The Role of "The Environment" in Cognitive and Evolutionary Psychology[1]

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Abstract

Evolutionary Psychology is widely understood as involving an integration of evolutionary theory and cognitive psychology, in which the former promises to revolutionise the latter. In this paper, I suggest some reasons to doubt that the assumptions of evolutionary theory and of cognitive psychology are as directly compatible as is widely assumed. These reasons relate to three different problems of specifying adaptive functions as the basis for characterising cognitive mechanisms: the disjunction problem, the grain problem and the environment problem. Each of these problems can be understood as arising from incommensurate characterisations of the nature and role of “the environment” in the two approaches. Purported solutions to the problems appear to require detailed information concerning the EEA (environment of evolutionary adaptedness), with the disjunction problem placing the lowest requirement, the environment problem placing the highest requirement, and the grain problem placing an intermediate one. In each case, such information is not likely to be forthcoming, because it may require iterating through successively more distant EEA’s with no principled stopping point. This produces a dilemma for evolutionary psychology – either to solve these apparently insoluble problems, or to attempt to avoid them but in doing so forego detailed evolutionary constraints on cognition.

The Role of “The Environment” in Cognitive and Evolutionary Psychology

1 Introduction

Evolutionary psychology encompasses a range of approaches that combine central tenets of evolutionary theory and psychology. The outcome makes the strong requirement that psychological claims about a faculty should be compatible with biological claims about that same faculty and, in support of this, that psychological investigations of that faculty should be commensurate with biological investigations of it. Perhaps the area in which these claims have been most consistently pressed is in the overlap between cognitive science and evolutionary theory.

In this paper, I will identify conflicts between the presuppositions of the two fields. The issues I will discuss are not, by and large, novel; some have been debated in evolutionary psychology and its attendant philosophical discussion for some time. My aim will be to provide greater insight into those issues by linking them to a conceptually prior one, concerning the notion of “the environment” in the two fields. A key causal role in both fields is played by environmental constraints – for cognitive psychology, in the form of current inputs to mechanisms and situations into which those mechanisms make outputs; for evolutionary theory, in the form of recurring problems in ancestral environments to which adaptations provided solutions. The over-all problem I raise is that these two causal roles, with their associated characterisations of the environment, cannot simultaneously be maintained. That is, the nascent field of evolutionary psychology appears to hold incommensurate assumptions concerning the key causal-explanatory variable of the environment.

This problem will be presented by, first, suggesting that the contrasting accounts of the environment in evolutionary and cognitive psychology may be grounded in different traditions of naturalisation of cognition. Second, and more importantly, I will discuss how the problem surfaces in questions concerning the indeterminacy of adaptive functions and their parallel mental faculties. Although these questions are particularly evident in respect of modular accounts of mental function, to which much evolutionary psychology is committed, their most pressing variant also arises for non-modular accounts. Attempts to answer such questions are vitiated in part by problems of the characterisation of the environment in evolutionary psychology; these problems are not shared by cognitive psychology per se. The outcome is a dilemma for future theory development in evolutionary psychology – either to provide solutions to these apparently insoluble problems, or to rescind on some current presuppositions concerning the environment, with consequent limitations on possible accounts of cognition.

2 Background: Evolutionary Psychology and “The Environment”

Perhaps the most detailed articulation of recent evolutionary psychology approaches can be found in the arguments of Tooby & Cosmides (1992), an approach which is developed in different ways in other sources (e.g., Sperber, 1994, 1996; Atran, 2000; Pinker, 1997). At the most abstract level, this approach combines an architecturally neutral, information-processing approach to cognitive science with the general tenet of adaptationism. Indeed, one way of understanding some of the drive of this approach is as providing an evolutionary explanation for key findings in cognitive psychology, and an evolutionary rationale for its general theoretical apparatus of representations, processes, and so on. Reciprocally, it can also be understood as recruiting data and models about specific cognitive processes from cognitive psychology, so as to add details to the general structure provided by evolutionary theory.

The result is thus an approach which requires claims about the mind to be consistent with claims about biology – what Cosmides, Tooby & Barkow (1992: 4) have referred to as "vertical integration": "the various disciplines within the behavioural and social sciences should make themselves mutually consistent, and consistent with what is known in the natural sciences". In simple terms, then, evolutionary psychology results from combining cognitive psychology with evolutionary theory. Such a combination could result in evolutionary thinking extending the descriptive and explanatory compass of traditional cognitive psychology. Extension requires key findings or claims of the two disciplines to be consistent with each other, since it would add new ideas to cognitive psychology, leaving the already existing stock of findings and theories intact. More radically, it could involve evolutionary thinking revolutionising cognitive psychology to form a new discipline; this could emerge by the addition of adaptationist thinking that provides new constraints on theory, as well as new explanatory options. Such a revolution would likely alter some relevant existing cognitive psychological assumptions about the mind, possibly as a result of there being contradictions in the prior assumptions from evolutionary theory and cognitive psychology. Tooby & Cosmides (1992) appear to advocate just such a revolutionary approach. The result would add the explanatory weight of evolutionary theory to cognitive theory, and provides the constraint of a stringent experimental methodology for generating tests of resulting models. They argue that evolutionary psychology contradicts "standard model" cognitive and social psychology in advocating, for example, the compatibility of human psychological universals in the face of cultural diversity, and a key claim about mental architecture comprising specialised content-based faculties. More recent, "post-standard model" cognitive psychology, by beginning to advocate similar claims, does not differ in these ways from evolutionary psychology (Tooby & Cosmides, 1992: 92—100). However, differences at this level of theoretical detail are less important than differences at a more basic level. For example, the general empirical and theoretical orientation concerning the definitions of principal explanatory

factors, how their relations are to be characterised at a general level, and how they can be best investigated and measured.

If evolutionary theory and post-standard cognitive psychology are to engage in vertical integration, this requires commensurability at that more basic level. There are core assumptions about key variables in each of the disciplines, whose compatibility ensures the possibility of a coherent research programme in evolutionary psychology. However, it is my argument that there is at least one such incommensurability on a key variable between evolutionary thinking and post-standard cognitive psychology. On the key variable of the concept of the environment, standard model and post standard model cognitive psychology are grouped together in opposition to evolutionary psychology. Both evolutionary psychology and cognitive psychology advocate a role for the environment as a central causal-explanatory variable regarding the structure and content of current cognition. However, for evolutionary theory, the environment is characterised in terms of adaptive problems that arose in the evolutionary past; in contrast, for cognitive psychology, the environment is characterised in terms of inputs to psychological processes occurring now. I return to this matter in the next section. For the present, a schematic picture of the resulting consistencies and differences between standard model cognitive psychology, post-standard model cognitive psychology, and evolutionary psychology, is provided in Figure 1.

Figure 1 about here

Notwithstanding widespread perceptions, adaptationist evolutionary psychology is an “environmentalist” approach. In general terms, this implies seeking key distal causes of mental faculties and key proximal causes of behaviour in the interaction between genotype and environment (see, e.g., Buss & Kendrick, 1998). In terms of the notion of the environment, the

account of distal causes is the central explanatory addition offered to traditional and post-standard cognitive psychology. This revolves around the "environment of evolutionary adaptedness" (EEA): that is, the environment to which our ancestors were adapted during the Pleistocene period. We will return to questions concerning the descriptive qualities of the EEA later; for now, we need to note the general structure of the position. The position makes conjectures concerning general and specific properties of the EEA, in terms of the recurrent adaptive problems faced by our ancestors. The Pleistocene environment has been characterised in terms of "the essential elements of a hunter-gatherer way of life – food sharing, hunting, a division of labour, central place for foraging" (Foley, 1988: 207), in which most distinctly human evolution occurred. The conjectured physical and social properties of the EEA are taken to have been stable enough to have given rise to psychological adaptations, which are hypothesised on the basis of conjectures about the adaptive problems faced by our ancestors during the EEA. Assuming that the intervening historical period (between the EEA and Now) has not witnessed significant countervailing adaptations, these conjectures facilitate empirical predictions concerning the cognitive mechanisms that subserve or constitute psychological adaptations today.

For evolutionary psychology, the main focus is on the adaptive problems solved by psychological means (which need not all be problems that present themselves as psychological problems). These psychological means comprise the set of psychological adaptations that constitute the species-typical and species-specific human cognitive architecture, whose processing of inputs interact to produce appropriate behaviour. A cognitive adaptation is, as Tooby & Cosmides note, defined in "information-processing" terms – in terms of the nature of the mechanism plus a representation of its proprietary database; what is innately "given" by selection pressures is both algorithm and represented content, and such content may be parametric, with parameters taking any of a range of possible values according to specific environmental inputs (as in Pinker &

Bloom's (1990) analysis of natural language, Sperber's (1996) analysis of concepts, and Tooby & Cosmides' (1992) analysis of cheater-detection).

Since we need to know exactly where one adaptation ends and another begins (otherwise, we can't tell whether it is truly an adaptation – and so truly special-purpose – or not), defining the nature of an adaptation requires a specification of precise conditions on the identity of content and the identity of algorithm. In the terms discussed by Marr (1982), cognitive adaptations can be characterised by a combination of Level 1 and Level 2 facets. As is well- known, Marr differentiated between three levels of description of cognitive and computational devices. Level 1 specifies "an abstract formulation of what is being computed and why" (Marr, 1977: 129): the "what" specifies the semantic content that individuates the faculty – the information-processing function to be computed (minimally, given in terms of input-output relations, and so specifying an extensional semantics for what is represented by the device); and the "why" can be characterised in evolutionary terms – how the ability to process this particular kind of content conferred adaptiveness on the organism in the EEA, within the nexus of all of the organism's other faculties. Level 2 specifies the process or algorithm whereby the function specified at Level 1 is computed. Level 3 specifies the particular physical instantiation or implementation of the algorithm specified at Level 2. The account of cognitive adaptations given by Tooby & Cosmides (1992: 66; see also Dretske, 1995: xiv), and implicit in the work of others, is in "information-processing terms" – which define mechanisms that operate according to a belief-desire psychology but which do not require an account of Level 3 implementational factors. This leaves it short of being a "module" in the sense discussed by Fodor (1983), which requires special-purposeness at all three levels (though Sperber countenances this). Cognitive adaptations are thus, minimally, special-purpose mechanisms with innate predispositions for parametric content – special-purpose functions (at Level 1) with dedicated mechanisms/algorithms (at Level 2). So evolutionary psychology derives from the EEA three different aspects of the hypothesised

cognitive mechanisms: an account of why that mechanism exists (derived from the adaptive problem it solved in the EEA), an account of the content at a parametric level (derived from the general properties of the characteristic of the inputs to the solution to the adaptive problem itself), and an account of the algorithm whereby the appropriate content (EEA-parametric plus current-details) is processed so as to solve the adaptive problem.

However, I suggest that there are some potentially contentious issues resulting from the ways in which evolutionary psychology and cognitive psychology construe “the environment”. The different construals give rise to questions concerning the solubility of some key problems that have been levelled at evolutionary psychology, concerning the way in which adaptive problems relate to the mental mechanisms that comprise those problems’ solutions. These different construals can be related to their different orientations on how best to naturalise psychological explanation.

3 Naturalisation and “the Environment”

One way of understanding the claim to vertical integration of the sub-fields in evolutionary psychology is as an attempt to naturalise (or at least be consistent with the naturalisation of) psychological theory. There are many different possibilities for a naturalised psychological theory, but at a general level, the enterprise involves characterising psychology in terms that are continuous with the natural sciences. In particular, the vocabulary should not presuppose the notions of meaningful mental representations and processes, etc., that are the focus of the explanations offered by the psychological theory under consideration. In short, the characteristically psychological vocabulary should ultimately be translatable into non-psychological terms.

Such a general characterisation of naturalisation leaves open both the precise connection between psychological vocabulary and non-psychological vocabulary, and also the choice of appropriate non-psychological vocabulary. Cognitive and evolutionary psychology each make different choices concerning the latter – broadly speaking, cognitive psychology’s chosen non-psychological vocabulary has traditionally arisen ultimately from physics, whereas evolutionary psychology’s chosen non-psychological vocabulary arises from biology. In general terms, the naturalistic enterprise for biological/adaptive functions does not appear to be easily consonant with ordinary physicalist reduction (cf., Williams, 1966; MacDonald, 1992).

Evolutionary Psychology seeks to naturalise psychology by relating cognitive psychology to evolutionary biology, and making particular use of the conceptual framework of special-purpose adaptations, defined via the EEA, in delimiting mental mechanisms. Adaptive problems and their solutions are invoked to characterise, respectively, the nature of the environment that required our ancestors to adapt, and the nature of the mental mechanisms that constitute the adaptations. Both are characterised in “functional” terms. The notion of “the environment” that is important, then, is removed from the here and now, in two different ways. First, in temporal terms, it concerns the EEA, not the current environment. Second, in terms of content or categorical distinctions in environmental inputs, it is characterised “functionally” or “distally” – based on the hypothesised adaptive functions and purposes of the organism, and the ways in which aspects of the environment relate to those functions and purposes (e.g., food, prey, predators, mates, rivals, to types of classification system). Key properties of the environment are characterised in terms of relations between the hypothesised adaptations and the adaptive functions – definitions of foods and non-foods depend on the organism’s food-eating mechanisms and capacities; and these relations depend on the adapted functions of the organism. Hence, the characterisations often depend on relations to other descriptive terms or mechanisms specified at the same or “higher”

level of abstraction or functionality (i.e., other adaptations), and so cannot be glossed straightforwardly in a way that is independent of the organism and its adaptations.

By contrast, naturalisation in cognitive psychology has traditionally sought to make particular use of “lower-level” conceptual frameworks that ultimately relate (via other lower-level frameworks that are progressively less semantical in nature) to the physical nature of the environmental inputs to receptors and of the nature of brain processing over those inputs (see, e.g., Fodor (1975), Fodor & Pylyshyn (1982), Pylyshyn (1984)). In practice, psychologists have not often made explicit attempts at this kind of detailed translation. Rather, the over-all aim for a naturalising research programme is better thought of as involving a series of steps of translation through different theoretical levels (possibly using Marrian levels as a part of a broad framework), which requires interdisciplinary approaches to theory, and therefore would involve the work of different fields to bring naturalisation to fruition. A first step in this approach is for mental faculties to be partly demarcated in “bottom-up” terms, with respect to the submechanisms and component representations that they employ, and those aspects of the environment which they currently process as inputs. In this way, the crucial environmental input is the here and now. First, temporally, it is the present nature of impinging stimuli that is important. Second, in terms of content or categorical distinctions in environmental inputs, the characterisation of those inputs should not presuppose the “intentional” vocabulary of the specific categorisations, meanings and mental representations that emerge from the processing to be explained, on pain of explanatory circularity. So the ideal has often been to characterise “the environment” in “non-functional” terms that are independent of the functions and purposes of the organism, and independent of the ways in which the environmental inputs are processed and understood by the organism. In the limit, this would be in terms of “proximal” properties of the environment, such as the physical nature of visual or auditory information at the receptors/transducers**.** The practice has sought to be consistent with this ideal by characterising the environment in a way that is independent of – or at

a lower level than – the ways in which the mechanism under scrutiny processes those inputs, represents them and produces outputs. This approach constrains theory development and, perhaps more importantly, characterises appropriate research methodologies for investigating the environment and its representation. For example, many such methodologies are “bottom up” in character, insofar as stimuli are selected on the basis of characterisations that are independent of the semantic and functional regularities under investigation, and such regularities within and between stimuli are to be discovered/inferred by participants rather than overtly presented to them. This contrasts with EP’s characterisation of the environment, which yields no obvious route into controlled experimentation. In this way, in contrast to evolutionary psychology, the characterisations are intended to not depend on relations to other descriptive terms at the same level of abstraction or functionality, but rather on terms or mechanisms at a lower or more primitive level; hence, there is the hope that they could be glossed ultimately in a way that is independent of the organism and its adaptations.

In very broad terms, this provides a two-way contrast in the role of “the environment” in EP and CP, as depicted in Figure 2.

Figure 2 about here

The general implication is that the goal of revolutionising cognitive psychology via incorporating adaptationist evolutionary theory may meet with some difficulty, given that they have incompatible approaches to the key explanatory variable of the environment. I now discuss some challenges to evolutionary psychology that bring this incompatibility into sharper relief.

4 Some Problems for Evolutionary Psychology

Some have argued that, despite its value in principle, evolutionary psychology is compromised in practice. I wish to focus on three challenges to the enterprise, which are separate though related in arising from the evolutionary characterisation of the environment. These challenges relate to the possibility of (adaptive) functional indeterminacy – that is, the inability to make a principled choice from a range of possible answers to the question, "what is the function of a given mechanism?" The general issues have been canvassed elsewhere, so my presentation of the problems and purported solutions will be brief.

The first is the "disjunction problem" (Fodor, 1991). To see this problem, consider a mechanism that appears to respond to the presence of some thing (F) in the environment, but where there are systematic correlations between F & G (i.e., whenever F is present, G is also present), so that the mechanism therefore also appears to respond to G. The question is then, should we characterise the mechanism's adaptive function as responding to F or G, or both? We would expect a well-adapted device to be attuned to natural kinds in the environment (as the basis for identifying, e.g., prey and predators). For example, a frog's prey-catching mechanism responds to flies, bees, food pellets, etc.; so is its adaptation attuned to flies, bees, fleebees, pellets, all of these, or just some?

The second is the "grain problem" (Sterelny & Griffiths, 1999). This problem concerns not the possibility that a given adaptive solution responds to a range of correlated situations or problems, but the possibility that a single adaptive solution responds to a single situation or problem that itself does not have a determinate characterisation. As Sterelny & Griffiths (1999: 328) ask, "What are the problems 'out there' in the environment? Is the problem of mate choice a single problem or a mosaic of many distinct problems? These problems might include: When should I be unfaithful to my usual partner? When should I desert my old partner? When should I help my sibs find a partner? When and how should I punish infidelity?" Notice that such a grain problem

would hold for each of the disjuncts in the disjunction problem, above, as candidate domains for the adaptive problem of “prey-catching”: is prey-catching a single problem or a range of problems? Sub-problems here might include: After how many attempts should the frog stop attempting to catch a prey item? To what retinal stimulation should a frog respond with a prey-catching action? When should a frog risk being stung by a stinging insect in its search for prey? The grain problem, then, concerns the possibility that any one adaptive problem might decompose into a series of sub-problems – which may be nested – and which may themselves relate to different input domains or situations.

A third problem – which we can call the “environment problem” – involves the characterisation of the domain even where specifying the problem appears to be non-problematic. This possibility may be a subtype of the grain problem or of the disjunction problem, if the parameters are fixed appropriately; however, it is worth specifying separately, for the different issues it raises. It flows from the discussion of adaptations offered by Williams (1966: 269), who states, “The nature of the stimuli that initiate and regulate a response may be no indication of the function of the response”. He gives the example of fruit-flies being more active at certain times of day or night; in fact, their degree of activity appears to be governed by the correlated properties of the degree of humidity or dryness in the ambient atmosphere. So, even if we could determine the domain to include one set of entities in the world, or one problem to be solved, the question would be, how to characterise that domain. Should it be characterised in terms of proximal stimulation at the receptors, or in terms of any of a range of distal properties of the domain? Consider a problem of “predator avoidance”: this has its own grain problem (is it one or many problems?), and also disjunction problem (does it avoid tigers and lions or all things that produce their characteristic retinal stimulation?). The environment problem then concerns how we should provide a characterisation of such a domain: should it be characterised in terms of the retinal or other receptor stimulation of an organism? In terms of characteristic locations of predators? In terms of

characteristic patterns of movement of predators? In terms of characteristic shapes, sounds, etc, of predators? The problem here is that, if characterised via proximal information, it does not provide a well-defined adaptive domain – what do all and only predators have in common in terms of retinal or other receptor stimulation? Or rather, is there a sufficiently discrete basis for making few enough mistakes for the resulting costs and benefits to permit survival?). This suggests a characterisation via distal information, but then which distal domain is it to be?

We can diagram the three problems schematically as in Figure 3.

Figure 3 about here

The general point to be made about the three problems is that failures to solve them can be seen to arise from uncertainty over how to characterise the environmental inputs to a mental mechanism. In particular, solutions would appear to lead us towards a characterisation either in terms of proximal or in terms of distal properties, which would remove the indeterminacy, but which would not simultaneously satisfy the twin descriptive and naturalisation demands of cognitive psychology and evolutionary thinking. The difficulty in resolving the indeterminacy problems appears to arise, at least in part, from these two different demands pulling in different directions and there being no principled reason to choose one or the other. If the two characterisations of the environment are different, and the specification of adaptive problems and mental mechanisms thereby proceeds independently, the indeterminacy problems retain their problematic status.

These problems appear pressing in the general case for evolutionary explanations. However, there are additional reasons why they might be even more pressing for evolutionary psychology. First, in its most widely canvassed form, EP assumes that adapted mental mechanisms are special-purpose mechanisms. For such a psychology, getting the right characterisation of the

domain/problem/function is crucial for, without this, the prospect of demarcating one special-purpose mechanism from other related-but-different purpose mechanisms is difficult. Indeterminacy of problem/function leaves open the possibility that a mechanism that is adapted to solve that problem will itself be more or less special-purpose depending on the way in which the domain is demarcated.

Although these problems relate only to one side of the equation – to the possible indeterminacy of the adaptive problem – they give rise to a comparable problem on the other side. As Atkinson & Wheeler (2002) point out, there is the possibility of a reciprocal indeterminacy in the specification of the adaptive solution – that is, in demarcating different cognitive mechanisms. The implication of this, they argue, is that there may be a “two-dimensional grain problem” – “the difficulty of matching phenotypic features with selection pressures, given that selection pressures are hierarchical and nested (the grain problem according to Sterelny & Griffiths), coupled with the mirror-difficulty of matching selection pressures with phenotypic features, given that phenotypic features are hierarchical and nested” (p.9). This problem clearly holds of any account of mental faculties, modular or non-modular. If both adaptive problems and adaptive solutions are indeterminate, what chance is there for evolutionary psychology? Various commentators have been somewhat more sanguine about the possibility of providing responses to these problems.

5 Solutions to Problems in Characterising Adaptive Functions?

There are several widely-canvassed responses to indeterminacy, but they divide into two general approaches. The first general response is to acknowledge the possibility of indeterminacy, and allow that it may produce empirical problems, but deny that it is a problem that in principle needs to be resolved.

The first response of this kind arises from the work of Neander (1991a,b), who suggests that there need be no single "correct" answer to the question of defining an adaptive problem or domain. In broad terms, her suggestion is that the way the various problems are posed provides the clue to their being circumvented. The various domains or functions are systematically related – for example, in the disjunction problem, they are correlated with each other, whilst in the grain and environment problems they are again correlated but by virtue of additional hierarchical or nesting structure. Neander suggests that we can accept a constrained form of indeterminacy, where the different functions are "stacked" one on top of the other – that is, where there are systematic positive correlations. For example, the frog's function of responding to pellets and specks depends on the function of responding to flies. So long as the regularities which stacked functions (and their stacking) express are real ones, this is a sufficient condition for an acceptable evolutionary account.

A related possibility is offered by Dennett (1995), who suggests that we may just have to accept the indeterminacy of categories of objects in the world. That is, the notion of what constitutes a natural kind may well depend on the sensory and other resources of the kind of organism perceiving that kind. Rather than expecting humans' categorical distinctions to map cleanly onto the distinctions responded to by other species (or for the distinctions made by each species to at least not cross-cut each other), it may be that different species have different kinds "in mind". As a result, a collection of entities that appears to humans to represent a disjunction, grain or environment problem, could be – to other species – a characterisation of a natural kind. So, for example, it may be that, for humans, flies constitute a natural kind, whereas for frogs, flies plus bees plus pellets, etc., constitute a natural kind. The crucial point, for Dennett, is not that the kinds for frogs are the same as the kinds for humans, but that both are based on "real patterns" (Dennett, 1991) – regularities at some real level of organisation which different organisms can

pick up on and to which they were able to adapt. And if kinds can be different across species, these will lead to different adaptive problems across species.

I do not want to dwell on either of these possibilities here – the most important point is that neither offers any particular help for the evolutionary psychologist who wishes to provide an explanation of current human cognitive capacities in terms of evolutionary adaptations. Neander’s position does not accord well with the notion that cognition comprises a suite of articulated special purpose mechanisms – the more abstract and general the domains of the stacked functions become, the less special-purpose would be the mechanisms adapted to those domains. Without fixing or limiting the abstractness of the domain, there is little prospect of articulating the bounds of a special-purpose mechanism, and the invitation to a relativistic view of a domain’s mechanism leaves little hope of providing a realist account of the nature of any mechanism, special-purpose or otherwise. And, whilst Dennett’s approach may help regarding the indeterminacy problems in the context of comparisons between species, it is difficult to see how his argument could be applied to resolve the problems for humans – at least, without inviting a form of cognitive relativism which would sit ill with the evolutionary constraint of providing an account of species-typical mechanisms. In sum, it is difficult to see how any approach that does not wish to resolve functional indeterminacy could accord with a naturalised evolutionary psychology.

The second general approach to indeterminacy is to attempt some way to resolve it, so that, from the plethora of competing possibilities, the true adaptive problem can be specified. The only possible resolutions are ones that appeal to empirical data, and these come in two guises. The first is to suggest that what is needed is empirical evidence concerning the EEA. This is suggested by, inter alia, Millikan (1984), Dennett (1995), and Dretske (1995). As Dennett suggests of the

disjunction problem, we can "… use the frog's environment of selection (to the extent that we can determine what it has been) to distinguish between the various candidates" (Dennett, 1995: 408).

Such a strategy – if it were open to us (and below I suggest that, in general, it is not) – may be a way of beginning to resolve the disjunction problem. For example, one might take the different entities to which an entity responds in the current environment, and assess their presence in the appropriate EEA. By assumption, food pellets and the like were not present at that point. Hence, some hypotheses could be formed concerning at least narrowing down the range of possible adaptive domains.

However, in order to address the grain problem, one would likely need to employ an iterative version of the above strategy in order to locate the specific EEA location at which a candidate adaptation or set of adaptations first appeared. Recall that the question here is over whether a problem actually constitutes a single problem or complex structure of problems. Hence, investigation would need to consider not only that EEA in which the problem and solution as now seen made its first appearance in the evolutionary sequence, but also antecedent EEA's in which any subparts of the problem and their solutions also made their appearance. Presumably, the question of grain would then in part come down to whether each of those antecedently existing problem-solution pairs were, when combined, sufficient to produce the problem-solution pair that we now see. If so, then we might infer that the over-all problem does decompose neatly into the hypothesised sub-problems, and so the single problem-solution pair as seen now does in fact constitute a set of component subproblem-solution pairs. However, if the aggregation of the antecedent problem-solution pairs did not amount to the current problem-solution pair – that is, if the current one involved significant functionality/adaptiveness over and above that conferred by the aggregated solutions to the sub-problems (perhaps by their systematic integration) – then there might be good reason to speak of a single problem-solution pair. Of course, if the grain

problem applies to any current problem under consideration, there is no particular reason why it should not also apply to any antecedent sub-problems, each of which might itself be construed as either a single problem or as a complex of problems. I will return to this general point later.

As regards the environment problem, it seems that inspection of the EEA alone will not be sufficient – this is because the problems of cognitive psychological investigation and assessment that we have today would simply be replicated regarding the facts about the past. It is possible that the problem could be narrowed down, in the same way as was envisaged for the disjunction problem. That is, if any of the D's noted in figure 2 did not exist in the appropriate EEA, or had significantly different properties from those that they have now, then those could, presumably, be ruled out as candidate domains for the problem-solution pair. However, in the general case, what is needed is not a better account of the environment per se, but rather an account that also describes the aspects of the environment to which the organism's solution is attuned. And this requires not solely an analysis of the properties of the environment of the EEA, but also an analysis of those properties as responded to and processed by the organism. Such an analysis depends on providing an account of the adaptations of our ancestors in the EEA, which itself is subject to the same problems of indeterminacy noted, potentially requiring the same iterative steps through different EEA's as the grain problem. Probably the only way to begin to address the specific issue of the environment problem in the current environment would be to conduct appropriate controlled cognitive psychological experiments to determine the causally important factors underpinning relative responses to the domain as characterised in different ways – e.g., does a mechanism respond to a natural kind qua that kind, or qua a set of aggregated properties, or qua an array of visual and other stimulations at the receptors? It is an empirical possibility that each of these cases would be responded to in slightly different ways. The same methods would also be necessary to ascertain the causally relevant aspects of the EEA. The pertinent psychological facts cannot be simply "read off" the environment of the present or the past, nor

can they be "read off" uncontrolled behavioural patterns in the present or the past – so, to resolve the question of to which aspect of an environmental domain a mechanism is adapted, we seem to require access to detailed experimental information – of the kind that usually involves construing the environment of the here and now in proximal terms – concerning the EEA. I also return to this point later.

Sterelny & Griffiths (1999) suggest the reciprocal strategy – that we can infer the nature of an adaptive problem from the nature of the cognitive mechanism/solution: "[The] grain problem in evolutionary psychology challenges the idea that adaptations are explained by the problem to which the adapted trait is a solution. If (but only if) there is a single cognitive device that guides an organisms' behavior with respect to issues of mate choice, then mate choice is a single domain…It is not the existence of a single problem confronting the organism that explains the module, but the existence of the module that explains why we think of mate choice as a single problem" (1999: 328—329). Such a direction of inference appears to assume that demarcating cognitive modules or mechanisms is somehow not problematic. This strategy, if successful, appears to presuppose an answer to both the grain problem and the disjunction problem, though it leaves the environment problem untouched. This is because demarcating a mental mechanism may indicate which entities/problems cohere together in a single domain (as opposed to related-but-different domains or combinations of sub-domains), but does not tell us in virtue of which properties or qualities of properties it responds to that domain. There are additional problems with this strategy. First, it makes a very strong demand on environmental consistency. In order to be able to begin this process, it seems to be important that the environmental conditions that trigger the mechanism today are not significantly different from those that triggered the mechanism in the EEA. Otherwise, the inferred environment and its problems for now may well differ from what existed in the EEA. Hence, inferring problems from solutions/mechanisms does not remove the need to have quite detailed information about the EEA. Second, adaptive domains and

contents appear to cross-classify modules in some cases: for example, the (plausibly) single adaptive function of “predator avoidance” would appear to involve a combination of other modules (e.g., visual or auditory processing) together with sub-parts of different modules (e.g., some conceptual inference, some action patterns). Notice that this is not amenable to a response that this indicates that predator avoidance is a complex of problems, since the suggestion is that the function does not involve sets of whole modules, but rather subparts of some modules. Third, it is possible that some putative adaptive contents are too coarse-grained for cognitive psychology modules. For example, language understanding is a widely proposed adaptive function, but there is little evidence for a single mental mechanism dedicated to language understanding; rather, there may be set of such mechanisms each dedicated to processing different kinds of language-relevant information – e.g., a syntax-processing module. Using Sterelny & Griffiths’ criterion, syntax processing should be a candidate adaptation in and of itself.

Atkinson & Wheeler (2002), by contrast, suggest a more ambitious strategy for dealing with indeterminacy: they argue (after Cosmides, Barkow & Tooby, 1992: 10) that it is plausible to make strong inferences in both directions, from adaptive problems to adaptive solutions and vice versa. That is, an account of an information-processing mechanism can, they claim, be used directly to infer the nature of the problem which that mechanism was adapted to solve. And an account of the adaptive problems facing an organism can be used to infer the nature of the information-processing mechanisms that were adapted to solve the problems. If they are correct in this, then it seems that the three indeterminacy problems simply dissolve. However, despite their optimism about these inference patterns, they offer no reasons in principle as to why they should be reliable, nor do they indicate how in practice they could be made. Instead, they merely accept Sterelny & Griffiths’ assertion that an “independence assumption” often made in evolutionary analyses – that we should be able to provide independent characterisations of adaptive problems and mental mechanisms (solutions), where neither is derived from the other –

may be too strong a constraint. However, in the broader terms of this paper, denying the independence assumption is to assume that the distal properties of the environment can be inferred from proximal properties, and vice versa. That is, to assume that the problems of functional indeterminacy disappear, and the naturalisation of cognitive mechanisms and representations is a problem solved. Atkinson & Wheeler use the terms of a Marrian multi-level analysis, noted earlier, as the vehicle for their discussion. In particular, they broaden such an analysis so as to construe level 1 not only as an account of the problem solved by one specific mechanism, but as an ecological/system level account of the function of the mechanism in the context of the organism’s full set of interactions with the environment. The claim they make, then, is that inferring the problem from the solution involves traversing Marr’s levels “upwards” from the implementational level (level 3) via the algorithmic level (level 2) to the functional and systemic level (level 1); and that inferring the solution from the problem involves traversing Marr’s levels “downwards” in a “cascade” of explanation from the functional and systemic level through the algorithmic level to the implementational level.

This solution to indeterminacy is directed towards the grain problem; in encompassing Sterelny & Griffiths’ strategy, it might be thought to begin to address the other problems (though with the above caveats). There are, however, reasons to doubt the Atkinson & Wheeler strategy. First, it appears to assume that adaptive solutions/mental mechanisms and adaptive problems are not based on different ways of characterising environmental inputs, which has been disputed here. Second, it appears to adopt the assumption made by Sterelny & Griffiths concerning continuity or substantial overlap between the nature of the current environmental inputs and the corresponding EEA inputs (however they are to be characterised). If there are major differences, so that the problem domain to which the mechanism was adapted in the past differs markedly from the domain to which it now responds, then there is no sound way of making inferences from problems to solutions or vice versa. This once again puts pressure on the extent of our knowledge

about the EEA. There are also problems with their use of Marr's levels. If there were domain mismatches between the EEA and the current environment, this would render a classical cascade of explanation through Marr's levels inoperable, because the function specified as the adaptive problem would be based on the EEA, whilst that specified as the information-processing problem would be based on the current environment. So the mechanism would be hypothesised by EP as computing a different function from the one it actually computes as discovered by cognitive psychology. This produces problems in explanation that parallel those that can arise from the role of idealisations in "competence" explanations in the cognitive sciences, discussed elsewhere (Franks, 1995, 1999). Moreover, taking Level 1 to be an account of the adaptive problem to be solved not only makes the above two assumptions, but also assumes that Marr's levels can be employed in an inferential manner – this is particularly problematic in the case of deriving accounts of the lower levels from the upper levels (in their terms, accounts of solutions from problems). This is because it is (an accurate) commonplace in any multi-level cognitive/computational explanation, that there is a one-to-many mapping between any description at a higher level and possible descriptions at a lower level. So any one functional description is compatible with an array of different algorithms that compute that function, and any one algorithm can be instantiated in a variety of ways in the actual physical mechanism. Hence, whilst one can infer from the performance of the function that there is an algorithm and an implementation that computes that function, one cannot directly infer anything about its properties (e.g., whether it is executed in parallel or serial manner, whether it is modular, and so on). And the inference in the reverse direction assumes that the information-processing problem that is solved by the implementation and algorithm – characterised in the usual proximal terms – somehow yields an account of the adaptive problem at level 1. This effectively switches the question of adaptive problems away from an analysis of the environment and towards an analysis of the cognitive faculties that process information about the environment. This may be the right line to take, but I will suggest below that it causes further problems for EP.

Notice, then, that purported solutions to the three problems each make demands on our knowledge about the EEA. In all cases, whether the problem is solved, or the competing options merely narrowed down, depends on our having sufficiently detailed knowledge of the EEA and our ancestors’ relations to it. Solving the disjunction problem seems to require detailed information about the existence and prevalence of specific EEA entities and the possible disjuncts to which a faculty today responds, thus allowing speculation about the true adaptive target. Solving the grain problem appears to take this one step further in suggesting an iteration through different, increasingly distant EEA’s, in order to determine whether a whole problem or a sub-problem first emerged in the life of our ancestors. And solving the environment problem may add to this iteration an increasing complexity of not merely observing the environmental contingencies at different temporal points in EEA’s, but also requiring some form of controlled experimental investigation of EEA variables to determine which from the set of competing possible characterisations is the characterisation of the domain was truly causal in the EEA. So it is that solving the indeterminacy problems appears to require access to data that would be hard enough to glean about the here and now, using experimental methods from cognitive psychology that are designed to uncover those data – and even harder, it would seem, to obtain about the EEA.

Such problems are of course multiplied in the case of any attempt to provide an account of a range of different mental mechanisms, as opposed to just one. For it is likely that different mechanisms should each be thought of as having their own EEA, in the form of the different adaptive problems to which they are putative solutions.

The upshot is that these solutions all appear to require that the two approaches to the environment are commensurate – that the methods and measurement techniques that cognitive psychology

applies to our representations of the current environment, can be straightforwardly applied to our ancestors' representations of the EEA. Their application to the EEA in this manner, however, seems unlikely on general grounds of empirical availability. I will now raise two further issues concerning the EEA, one of which appears to have more the sense of a question of principle. These issues further highlight this incommensurability.

5 The Environment of Evolutionary Adaptedness?

As we have seen, it is assumed by EP and by the purported solutions to functional indeterminacy, that specifying the nature of the environment/problem to which an extant mechanism was adapted (i.e., the appropriate aspects of the EEA), is empirically and conceptually tractable.

EP makes two "continuity" or "stability" assumptions concerning environmental inputs, both of which may be misplaced. The first is one of continuity or stability within the EEA itself – that is, the environmental conditions were stable enough to produce sufficiently recurrent adaptive problems, to which human cognition was obliged to adapt. The second is one of continuity between the hypothesised EEA and the current environment, either in terms of distal inputs to functions or in terms of overlap between proximal inputs; it is this that ensures the adaptations continue to be adaptive (or at least are not sufficiently maladaptive to have been selected out).

The first continuity assumption raises the question of whether there was a stable EEA of hunter gatherer communities. As noted earlier, such a view of the EEA is implicit or explicit in key EP theorising. Whilst this is a very complicated area, and fossil records really do not provide unambiguous answers to the question, it is worth noting that there is at least some reason for doubt. Foley (1988) argues against what he labels the "Essential EEA Assumption", which is

"a model of human evolution that is essentially gradualistic and unilinear", where "the essential elements of a hunter-gatherer way of life – food sharing, hunting, a division of labour, central place for foraging, and so on – can be identified very early in the fossil and archaeological record" (Foley, 1988: 207). He argues, in contrast to such an assumption (Foley, 1988, 1994, 1996), that anatomically modern humans may not share physical or social/hunter-gatherer characteristics with pre-human hominids, and indeed that the assumption of widespread and consistent hunter-gatherer ways of life for all pre-agricultural people may be incorrect. I would suggest that, contra-Foley, this does not challenge in general the utility of the EEA concept for EP. However, it does suggest that much of what is taken for granted as a detailed empirical picture of the EEA in EP may be incomplete at best, or inaccurate at worst, and so the derivation of predictions about current cognition from this base may be compromised.

A different challenge to the idea of a stable EEA originates in a claim by Sterelny & Griffiths that the notion of an adaptation needs to be reconsidered. It is not clear whether their aim is to challenge the general notion of an adaptation, or only its application to human psychology. Regardless of this, they note that the prevalent notion of adaptation in EP is, in fact, one of accommodation to environmental contingencies. They suggest, "Traits are sometimes adaptations to an independent, impervious environment. But when evolution is driven by features of the social structure of the evolving species, evolution transforms the environment of the evolving organism…There are no stable problems in these domains to which natural selection can grind out a solution…We suspect that cognitive evolution often transforms the environment rather than being an accommodation to it" (1999: 331). It is for this reason that they argue against the "independence assumption" that would define adaptive problems and solutions independently of each other. I think that there is much to be said for their claim about the instability of the EEA – or at least, instability of adaptive problems – in the context of cognitive and social adaptations, but would wish to argue against the moral that they draw from this. There is no incompatibility

between this more dynamic account of the EEA on the one hand, and the notion of adaptations as accommodation and the independence assumption, on the other. Rather, we need only to consider adaptation to take place to each successive EEA as this itself is changed by the changes that arise from previous adaptations. That is, the solution to an EEA problem at time 1 gives rise to a changed EEA problem at time 2, whose solution then produces a new EEA at time 3, to which a new adaptation has to accommodate. So EEA/problem 2 amounts to EEA/problem 1 filtered through or altered by the solution to problem 1; and EEA/problem 3 constitutes EEA/problem 2 as filtered through or altered by the solution to problem 2, and so on. If this is right, then there is no in principle challenge to the independence assumption nor to adaptation as accommodation, in this more dynamic account of the EEA. The key point concerns the relative time scales involved: do the hypothesised changes to the EEA that arise from social and cognitive adaptations arise over a time scale which is too short for the typical human rate of genetic mutation? This is, then, another empirical question about the EEA.

The second continuity assumption concerns whether there has been relative continuity between the EEA and today. Of course, if we accept Sterelny & Griffiths’ view that the EEA was radically dynamic, then this question has to be answered in the negative. Indeed, there are other approaches which tend towards the same answer. For example, Gamble (1997) has expanded on Foley’s thesis, and reviewed evidence which suggests that contemporary hunters and gatherers are not survivors of the remote Pleistocene EEA, but are rather responding to selection pressures operating on a well understood, immediate timescale. And Sperber (1994) advocates an account of cultural variation in beliefs which takes as its starting point the idea that the distal functional domain to which a mechanism responds today (the “actual domain”) may differ from the domain to which it was adapted to respond in the EEA (the “proper domain”), as long as the way in which those two domains impact proximally on the information-processing receptors is similar enough. Similarly, Crawford (1998) has discussed “environmental mismatch theory”, which, in part, seeks

to explain some psychological pathologies by reference to such mismatches: In brief, if psychological health was predicated upon adaptation to the EEA, but the current – changed – environment elicits the same cognitive responses, then psychological disorders may well be an outcome. On the views of Sperber and Crawford, the separation of the two different characterisations of the environment is clear – they both require that, while the distal environment may have changed, the proximal environment has not changed substantially. Such a separation appears to differ from the view taken by Sterelny & Griffiths, whose denial of the independence assumption is tantamount to a denial of the distinction between such characterisations.

However, I would now like to suggest that the problem in assessing environmental continuity is perhaps harder than it seems at first glance, for it faces exactly the same general problem as do the solutions to the functional indeterminacy problems. The reason for this relates to the understanding that the evolutionary "design space" is relative to previous "choices". Put simply, our ancestors' ancestors had adapted to their EEA, and those adaptations limited both the range of adaptive problems and the available range of adaptive solutions for our ancestors in our EEA. The point here is that the necessary frame of reference for assessing EEA continuity is not our frame of reference (with its adaptations), nor is it the "bare" EEA (i.e., the set of physical and social facts that obtained). Rather, it is the bare EEA "filtered through" the frame of reference of the adaptations of our ancestors. This appears to be a straightforward interpretation of some of the force of the description of the EEA offered by Tooby & Cosmides (1990: 384): "a species-specific array of selection pressures refracted through the specific ecological, social, genetic, phylogenetic and informational circumstances experienced along a given species' evolutionary history". The EEA is the set of impinging circumstances or problems faced by a species as "refracted through" the adaptive history of that species. Now, this implies that ascertaining the adaptive functions of our mental mechanisms requires first knowing the adaptive functions for our ancestors' mechanisms during the EEA, for only in this way can we isolate the adaptive

“added value” that a given mechanism has yielded for us – that is, the specific problem solved. And knowing about this requires performing an evolutionary-historical analysis of our ancestors’ mechanisms – that is, understanding the functions of their mechanisms as adapted to their EEA. It seems plausible that this itself will then require the same analysis of our ancestors’ ancestors’ EEA. And so on. The question then is, can this regress be prevented from being infinite? Is there some empirically acceptable stopping point?

It should be clear that a general solution to all of the indeterminacy problems requires a solution to this regress problem. Even solving the disjunction problem, which earlier appeared to require merely obtaining evidence of EEA behavioural contingencies, now seems to issue in a regress. The other problems, whose empirical requirements were more stringent, are made even more complex. Any attempt to resolve the problems empirically depends on the ability to assess the properties of the EEA without issuing in such a regress. Since it is not clear which general or specific conditions would indicate a plausible stopping point, this problem appears insoluble.

6 Implications for Evolutionary Psychology

What are the implications of these arguments? It is important to be clear about what is not being claimed here. The arguments in no sense count against a general evolutionary explanation of psychology. However, they do suggest that there are unresolved tensions in the widely adopted formulation of EP as comprising cognitive psychology (standard or post standard) plus adaptationism. As it stands, the suggestion is that, as soon as there is an attempt to develop an account of the detailed properties of adaptive problems and solutions, the approach faces difficulties – the disjunction, grain and environment problems are all problems that arise when detailed accounts of cognition are under consideration. These may look like problems in principle that have no impact in practice. How far should they matter to EP practitioners?

One consideration is that they undermine the intuitive demarcation of mental mechanisms, and so lead to difficulties with providing empirical bases for the notion of special-purpose mental mechanisms. If we can't tell which of a set of competing disjuncts constitutes the problem, or whether a problem is a single problem or a complex of sub-problems, or at what level of information the problem is demarcated, then problems arise in determining where one adaptation ends and another begins. Given that there are no obvious solutions or ways of circumventing the problems presented, it is not easy to see how the field can develop detailed theories that make good on what remains an intuitively plausible connection between evolutionary adaptationism and mental modularity.

But the problem is not confined to modularity-based evolutionary accounts of cognition. It is clearer to see in those accounts. Because substantiating their claims requires precise content distinctions as part of the architectural description, the lack of solutions to all three of the problems of indeterminacy is important. The problems hold for any approach that assumes a direct mapping between adaptive problems and cognitive solutions, since the demarcations of the former specify the demarcations of the latter. We might imagine other evolutionary psychology approaches that do not assume a modular approach to cognition – either because they are non adaptationist, or adaptationist but not modular. In these cases, the grain and disjunction problems appear less troublesome, because precise demarcations of environmental conditions and so of mental content are less important. However, the environment problem still obtains, because this does not concern the separation of domains at a single level of content; rather, it concerns how any domain provides content for a mental mechanism. And this problem holds not only for special purpose mechanisms, but also for general purpose mechanisms – that is, it holds for any content and mechanism at all. We have also seen that solving the environment problem would make the greatest demands on our knowledge about the EEA. Hence, the environment problem

not only holds regardless of assumptions about cognitive architecture, it is also the least likely to be resolved satisfactorily.

This outcome appears to raise a dilemma for evolutionary psychology. One horn is to continue with present approaches to evolutionary psychology but to solve the problems of functional indeterminacy. However, we have seen that it is unlikely we will solve these problems, since we simply do not have access to the appropriate kinds of evidence regarding the EEA. The alternative horn may then be to change the approach to evolutionary psychology – in particular, to reconsider current EP's commitment to a direct mapping between adaptive domains and cognitive faculties.

Reconsidering this commitment is likely to lead to either of two general types of response from an evolutionary psychology perspective. One is to attempt to circumvent the incommensurability of the two conceptions of the environment by advocating an evolutionary psychology that does not involve detailed appeal to either conception. This might be achieved by raising the question of the level of detail of evolutionary accounts of cognition – that is, the level of detail at which evolutionary constraints are held to make predictions about the mind. Quite simply, there seems little wrong in thinking of evolutionary demands such as finding sustenance, shelter, reproducing, and so on, as still relevant to humans today. Moreover, there may be other evolutionary adaptations whose hypothesised qualities derive less from detailed speculations concerning the EEA, and more from quite general evolutionary considerations. Some of the more successful accounts of evolutionary psychology arise not from adaptationist thinking directly applied to individual cognitive mechanisms, but from population level thinking about evolutionary demands broadly conceived. For example, the accounts of homicide offered by Daly & Wilson (1988) combine inclusive fitness with population level thinking to provide novel and striking hypotheses about the distribution of homicide in the population. And Miller (2000) has provided an

interesting approach to cognition whose starting point is in quite general considerations about sexual selection, as opposed to assumptions about the EEA allied to natural selection. Such ideas have also been applied to a detailed analysis of communication and deception in concept use (Franks & Rigby, 2002). A possible implication of the relative success of these approaches is that they have focused on particularly well-specified adaptive though general questions, whose nature as a problem does not require detailed accounts of the EEA , and which are therefore unlikely to have altered since the EEA; a range of such areas could be imagined (e.g., vision, mate selection). By contrast, Betzig (1998) has suggested that we may better consider not speculations about the details of the EEA, but rather the implications of variations in fitness that might be hypothesised from plausible general changes in culture and the environment. In these and other cases, the account of the EEA makes relatively minimal commitments concerning details, and hence the indeterminacy and regress problems have less bite. Whether, in making this move, researchers are less likely to fall foul of the functional indeterminacy problems, is a further question. Presumably, this would need to be determined on a case-by-case basis according to the empirical evidence.

A second type of response is to deny that the problems arise by, for example, arguing against the notion that the environment can or should be characterised in the two independent ways. One option would be to prioritise one of the claims to naturalisation over the other. For example, one might forego the traditional approach to cognitive psychology, and permit functional characterisations of the content of mental representations and mechanisms. This might be achieved in different ways – for example, by considering mental mechanisms to be akin to Gibson’s notion of affordances (Gibson, 1966; see also Wells, 2002). Another way of achieving this would be to focus adaptive functions less on representation “producers” than on representation “consumers”, as suggested by Millikan (1984, 1989a,b, 1991, 1993; see also Godfrey-Smith, 1992). Both of these approaches in some sense circumvent the proximal level of input and focus on the distal or functional characterisation of the environment, thus seeming to

concur with Sterelny & Griffiths’ disavowal of the “independence assumption”, with attendant problems.

However, neither of these types of response can deliver on the original promise of evolutionary psychology revolutionising cognitive psychology. The first fails to do so because the cost of circumventing the problems is a lack of purchase on the kinds of details about cognition that cognitive psychology has traditionally been able to uncover. The second fails to do so because it simply replaces one approach to the environment with another, and so leaves it at best unclear as to which current detailed cognitive psychology findings, method and theory – if any – could be added to the general evolutionary perspective in evolutionary psychology.

7 Conclusions

I have suggested that there may be some reasons to doubt that the assumptions of evolutionary psychology and of cognitive psychology are as directly compatible as is widely assumed. These reasons all relate to problems of specifying adaptive functions as the basis of determining the content that is represented or processed by a cognitive faculty. It was argued that such problems themselves can be understood in terms of incommensurate characterisations of the nature and role of “the environment” in the two approaches. Whilst these problems appear ultimately to be empirical ones, because they involve access to data regarding the EEA, they are not easily solved. The result is a dilemma for evolutionary psychology: to provide solutions to these apparently insoluble problems, or to reconsider its commitment to a direct mapping between adaptive domains and cognitive faculties, which itself may render it less able to generate detailed models of cognition.

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	Standard Model Cognitive Psychology	Post-Standard Model Cognitive Psychology	Evolutionary Psychology
Detailed theoretical claims	Claim p (e.g., general purpose mechanisms)	Claim q (e.g., special purpose mechanisms)	Claim q (e.g., special purpose mechanisms)
Core theoretical assumptions regarding the Environment	Assumption x (e.g., environment as current environment)	Assumption x (e.g., environment as current environment)	Assumption y (e.g., environment as EEA)

Figure 1. Schematic Similarities and Differences between the Three Theoretical Fields

Note: the key differences in core theoretical assumptions regarding the environment can be seen in Figure 2

		Basis for Demarcations of Environmental inputs that define the function of the faculty	
		Distal	Proximal
Temporal location of Environment that defines the function of the faculty	EEA	Evolutionary Psychology	
	Current		Cognitive Psychology

Figure 2. The Environment in Evolutionary Psychology and in Cognitive Psychology

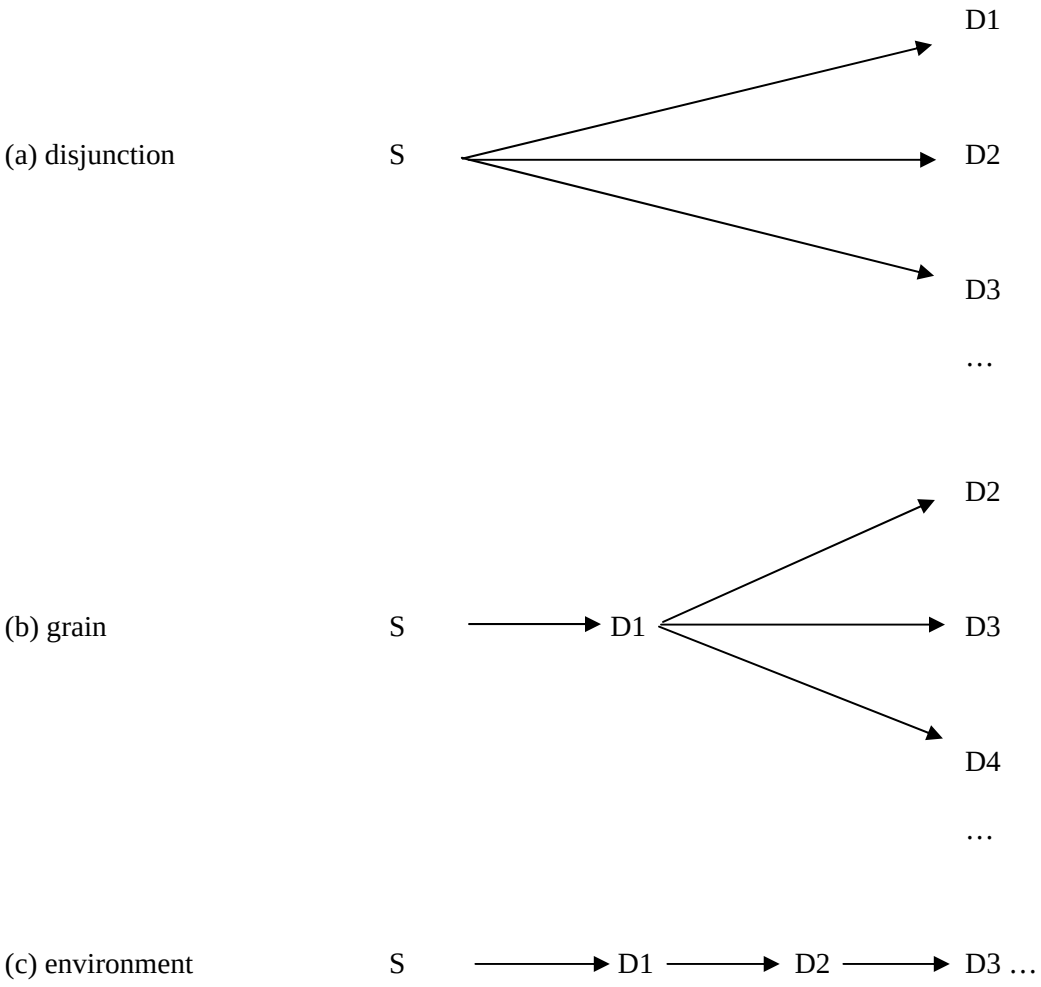

Figure 3. Three Problems in Aligning Adaptive Problems and Solutions.

Note: In each case, "S" indicates the adaptive solution/mental mechanism, and "D" the possible adaptive domain/problem. Movement left to right in the space of domains should be read as indicating increased abstractness/generality.

Note:

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