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The Roles of Evolution in the Social Sciences:

Is Biology Ballistic?

BRADLEY FRANKS

Department of Social Psychology

London School of Economics

## ABSTRACT

This paper discusses some widespread but often not fully articulated views concerning the possible roles of biology and evolution in the social sciences. Such views cluster around a set of intuitions that suggest that evolution's role is "ballistic": it constitutes a starting point for mind that has been, and is, superseded by the role of culture and social construction. An implication is that evolved and the socially constructed aspects of mind are separable and independent, with the latter being the primary driver of mind. I outline four variants of the ballistic view. I then show how current findings and arguments in evolutionary thinking as related to mind contradict those ballistic views. The contrary view—that evolutionary and social factors are interdependent in the generation of social psychological capacities—is proposed as a consequence. This view is able to respect some insights of theories that make ballistic assumptions, whilst avoiding those assumptions.

Keywords: evolutionary theory, social psychology, ballistic concepts, culture, social construction

## 1 INTRODUCTION

There are longstanding and complex debates regarding the role of the biological in explanations of mind originating in the social sciences. Many theories have downplayed or indeed elided any strong directive or constraining role for evolutionary considerations, to the extent that they have been labelled the “standard social science model” of mind (Tooby & Cosmides, 1992).

My argument in this paper will be that many established views in the social sciences employ “ballistic” metaphors of the role of evolution in regard to mind.

Boyer & Barrett (2005) note that a ballistic process is “a process (e.g. kicking a ball) where one has influence over initial conditions (e.g. direction and energy of the kick) but this influence stops there and then, as the motion is influenced only by external factors (e.g. friction)” (p. 6). Such a ballistic metaphor has been applied to a range of psychological processes and phenomena. For example, Fernandez-Duque, & Johnson (1999) note that theories of attention have often involved the assumption that non-attentional processes are “ballistic (they cannot be stopped once initiated)” (p. 103). More broadly, as Kihlstrom (2008) noted, theories of automatic processes have often assumed their “Incorrigible completion:

Once evoked, they run to completion in a ballistic fashion, regardless of the person's attempt to control them" (p. 156). Similarly, Kelly (2013) suggests that an emotion like disgust is "in a sense ballistic: once activated, it runs its course" (p. 142). Cimpian & Salomon (in press) suggest that a widely-applied non-demonstrative inference heuristic based on the presumed "inherence" of key properties inside individuals, groups and so on (underlying, for example, essentialist assumptions about the natural and social world, or attributing behavioural causes to internal qualities) is a fast, relatively automatic ballistic process.

This general metaphor has a number of facets. Once initiated, a ballistic process has a stable, predictable trajectory, which runs to completion or termination unimpeded in normal circumstances. It is therefore not dependent on, and indeed may be resistant to, additional inputs from the initiating source after it has been initiated. The initial input sets the process in train, but then ceases to influence the way the process unfolds or its outcomes. Boyer & Barrett (2005) have addressed the application of the metaphor to the role of evolution in the ontogenetic development of human psychological capacities. As they indicate, if brain development was ballistic, the evolved "genome would assemble a brain with a particular structure and then stop working on it" so that after birth "the only functionally relevant brain changes would be brought about by interaction

with external information” (p. 7)

My suggestion is that the ballistic metaphor has been applied to the role of evolution in the construction of mind more generally—with many views either explicitly arguing or more commonly implicitly assuming that evolution’s role is confined to providing a starting point for the construction of mind, providing a set of generic inputs or weak constraints; the further we proceed from that starting point, the less marked is its influence, so that it can ultimately be seen as negligible or even entirely absent. I will suggest that there are four different but interconnected variants of this ballistic view: the individual developmental variant just noted; an historical developmental variant in which the ballistic metaphor applies to the capacities of human minds in general over historical time, such that mind in antiquity is taken to have been more heavily constrained by evolution than in current human life; a psychological modality variant, in which “lower” psychological processes such as motivations are viewed as more heavily influenced by biology than “higher” processes such as cognition; and a representational variant, in which “lower” or less complex forms of mental representation are viewed as more heavily influenced than “higher” or more complex representations. In all

these cases, the relative reduction or absence of a role for evolution (i.e., later in individual development, later in historical development, in progressively “higher” mental processes, and in progressively more complex representations) is counterbalanced by the increasing dominance of the forces of social construction.

The common kernel to all such views are the assumptions that there is a straightforward means of separating out, in social and psychological phenomena, the impact of evolution from the impact of social construction, that explaining mind and behaviour in evolutionary or cultural terms is a zero-sum game (so that as one increases its role, the other must decrease its role), and that it is the latter that plays the major role in key aspects of mind.

The outcome of the discussion will be a suggestion that because there is no currently plausible means of empirically separating out the impact of evolution from that of social construction, ballistic views must be deeply flawed despite some variants having some intuitive appeal. The over-all result is a view that social construction and evolution are interdependent: the biological is integral to social construction and social construction is integral to evolutionary views.

## 2 EVOLUTION IN THE SOCIAL SCIENCES: ELIDED AND BALLISTIC ROLES

## 2.1 Evolution Elided?

Recent years have seen increasing numbers of approaches to social psychology embracing roles for evolution. Some have suggested that evolution provides an explanation for systemic aspects of social psychology (for example, ensuring that adaptively costly errors in social cognition are minimised: Hasleton & Funder, 2006). More often, others have argued for more task-or domain-specific roles for evolution regarding particular social psychological capacities (for example, in intergroup relations: Van Vugt & Park, 2008; in emotions: Keltner, Haidt & Shiota, 2006; or the sense of self: Leary & Buttermore, 2003; Sedikides, Skowronski & Dunbar, 2006).

However, such detailed explanatory roles for evolution are more likely the exception rather than the rule in social psychology. Consider the views presented in the classic social cognition textbook of Fiske & Taylor (2008). They note the series of working models of mind that have guided social cognition research since the 1950's, culminating in the "activated actor" model. A striking aspect of their discussion is that all of these models reflect foundational processing or architectural principles that govern an array of social information processing tasks—



presumably, they are understood as general universals, whose specific expression varies from one cultural setting and/or information-processing task to another.

For example, the 1980's saw the concept of cognitive economy playing a key role in understanding the "cognitive miser"; the 1990's saw the concept of motivated

cognition playing a key role in the tactical deployment of resources by a

"motivated tactician"; and the 2000's have seen the affective and motivational influences on the use of conscious or unconscious processes by the "activated actor". Equally striking is

the omission of any sketch of an evolutionary account of these constraints on social cognition, even though they would appear to be good

candidates for universals, which themselves are often taken to be plausible candidates

for evolutionary explanation (e.g., Brown, 1991, 2002; Kappeler & Silk,

2012). To say that evolution has been elided may be an overstatement, but

its potential contributions have not been fully explored. The social cognition

accounts provide clear proximal explanations of phenomena which are plausible

on their own terms, but they have not been consistently connected to distal,

evolutionary explanations, despite the possibility that evolution could provide

reasons why social cognition connects intimately to both neuroscience and

culture.

Eliding (or at least, not detailing) evolutionary foundations for current, proximal social psychology is not restricted to social cognition; perhaps unsurprisingly, it is more often characteristic of sociological or socio-cultural forms of social psychology, which often embrace strong social constructionist ideas (see Burr, 1995; Franks, 2013a). Social constructionist social psychology usually emphasises the local historical and cultural setting as determinants or constituents of thought (e.g., Burr, 1995; Gergen, 2009). It asserts that “the individual and the social are inextricably inseparable...the individual constitutes and is simultaneously constituted by the social” (Augoustinos, Walker & Donaghue, 2010: p. 5). Zhou & Cacioppo (2010: p. 61) frame Markus and Hamedani (2007)’s related view as follows: “as people actively construct their worlds, they are made up of or ‘constituted by’, relations with other people and by the ideas, practices, products and institutions that are prevalent in their social context”. And Kitayama, Duffy & Uchida (2007) propose that there are “emerging patterns of interdependence between one’s mode of being and the generalised responses of society at large” (p. 138), where a “mode of being” is understood as a suite of psychological systems for action. Hence, the socio-cultural constitutively constructs individual psychology; but the reciprocal direction of constitution (i.e., in which individual psychology “constitutively constructs” the social) is not itself seen as directed by evolutionary

factors. Rather, individual psychology acts as a vehicle for the results of earlier or different socialisation experiences, which intersect with ongoing social construction pressures. The individual is thus a vehicle for deferred social construction, where this is not in any direct manner driven by evolution.

## 2.2 Ballistic Biology?

As noted above, the general ballistic metaphor suggests that a process, once initiated, has a predictable trajectory, which runs to termination unimpeded in normal circumstances. That trajectory is not dependent on, and indeed may be resistant to, additional inputs from the initiating source. This is illustrated by the developmental variant, which was discussed by Boyer & Barrett (2005): the evolutionary foundations for the genome cease to have any directive impact on the development of the brain and mind after birth, when environmental inputs take precedence in determining the process and contents of thought.

There are four variants of the ballistic metaphor. Each variant has several aspects. First, a domain to which the metaphor is applied (for the developmental variant, the ontogenetic development of cognition; for the historical variant,

qualities of human cognition over historical time; for the modality variant, the set of modalities or types of psychological capacities of the human mind; and for the representational variant, the set of strictly representational or cognitive processing capacities of the human mind). Second, an intuitive trajectory, process or ordering over that domain suggesting a sense of change over time and/or an ordering in terms of degree of complexity, sophistication or attunement to local circumstances—from a putative starting point or lower level to a later or more complex level (for the variants in the order above, this ordering reflects the process of individual cognitive development; changes in a population’s general cognitive capacities over historical time; the difference in quality between apparently “lower” non-representational and “higher” representational mental capacities; the difference between relatively simple mental representations and computations and more complex representations and computations). Third, explaining the trajectory through the domain via the relative contribution of evolved/biological and acquired/cultural influences. Fourth, in developing this explanation, assuming that it is possible empirically to separate out the impacts of biology and culture on mind. Fifth, the ballistic presumptions that the evolved/ biological influence is an initiating cause, which generates the foundations for the qualities of the domain at the start of its trajectory, but that as that trajectory unfolds, so the

evolved/ biological has a progressively lesser contribution and the acquired/ cultural has a progressively greater contribution. An increased explanatory role for biology entails a decreased role for culture, and vice versa, so that ultimately the biological “drops away” as the trajectory unfolds.

Each variant begins with a plausible or at least reasonably intuitive premise about the mind that is used as the starting point to infer a less plausible conclusion. Part of the chain of inference involves the fourth and fifth aspects of the metaphor noted above: that it is possible empirically to separate out the impacts of biology and culture on mind, and that culture—and so social construction—is the major driver of those aspects of modern mind that are most of interest to the social sciences. The original driver for mind may be (or have been) evolution, but once “fired” this drops away like a bullet and, at a certain point, culture takes over and evolution drops out of the picture. Evolution thus directly generates only a minor subset of mental phenomena (the putatively less important ones), if any, whilst others are generated by culture and so require a cultural analysis. The difficulty of separating out such different realms of phenomena has been widely debated (e.g., Brown, 1991).

Before discussing the variants of a ballistic view of biology, it makes sense to first note one or two general themes to the ways in which evolutionary ideas have been used in recent social psychological theory. There are perhaps two main approaches to integrating evolutionary ideas with social psychology. One is the well-established approach from evolutionary psychology, using the idea that mental competences are mental modules (or combinations of them) which comprise adaptations (Tooby & Cosmides, 1992; Sperber, 1996, 2004; Pinker, 2002). Such competences are special-purpose, in that they apply to a specific kind of domain or content. They were acquired as psychological aspects of solutions to adaptive problems faced by our ancestors in the EEA (environment of evolutionary adaptedness). There are wide debates to be had on the nature and adequacy of mental modules (e.g., Barrett & Kurzban, 2006; Buller, 2005; Chiappe & Gardner, 2012), but the account is currently the best worked-out view of the impact of evolution on mind. It also seems to be the kind of model that Bergesen has in mind, when he refers to discrete or particulate mental competences that can be combined in various ways, like “lego”. Many of the adaptive problems that are held to have generated modular responses arose from social life, and so the adaptations are designed to solve social psychological

problems: they are social for biological reasons, and not for adventitious social ones. Such approaches emphasise the context-dependence or facultative nature of the resulting competences—they vary in a longer term sense across cultures in terms of the content that is usually held in representations, and in a shorter term sense within cultures in response to specific input cues (e.g., Sperber, 2004). However, this context-dependence is in many ways limited by the structure provided by the innate template: culture expresses, translates, and instantiates that template; it modulates its expression, filling in its details. The adaptations are special-purpose but flexible (within limits set by the specialness of the purpose). Every mental representation that arises as an instance of such an adaptation therefore reflects the expression of the adaptation in the modern social and cultural context: the biological and the cultural are intertwined. Hence, the biological is not ballistic. This approach offers the most well-developed account of evolutionary influences on modern mind, and has been applied to a range of domains such as folk biology (e.g., Atran. 1990, 1998), folk sociology (e.g., Hirshfeld, 1996), theory of mind (e.g., Baron-Cohen, 1995), the self (e.g., Kurzban, 2009).

The second view of the relation between evolution and social psychology is less

well-established, indeed it in part comprises a critique of modularity. At its heart is the idea that evolved mental competences are not modular, but rather are designed to be flexible learning devices. Rather than being built via special-purpose adaptations, it is arguable that major social and cognitive faculties arose via something like “variability adaptation” (Potts, 1998; Franks, 2011; Chiappe & Gardner, 2012). The result is a set of very nuanced, less special-purpose and more flexible heuristics for social learning (e.g., Boyd, Richerson & Henrich, 2012; Richerson & Boyd, 2005; Levinson, 2006), which may depend on human capacities for co-operation and joint intentionality (e.g., Tomasello, 1999, 2008). Such learning is highly attuned so that developing children come to acquire knowledge and skills by learning from significant role models that have adaptive significance to their community even where, for example, this contrasts with parental role modelling (Hirshfeld, 2008). A final point is that such approaches explicitly see social learning as generating outcomes that are possibly biologically adaptive, often driven by adaptive motivations, but argue that the form and content of the resulting competence depends crucially on cultural context. The scope for flexibility is greater than in massive modularity, for culture can not only modulate but also in some way transform the innate starting point (we return to this point



below). Every instance of biologically driven and biologically consequential learning takes place in a social and cultural environment that is already “culturally engineered” by previous generations (e.g., Cole, 1996; Sterelny, 2003, 2004), so that the latter may form a cultural niche to which learning itself is particularly attuned (Laland & Brown, 2006).

In sum, there are at least two views for which the biological and the cultural are intertwined “by design”, for which the biological is therefore not ballistic. Even if all significant social psychology is culturally saturated, this does not mean that culture is the only or main force driving modern mind; not only is evolution the reason that it is culturally saturated in general, evolution also generates specific directions for cultural learning to take, and/or specific constraints on what can be learned and how.

### 2.2.1 Ballistic development.

Perhaps the most widespread variant of the ballistic view is the developmental one. This variant begins with the uncontentious idea that humans manifest an astonishing and perhaps distinctive capacity to learn, particularly from conspecifics. It then suggests that, whereas biology provides the

starting point for mind (in terms of the neural and psychological structures in place at birth), the importance of cultural learning after birth results in culture superseding evolution as a constraint on and director of mind. Such a general ability to learn would add to the concept of the “blank slate” (e.g., Pinker, 2002; Tooby & Cosmides, 1992; Boyer & Barrett, 2005), which takes the newborn mind as more or less a general, unstructured starting point.

Problems of this variant are both empirical and theoretical. They connect to a recent, significant debate in the *Journal for the Theory of Social Behaviour*, regarding the role of innate factors in sociological theory (Bergesen, 2011, 2012; Bjerre, 2012; Peterson, 2012). Bergesen makes the important argument that traditional and current sociology generally cannot and does not take into account a range of impressive findings from psychology that seem to point towards there being innate capacities for language and other cognitive and social functions. As Bergesen argues, there is clear evidence of a variety of domains in which infant acquisition of a social or cognitive competence is precocious (i.e., takes place before it is likely that they have a huge amount of cultural experience and input), and is often based on an impoverished stimulus (i.e., the infant is not systematically or even near-systematically “trained” by exposure to patterned reinforcement). The outcome is the claim that either some content of representations is innately predisposed (as in

the massive modularity account), or that some heuristics and biases for learning from appropriate role models are innately predisposed (as in the non-modular evolutionary accounts). Either way, the ballistic assumption of an innate starting point that has no further purchase on what is learned, appears mistaken. As Tooby & Cosmides (1992) suggest, “Evolved structure does not constrain; it creates or enables” (p. 39). Biology conditions not just where we start, but also where and how we travel.

However, as with social psychology, there are notable exceptions to the ballistic metaphor in sociology; for example, Freese (2008) offers a subtle and nuanced discussion which explicitly disavows ballistic assumptions. My argument is consonant with Bergesen’s starting point and some of his over-all conclusion, but is somewhat broader. As noted, there are four variants of the ballistic metaphor, which may be mutually supporting, but which have different degrees of plausibility; countering one of those views, however, as Bergesen does, is not to counter them all. Moreover, Bergesen et al. pick up on only one way in which an evolved foundation might be expressed in modern minds—the Chomskyan view which accords with the widely debated massive modularity approach to evolutionary psychology noted above; as suggested, other approaches offer a more flexible

relation to culture, and so can offer a more nuanced response to the other variants of the ballistic metaphor.

### 2.2.2 Ballistic history.

The second variant of the ballistic view relates to viewing mind in an historical timeframe. Its clearest exposition has foundations in Gergen's (1973) thesis of "social psychology as history": social psychology's models and theories have explanatory purchase only at specific historical (and cultural) locations. Social and psychological phenomena concern "facts that are largely nonrepeatable and which fluctuate markedly over time. Principles of human interaction cannot readily be developed over time because the facts on which they are based do not generally remain stable." (p. 310). A major reason for this nonrepeatability lies in culture Commonsense beliefs about mind are important influences on behaviour, and those beliefs are interconnected with dissemination and interpretation of social science explanation, so that if the latter changes so do the former. Given such influence, the major driver of mind is culture, in particular in more recent historical times, with increasing proliferation of scientific and social scientific ideas in commonsense .

Gergen's argument, however, appears to be less that there are empirical

grounds to support the idea that humans have become, over historical time, progressively freer from biological constraint; rather, it appears to be more that there are social and political reasons for arguing that this is so. Without this, he believes there would be no grounds for seeking social change: as he puts it (Gergen, 2003), “If patterns of human behavior are prepared by evolution and locked into the nervous system, then whatever exists does so for good historical reasons. Roughly speaking, what is here is here to stay” (p. 126). Hence, “owing to the presumption that patterns of human action are both universal and transhistorical, there is little invitation to imagine new worlds of possibility” (p. 135). This is not the place to debate Gergen’s interpretation of the relations between evolutionary ideas and social change. For our purposes, what is important is the presumption that biology’s contribution mind should be understood as being limited to producing fixed, invariant drives and structures.

The historical variant takes something like Gergen’s view of historicity and adds the uncontentious ideas that humans have become ever more surrounded by and embedded in culture over (pre-) historical time and that culture changes far more rapidly than biology. Whereas evolution may have had a major role in humanity’s distant past, it claims, the advent of culture has resulted in evolution having an

ever dwindling role in current thought and behaviour. The biological bullet lost its force long ago. This variant is expressed in socio-cultural views that combine constitutive social construction with a superorganic view of culture (e.g., Kroeber & Kluckhorn, 1952; R. Wilson, 2001; see Franks, 2011). The connection with ballistic development is straightforward: ballistic (historical) depends on ballistic (developmental): for there to be a crucial historical point at which the biological was completely superseded by culture, there should be no carryforward of the influence of the biological influence on mind from that point. And such a lack of biological influence can be guaranteed if all humans born after that crucial historical point do not carry that influence. There is, however, a second way in which ballistic (history) could be argued to arise: if ballistic (development) is not true, so there are innate dispositions in mind, but where those dispositions are somehow cancelled out, overridden or otherwise erased by culture. The result would be adult mental competences that do not bear the stamp of biology. Two possibilities of this kind are discussed below—the representational and the modality variant of the ballistic view.

Is there a kernel of truth to historical ballistics? Although it has a *prima facie* intuitive plausibility, it is difficult to see how unless the representational and

modality variants are accurate (see below). This is because the historical variant faces all of the problems of the developmental variant, plus some of its own. It faces the problem of specifying at which point in human (pre-)history culture took up the baton from biology. Since, by hypothesis, the separation of the biological and the cultural is fundamental, this seems also to require articulating some point at which culture itself began, without this depending on biology. Such a “cultural creation myth” whereby only culture begat culture, seems the inevitable consequence of the standard social science model of explaining cultural variation by other, earlier cultural variation alone, and proffering no role for biology (see also, Tooby & Cosmides, 1992).

However, Gergen’s ballistic approach suggests that explaining mind and behaviour via the roles of biology and culture is a zero-sum game—if the role of culture increases, the role of biology therefore must decrease. He suggests (e.g., Gergen, 2010: p. 807) the need to develop a “method for assessing the relevance of fixed biological tendencies as opposed to culturally generated forms of behaviour” (my emphases), and, as Derksen (2011) notes, culminates in dichotomising nature versus nature as explanations for behaviour. However, we have noted above that

the evolved and the cultural are not in opposition. At least two widely held views of their connections emphasise context-dependence of the evolved so that there is an intrinsic role for culture.

Even if the range and variety of cultural items has increased massively (culture abhors a vacuum), this does not entail that the role of the cultural in any given mental competence has increased. The variety of cultural influences has increased, the ways in which biology is expressed have multiplied enormously, but this is not to say that there has been an increase in cultural influence per se, relative to the biological. “More culture” does not entail “less biology”; indeed, if biology and culture are intertwined, an increased role for either suggests an increased complementary role for the other.

Reciprocally, “human evolution did not stop when culture was born”

(Kitayama & Tompson, 2010: p. 99; see also, Cochran & Harpending, 2009;

Franks, 2011). Indeed, the suggestion of findings such as those of Cochran &

Harpending is that biological evolution has continued, and in many cases is driven

by recurrent local, cultural circumstances. Recurrent social constructions may

have driven specific biological evolutionary changes. The rate of cultural change



outstrips that of biological evolution, but the slower speed of the latter should not be misunderstood as its having stopped altogether, nor as implying that biological adaptations acquired in the distant past have less or no purchase today. More broadly, cultural and biological evolution proceed together, and may be mutually constraining: in the phrase of Laland & Brown (2002), “The leash that ties culture to genes tugs both ways” (p. 243).

What this suggests is that explanations adverting to culture and to biology are not in competition, but are complementary (e.g., Boyd, Richerson & Henrich, 2012); it is not a zero-sum explanation game if humans are cultural for biological reasons, and if biological reasons are expressed and conditioned through culture.

### 2.2.3 Ballistic modality.

The psychological modality variant concerns the “modality” or quality of the mental faculties that are held to be differentially subject to biological and cultural constraint: different kinds of faculty have different constraints.

Another quote from Gergen (1973: p. 318) suggests this: “there is a profound difference between the processes typically studied in the general experimental and social domains. In the former instance, the processes are often locked

into the organism biologically; they are not subject to enlightenment effects and are not dependent on cultural circumstance. In contrast, most of the processes falling in the social domain are dependent on acquired dispositions subject to gross modification over time.” The latter processes, “falling into the social domain” are reciprocally free from biological constraint since they are not “locked into” the organism.

This variant begins with the uncontentious idea that humans have a variety of motivations which they satisfy or aim to satisfy in everyday life, which appear, subjectively at least, to vary in their connection to biological drives. It then suggests that, whereas the “drive” for some of these motivations may be rooted in biological adaptations, those drives are not directly expressed in the psychological motivation, emotion and in particular the representations and processes that proximally drive behaviour, which are fully governed by cultural constraints. Indeed, Gergen (1999: pp. 136–137) offers an account of emotions, pleasures and motivations as not biological, but instead cultural in their origin, operation and outcomes. The psychological competences that result are therefore not directly relevant to adaptations. The biological bullet of motivation somehow falls short of cultural cognition. The biological beast may be within, but it lies deeply hidden.

Is there a kernel of truth in this division between evolved motivation and cultured cognition? It is hard to find it. The empirical counter-case is very strong. For example, the history of the study of social cognition since the 1970's has been one of ever-increasing findings concerning the roles of motivation and affect in social cognition (see Fiske & Taylor, 2008, for a summary)—as antecedents (for example, being in a given mood may lead to recalling social and other information that is consistent with that mood), and as consequents (for example, the interpretation or appraisal of the reasons for feeling aroused or motivated can form the basis for a full emotional experience). So there is no clear causal separation between motivation, its associated affect, and cognition. More importantly for our discussion, is the increasing array of evidence pointing towards the interpenetration of cognitive and affective/valuational/motivational states (e.g., Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006; Tooby, Cosmides & Barrett, 2005; Clore & Huntsinger, 2007). Arguments here range from suggesting that in many decision-making contexts, affect is treated as information, on a par with empirical data—the two are combined in a single process (e.g., Clore & Huntsinger, 2007), to the more fundamental claim that affect and cognition simply are not separate or separable aspects of mental processing (e.g., Duncan &

Barrett, 2007). In sum, the evidence of the intimate connections between motivation and cognition provides a strong argument against the psychological modality variant of the ballistic view.

#### 2.2.4 Ballistic representations.

The representational variant is concerned with the possibility that different (kinds of) mental representations are more or less subject to biological and cultural influences. It begins with the uncontroversial idea that

different mental competences do seem more or less susceptible or pervious to cultural and/or biological influences. The indicator for this is often taken to be that different competences show varying degrees of variation across cultures. It then suggests that, whereas biology provides significant constraint and direction for “lower level” mental competences (such as perception or attention), culture alone is responsible for informing and directing “higher level” ones (such as reasoning and categorisation). And because of this, there are significant cross-cultural variations in higher cognitive functions, but not in lower cognitive functions.

This offers a reading of Vygotsky’s developmental psychology, in which qualitative

changes to mental competences can—subject to appropriate experience—render them, in a sense, increasingly marked by the cultural and decreasingly constrained by the biological over time. Vygotsky (1978: p. 46) argued that in child development “two qualitatively different lines of development, differing in origin, can be distinguished: the elementary processes, which are of biological origin, on the one hand, and the higher psychological functions, of sociocultural origin, on the other”. The biological “is not replaced by later cultural stages, rather the latter was superimposed like scaffolding on the former, changing, restructuring, and adapting those natural processes” (Vygotsky & Luria, 1993: pp. 9–10). Vygotsky & Luria (1993: p. 186) argue, in this vein, that “Development is not a simple maturation, but cultural metamorphoses, cultural re-armament”, since there are “fundamental changes that occur in the internal psychological mechanisms as a result of culture.” As Vygotsky suggested, “it is culture, not biology, that shapes human life and the human mind, that gives meaning to action by situating its underlying intentional states in an interpretive system” (Vygotsky, 1978: p. 34). The “interpretive system” is provided by culture.

To the extent that we can, as Vygotsky assumes, demarcate lower from higher mental functions, this generates a ballistic role for biology regarding those functions,

where the biological bullet falls before it reaches the higher echelons of cognition, to be superseded by culture. The principal engine of such cultural impact on cognitive capacity is its “mediation” by cultural symbols. Put simply, a child can be exposed to and encouraged to employ symbols, tools or other cultural artefacts that are within their “zone of proximal development”. Artefacts in this zone are, as it were, partly understood, grasped and well-used based on current capacities; but they are partly out of reach based on those capacities. Where the child’s learning to use those artefacts is “scaffolded” by support of other people, in a pedagogical or cooperative problem-solving context, then the capacities of child can expand to encompass those needed for skilled use of the artefacts.

It is important to note that Vygotsky developed both an ontogenetic developmental thesis and a cultural-historical thesis, which are independent of each other.

The former, as just noted, concerns the the emergence of complex, cultural representations and processes from simpler, biological ones, under the influence of maturational and cultural pressures. The latter concerns the (rather more contentious) thesis in which Vygotsky entertains parallels between the cognitive capacities of young children from developed societies and adults from “primitive” societies, on the basis that neither have been exposed to the complex meditational

demands that arise for adults in the cultures of developed societies (e.g., Vygotsky, 1997).

This gives rise to a second empirical indicator of representational ballistics:

massive change or transformation within a child's development within a culture.

As a child becomes increasingly enculturated, the scope for radical change in their cognitive capacities increases. The outcome is the possibility that the cognitive capacities of an older child may outstrip the ones it possessed when it was younger, both qualitatively and quantitatively. That is, the changes are not solely concerned with increased capacity of memory or increased skill at a task, but also with transformed capacities; the skills that an older child possesses are simply not in the canon of the younger child. And, as noted above, where such a pattern of massive developmental transformation is generalised across the whole human population, and each generation, the result is something like ballistic (historical): a species whose core cognitive and social capacities are not constrained or directed by biology.

Vygotsky's is a persuasive and important view. Our suggestion is that it may be possible to retain the most important insights of his approach without retaining his

ballistic assumptions. That is, there may be no kernel of truth in ballistic (representational) per se, but there is much to be retained from the Vygotskan view after rejecting that assumption.

Empirical problems regarding ballistic (representational) include the fact that the more or less arbitrary distinction between “lower” versus “higher” levels of thought does not directly map onto the absence versus presence of cultural variation. For example, there is increasing evidence that apparently “lower level” competences are susceptible to cultural variation (e.g., Nisbett & Masuda, 2005, on perceptual attention). Symmetrically, at least some core aspects of “higher level” competences may not have significant, constitutive cultural variation (e.g., Atran, 2000, on essentialism in categorisation and inference in folk biology).

Further, ballistic views would take it that cross-cultural variation indicates a higher degree of cultural perviousness. But, in a direct echo of the historical variant, this conflates degree of variation with depth of variation, quantity with quality—the mere fact that there are many cultural variations regarding a given competence does not entail the significance or increased depth of those variations. Moreover, significant cross-cultural variation is built into the two evolutionary approaches to



psychology noted above; such variation does not render the competences any “less biological”. Moreover, the fact that a capacity is heavily influenced by culture does not, in any case, entail that it will vary from one culture to another—it may be influenced by qualities of culture that are generic or common across cultures (e.g., Tooby Cosmides’ (1992) notion of “metaculture”; see also Franks, 2013b).

The second empirical indicator of biological and/or cultural perviousness was the potentially transformative role for culture. This is an important possibility.

Cognitive development offers examples of what appear to be transformations in processing, where a later capacity is incommensurate with an earlier one from which it derives with the input of cultural mediation (Carey, 2010; Spelke, 2000).

Critically, however, the transformative outcome of cultural mediation does not require a ballistic premise. Such transformation, rather than arising despite biological constraint, or because of being freed from or overwriting biological constraint, is better thought of as arising because of biological dispositions. Mediation generates transformed representations because it is driven by biological motivations, and those representations remain connected to, imbued with the biological, and so are themselves potentially subject to further transformation for the same reasons.

Two views explicitly tie cultural transformation to evolved foundations. One is the “cultural adaptations” theory of Boyd & Richerson. For Boyd & Richerson, the key is that cultural tools can be cultural adaptations, which become widespread and retained in a culture precisely because of their contribution to biological adaptation. The process is cultural, however, in that it involves social learning, and in particular from plausible role models. The precise format of the artefacts and tools that are available for mediation depends on their format in the previous generation, as the cultural adaptation undergoes cumulative cultural evolution. But it is cultural because it is biological: mediation takes place for evolutionary reasons—the need to acquire complex adaptations on the basis of relatively simple learning processes. Such processes use cultural information to locate the better role models and more successful complex artefacts and tools. These evolutionary reasons also drive repeated changes and refinements to those artefacts, through successive generations. The result is, as for Vygotsky, a form of thought or artefact that goes beyond what an individual could acquire alone; but it is a form that is rooted in the performance of adaptive functions.

A similar argument is available from Tomasello, and Moll & Tomasello (2007)

who indeed advocate a “Vygotskian intelligence hypothesis”—that complex cognitive and social functions are driven by culture, and in particular by co-operative and dialogical relations between people. However, such co-operation is underwritten by an evolved, non-modular set of competences for engaging in collective or joint intentionality. This capacity is taken to involve the motivation to share emotional and affective states, goals and beliefs—indeed, all mental states. Those cognitive and social functions that derive from joint intentionality, then, involve content that is dialogical, and therefore bear the stamp of the adaptation throughout their development and use. A related position has been advanced by Franks (2011), who proposes that such faculties are rooted in embodied “dialogical affordances”, which are simultaneously evolved and socio-cultural. There is no principled separation between lower and higher faculties in terms of their biological connections, though one may want to make such a separation on other terms.

It is striking that these possibilities for transformation are argued for in only one strand of psychology that connects to evolution—the non-modular strand. There are principled reasons why a modular view of mind seems unable to countenance transformation. A module is defined as only processing specific kinds of information in specific ways for specific purposes. These are laid down by its adaptive

function. It simply cannot, through development, undergo radical transformation of the information it processes or the way its processes work, without somehow becoming a different module, and thereby relinquishing its adaptive function. The boundaries of modules' identity conditions are set at birth. Modules might be flexible, but such transformation seems just too flexible as it explicitly takes the competence beyond its initial identity conditions to perform tasks that are incommensurable with them (see, e.g., Buller, 2005; Franks, 2011). Bergesen's Chomskyan "lego" model of cognitive and social competences has precisely these qualities, and therefore seems to not only reject the ballistic premise of Vygotskian cultural mediation and transformation, but also the possibility of any such transformation even without ballistic premises. By contrast, the more flexible approach to evolved sociality and cognition denies the ballistic premise, and offers a different foundation for cultural mediation and transformation. This results in a view in which the biological and the cultural are interdependent for evolutionary reasons.

### 3 CONCLUSIONS

Ballistic views of the relation between biology and the mind are widespread in the

social sciences. We have discussed four variants, all of which begin with a more or less plausible intuition about the mind, and end with the claim that there is a separation between culturally and biologically influenced aspects of mind, and that culture is the major or sole determinant. Yet there seems little reason to support them as regards social psychology. However, this should not be taken to suggest that at least some of the ideas that derive from ballistic views have not provided important insights into the relations between mind and culture. The biological and the cultural should be seen as partners in the construction of mind, not zero-sum explanatory antagonists. In particular, the corollary of the representational variant of the ballistic view—the cultural transformation of thought—offers a powerful approach to the intersection of mind and culture that should and can be reconstructed from a non-ballistic, naturalistic perspective, in which culture and biology are interdependent.

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