they usually occur in near-money situations such as pay-as-you-go cellphones or multi-trip transit tickets.

While we have explained here why we favour our original hypothesis about the instincts supporting the

drug effect of money, we do welcome these alternative suggestions. The drug metaphor will have served its purpose if it sparks an empirically driven debate about the origins of the money motive, whatever conclusion that debate then comes to.

R8. Some extensions

Finally, we turn to some commentaries that take our basic argument and seek to extend it. **Ainslie's** thoughtful and insightful contribution argues that whilst money clearly has an emotional value over and above its value in exchange, this need not be linked to particular underlying instincts like play and reciprocal altruism (indeed, he believes this approach is unnecessarily specific). Second, he claims that money gains its emotional power through being authenticated as a "prize" – but that money is not special in this respect. This is also true for a wide range of other facts through which we pace our emotions, such as sporting feats or news items – in fact anything that is scarce, which links his view to that of **Ascoli & McCabe**. They argue that scarcity is an excellent explanation for the drug-like properties of money – but also for the drug-like properties of food and other generalised reinforcers. Because both barter and food have been hard to obtain throughout human history, and because (crucially) future availability of both is uncertain, it makes good sense that people are addicted (i.e., want too much of) both food and money. In an affluent society, one consequence is that people eat more than is good for them (they get obese and have shorter life expectancies) and (by extension) work more than is good for them to obtain more money. This corresponds to our view that money needs to be conceived of as a drug, but places emphasis on trading (barter) rather than play, and puts the ecology of early man (when barter was scarce) at the heart of the explanation. However, in an interesting reverse of the conditioned reinforcement account, Ascoli & McCabe see money as a reinforcement for barter. Like the operant psychologists, we would expect the relationship to run in the opposite direction.

Both of these contributions seem to us to be valuable extensions of our argument. As **Romanowich et al.** remind us, we have known since Premack (1965) that relative scarcity can turn anything into a reinforcer. However, we do want to defend the idea of looking for specific instincts on which the money motive is based, because without that specificity Drug Theory becomes dangerously vague. It can also be argued that money is not a particularly good prize, for some of the same reasons that it is not a particularly good gift: it is not special (i.e., scarce) enough, even if it is difficult to acquire a lot of it.

Two commentaries suggest mechanisms that might account for the drug effects of money. **Chandrasekharan** uses his concept of epistemic structure and shows how it could explain the origin of money and the tendency to acquire money, given a general "tiredness" or avoidance-of-effort motive. This links well to the classic economic observation that money makes exchanges easier, which we see as part of the tool account, but also explains how something that provides epistemic structure might come to be independently valued. We are not convinced, however, that this adds more than some useful labels to

fairly standard evolutionary arguments. **Glassman** makes the valuable points that every evolved feature of a living system originated as something else – it achieves autonomy as it evolves – and that a sub-system naturally accumulates additional functions, thereby becoming more and more robust. Like conditioned reinforcement theory, Glassman's concept of "entification" provides a more explicit alternative for Allport's underspecified concept of functional autonomy. It thus locates money as a special case of a more general phenomenon – other examples being music or reading (echoing **Ainslie's** suggestion).

Markman et al. extend the drug/tool distinction in a different way, by mapping it into a dimension of motivationally active uses or cool uses: to them, motivationally active uses of money exemplify Drug Theory and motivationally cool uses fit Tool Theory, and they cite experimental evidence in support of this. We find this interesting, and we support their empirical argument – we too have evidence that transactions such as repaying neighbourly help with money can be taboo (Webley & Lea 1993a). However, we are concerned about too easy an identification of "tool" with "rational" and "drug" with "irrational" (we have a similar issue with **Walsh's** argument). Tool uses of money are, perhaps, rational by definition if we adopt a descriptive sense of rationality – they involve valuing money strictly for what it can be used for. But that, as Simon (1978) long ago pointed out, need not imply that behaviour is governed by a rational process, nor need drug effects of money imply irrational processes.

Finally, **Kniffin** gives the argument one more twist by pointing out that money is itself a protean metaphor, used to give value to near-moneys and other commodities; we must recognise that if the money motive is built on more basic instincts, additional motives may still be built on to the money motive.

R9. Envoi

By responding first to those who challenged even the foundations of our argument, we have constructed this response on a steadily rising plane of agreement. However, we would not wish it to appear that we are searching for affirmation. The commentaries have included much that is complimentary of our argument, along with many challenges. But the comment that gave us most pleasure came in the Note to the contribution by **Glassman**, who thanked a student class which had had an enlivening discussion of the target article. The tool and drug metaphors for money motivation may continue to be discussed, or they may not. But they will have served their purpose if they stimulate discussion: discussion among those whose profession is to understand money, about the origins of our interest in it; and discussion among those whose profession is to understand origins, about our interest in money.

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[The letters "a" and "r" before author's initials stand for target and response article references, respectively.]

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