

## 10 Evolutionary Psychology: A Critique

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### What Is Evolutionary Psychology?

Some researchers define “evolutionary psychology” as simply “the evolutionary study of mind and behavior” (Caporael 2001, p. 608). So conceived, evolutionary psychology is a *field of inquiry*, defined not by any specific theories about human psychology, but only by a commitment to developing such theories within the framework of evolutionary biology. Other researchers claim that an evolutionary perspective on human behavior and mentality entails a number of specific doctrines regarding the nature and evolution of the human mind (Buss 1995; Cosmides and Tooby 1997; Pinker 1997; Symons 1992; Tooby and Cosmides 1992). For these researchers, evolutionary psychology is a *paradigm*, a tightly interwoven web of theoretical claims, methodological commitments, and empirical results. This paradigm, which I will call “Evolutionary Psychology” (capitalized) to distinguish it from the field of inquiry (“evolutionary psychology”), is the focus of this chapter.

The basic tenet of Evolutionary Psychology is that, just as evolution by natural selection has created human morphological adaptations, so it has created human psychological adaptations. Our psychological adaptations, however, are presumably complex traits, and the construction of complex adaptations typically requires hundreds of thousands of years of cumulative selection. Our ancestors spent the Pleistocene—the epoch spanning 1.8 million to 10,000 years ago—living in small hunter-gatherer groups, but only the past 10,000 years living as agriculturists and the past few hundred years living in industrial societies. Consequently, Evolutionary Psychologists argue, “it is improbable that our species evolved complex adaptations even to agriculture, let alone to postindustrial society” (Cosmides et al. 1992, p. 5). Rather, our psychological adaptations must have been designed during the Pleistocene to solve the adaptive

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problems faced by our hunter-gatherer ancestors. As Cosmides and Tooby say, “our modern skulls house a Stone Age mind” (1997, p. 85).

Adaptive problems are problems whose solutions enhance the ability to survive or reproduce. And the adaptive problems faced by our Pleistocene ancestors ranged from avoiding predators and inedible flora to acquiring mates and forming social alliances. Since these problems required very different behavioral solutions, Evolutionary Psychologists argue, a successful solution to one problem could not have transferred to another. So each adaptive problem would have selected for its own dedicated psychological mechanism. As Symons argues, “it is no more probable that some sort of general-purpose brain/mind mechanism could solve all the behavioral problems an organism faces (find food, choose a mate, select a habitat, etc.) than it is that some sort of general-purpose organ could perform all physiological functions (pump blood, digest food, nourish an embryo, etc.)” (1992, p. 142). Thus, Evolutionary Psychologists conclude, the human mind must be “organized into *modules* or mental organs, each with a specialized design that makes it an expert in one arena of interaction with the world. The modules’ basic logic is specified by our genetic program. Their operation was shaped by natural selection to solve the problems of the hunting and gathering life led by our ancestors in most of our evolutionary history” (Pinker 1997, p. 21; emphasis added). Given the enormous number of adaptive problems our Pleistocene ancestors faced, Tooby and Cosmides estimate that the human mind consists of “hundreds or thousands” of such evolved modules (2000, p. 1171).

Modules have the following properties (Buss 1995; Cosmides and Tooby 1997; Tooby and Cosmides 1992). First, they are *domain specific*—that is, each module is dedicated to solving one problem or a restricted range of closely related problems. As such, their information-processing procedures are activated by, and are sensitive to, only information about a particular aspect of the world, in much the way that the ear is responsive only to specific vibratory frequencies. Second, each module comes equipped with substantial innate knowledge about its proprietary problem domain and a set of innate procedures for employing that knowledge to solve problems in its proprietary domain. Third, modules develop reliably and without formal instruction in every “normal” member of the species.

Since “selection usually tends to make complex adaptations universal” (Tooby and Cosmides 1992, p. 38), Evolutionary Psychologists argue that the network of evolved modules in the human mind are “the brain/mind mechanisms that collectively constitute human nature” (Symons 1992, p. 144). This universal human nature can, however, produce individual and cultural differences when modules encounter different developmental and occurrent inputs. As Tooby and Cosmides say, an Evolutionary Psychologist “observes variable manifest psychologies or behaviors between individuals and across cultures and views them as the product of a common, underlying evolved psychology operating under different circumstances” (Tooby and Cosmides 1992,

p. 45). This entails that “individual differences, including heritable individual differences, are unlikely to represent differences in the presence or absence of complex adaptive mechanisms” (Buss 1995, p. 11).

To summarize, the fundamental theoretical tenets of Evolutionary Psychology are these. First, the human mind consists of “hundreds or thousands” of “genetically specified” modules, or special-purpose computational devices, each of which is an adaptation for solving a specific adaptive problem. Second, the information-processing functions of modules are designed to solve the problems of survival and reproduction that were faced by our Pleistocene hunter-gatherer ancestors. And, third, evolved modules collectively constitute a universal human nature. In the sections to follow, I will argue that each of these tenets is mistaken. (See Buller 2005 for a comprehensive and detailed critique of Evolutionary Psychology.)

### Modularity and the Adapted Mind

The principal argument for the claim that the mind consists of “hundreds or thousands” of “genetically specified” modules is this. First, our ancestors encountered a diverse array of adaptive problems, and each adaptive problem “domain” required its own “domain-specific” solution. Second, no single “domain-general” psychological mechanism could have successfully solved widely different adaptive problems. Therefore, a distinct psychological mechanism evolved for each distinct adaptive problem our ancestors faced.

The crucial step in this argument is clearly the second premise—the claim that no single “domain-general” mechanism could have generated solutions to multiple and varied adaptive problems. Cosmides and Tooby support this premise with the following argument: “A woman who used the same taste preference mechanisms in choosing a mate that she used to choose nutritious foods would choose a very strange mate indeed, and such a design would rapidly select itself out” (1994, p. 90). But this argument conflates *behavioral solutions* to problems (choosing a high-quality mate and choosing a nutritious food item) with the *psychological mechanisms* that produce behavior. And there is no reason to think that the same psychological mechanism couldn’t produce diverse behaviors that solved distinct problems, in much the way that the same computer program can produce both spreadsheets and bar charts.

To illustrate this point, consider the domain-general “mechanism” of social learning, which involves observation of role models followed by imitation of the observed behavior of those models. Suppose a female employs social learning in figuring out how to select nutritious peaches: She observes her parents selecting plump and juicy peaches, and she does the same. If she now switches problem domains to the selection of a mate, the mechanism of social learning would clearly not guide her to search for a plump and juicy mate. Rather, it would guide her to observe and imitate the

mate-selection behavior of female role models, and this would lead to the acquisition of mate-selection criteria that are specific to the problem domain of selecting a mate. So the domain-general mechanism of social learning would generate behavioral solutions specific to each problem domain in which it operated.

The point of this example is not to defend social-learning accounts of behavior, but to illustrate that domain-general learning mechanisms could operate on domain-specific inputs, and make use of information specific to those inputs, in order to generate domain-specific behavioral solutions to the problems they encounter. So the need for highly specific *behavioral solutions* to adaptive problems in our evolutionary history wouldn't necessarily have selected for *distinct mechanisms*. Thus, the principal argument for modularity rests on a false premise.

Although our species doesn't appear to have solved the adaptive problems it faced by evolving a massively modularized brain, it also doesn't appear to have solved those problems by evolving a brain consisting of just a few domain-general learning mechanisms (such as social learning). Indeed, the evidence indicates that the evolution of human intelligence was more complicated than either of these simple alternatives. For environmental complexity of the sort posed by the multiple and varied adaptive problems faced by our ancestors typically selects for *phenotypic plasticity* (Godfrey-Smith 1998; Sterelny 2003). Phenotypic plasticity is the capacity of a single genotype to produce more than one adaptive phenotype—more than one anatomical form, physiological state, or psychological mechanism—in response to environmental conditions. And research in developmental neurobiology has shown that mechanisms of neural development embody a plasticity that produces, through interaction with the local environment, brain structures that perform relatively specialized cognitive functions (Buller and Hardcastle 2000).

According to our best evidence to date, the brain structures that perform specialized cognitive functions—and that would have been involved in generating cognitive solutions to adaptive problems throughout our species' evolutionary history—develop through a process of diffuse proliferation of brain cells and connections followed by a "pruning" that shapes this diffuse connectivity into relatively specialized structures. That is, functionally specialized brain structures are produced by a process consisting of both "additive" events (the formation and migration of brain cells and the formation of neural connections) and "subtractive" events (the pruning of synapses through cell death and axonal retraction) (Elman et al. 1996). In this process, gene-directed protein synthesis is involved in the additive events that build the diffuse connectivity with which brain development begins. The subtractive events, however, are not under genetic control. Rather, the subtractive events occur through cell competition, whereby cells with the strongest patterns of innervation (primarily from sensory inputs) retain their connections and the others die. Thus, genes specify the proteins involved in the

additive events during brain development, but the forms and functions of brain structures are then shaped by environmental inputs. So the specialized brain structures we have are primarily environmentally induced, not “genetically specified.”

Our species may, nonetheless, have been faced with recurrent adaptive problems throughout its evolutionary history, and human brains may have recurrently produced information-processing solutions to these problems. But contrary to Evolutionary Psychology, distinct “genetically specified” modules were not required to solve these recurrent adaptive problems. In designing the human brain, selection hit upon a different solution: a plasticity that allows particular environmental demands to participate heavily in tailoring the responses to those very demands. This developmental plasticity, which forms functionally specialized circuits in response to demands of the local environment, is a *domain-general* mechanism with respect to behavioral response. But its function is to produce more highly specialized mechanisms, which in turn produce behavioral solutions specific to the problem domains that have been involved in shaping them. This developmental process can produce relatively stable brain structures that specialize primarily in particular information-processing tasks. But, the extent to which “modular” outcomes of human brain development have been regular throughout some of our evolutionary history is due to the fact that developmentally plastic human brains have encountered recurrent environmental demands throughout that history, not to “genetic specification” of the outcomes.

There are two morals to be drawn from this. First, the cognitively specialized brain structures that are the outcome of brain development have not been shaped by natural selection. For natural selection does not retain environmentally induced phenotypic characteristics of organisms; that would be Lamarckian evolution. Instead, natural selection retains only those genes that have fitness-enhancing effects on an organism's morphology. And, as we have seen, genes do not guide the subtractive process that shapes specialized brain structures. Consequently, the specialized structures in an adult human's brain are not the product of hundreds of thousands of years of cumulative selection for incremental, genetically-induced modifications to the human brain; they are, instead, the product of that individual's history of interaction with the local environment.

Second, it is a mistake to seek adaptation among the *products* of brain development—that is, among the relatively special-purpose brain structures that emerge during the course of brain development. Those products are highly plastic responses to environmental inputs. The human cognitive adaptation is, instead, the *process* that generates those special-purpose brain structures (Deacon 1997). That is, the brain's *plasticity* is the adaptation, and the contingently stable brain structures in an adult's brain are by-products of that adaptation's functioning in its local environment. Similarly, the antibody-assembly process in the immune system is an adaptation, but the particular

antibodies it produces are not. The specific antibodies in an adult's immune system (many of which way not have been present in our ancestors) are, instead, the result of a plastic system's interaction with the pathogenic environment. In both cases, a particular trait (a psychological mechanism or an antibody) is present in an individual because of how the local environment has acted on a mechanism of plasticity. An adaptation, however, is a trait that is present in an individual because that individual inherited "genes for" that trait from ancestors in whom those genes were selected for. Thus, the relatively "modular," yet developmentally reversible, structures in an adult brain don't have the right etiology to be biological adaptations.

Evolutionary Psychologists frequently support their modular view of the mind by arguing that the only alternative is the view that "all adult mental organization and content is...cultural in derivation and substance" (Tooby and Cosmides 1992, p. 115). And they argue persuasively that this alternative is implausible. But there is a middle ground, which is favored by the evidence about brain development.

Rather than consisting of a plethora of "genetically specified" modules, the "innate" structure of the brain consists in a comparatively small number of *learning biases*, which take the form of a heightened responsiveness to certain classes of stimuli (Elman et al. 1996; Karmiloff-Smith 1992). These learning biases increase the probability that interaction with the environment will eventually produce domain-specialized structures, but there is no isomorphism between the "innate" learning biases and the knowledge databases embodied in the eventually resulting structures. Rather, development proceeds by a process of gradually branching domain specificity (or problem specialization), and the initial learning biases pertain only to the first and most general domains in this process (Karmiloff-Smith 1992). For example, a relatively large chunk of an adult human brain is devoted to face recognition, but infants appear to preferentially attend to *any* stimulus consisting of three high-contrast blobs configured like the two eyes and the mouth of a face, and they show no preference for actual faces over blobs. There is a face-recognition learning bias, then, that takes the form of heightened responsiveness to three high-contrast blobs, but full-blown face recognition is the result of a gradual process of progressive specialization (Elman et al. 1996, pp. 115–118). There is no direct mapping from the very minimally specified "innate" learning bias to the complex knowledge structure embodied in a mature face-recognition "module." A brain that develops in this way will mimic one that possesses a plethora of "innate" modules, even though its "innate" structure is relatively minimal.

According to this alternative picture, human psychological adaptation does not consist in "hundreds or thousands" of "genetically specified" modules. Rather, the fundamental adaptation is the brain's developmental plasticity, which is capable of producing a wide variety of problem-specialized information-processing structures that are responsive to local conditions. Additional adaptations lie in the minimal learning biases instantiated in the early stages of brain development.

### Detecting Cheating in the Evidence for Modularity

But Evolutionary Psychologists have presented *empirical evidence*, not simply arguments, for their modular view of the mind. In particular, Cosmides (1989) claims that the modular view of the mind predicts the existence of a “cheater-detection module,” and she claims to have gathered strong empirical evidence of this module. If the modular view of the mind has, indeed, accurately predicted such a discovery, it has a lot going for it, despite the foregoing arguments. In fact, however, there is no good evidence of a cheater-detection module.

Precisely why reciprocal altruism—the mutual exchange of fitness benefits—has evolved in our lineage (and others) remains a much-debated question. But it is widely agreed that, once individuals evolve altruistic propensities, selection favors the evolution of *cheaters*, nonreciprocators who accept the fitness benefit of another’s altruistic act without paying the fitness cost of providing a benefit in return. The evolution of cheaters, in turn, selects for the ability to detect and avoid cheaters. Accordingly, Cosmides (1989) argues that the human mind should be innately equipped with a *cheater-detection module*, a special-purpose psychological adaptation for detecting cheaters in social exchanges, which evolved to save us the fitness costs of being exploited.

Evidence for Cosmides’ hypothesis derives from studies with the Wason selection task. In Wason selection tasks, subjects are given a conditional, *if P, then Q*, together with four two-sided cards displaying information of the form *P*, *not-P*, *Q*, and *not-Q*, and they are instructed to turn over those cards necessary to determine whether the conditional is true. The logically correct solution is to turn over the cards displaying *P* and *not-Q* in order to see whether their other sides contain *not-Q* and *P* respectively, since these, and only these, cards can falsify the conditional. Two results from studies with the Wason selection task are taken as evidence of a cheater-detection module.

First, there appears to be a *content effect* in the selection task: The frequency with which subjects select the “logically correct” cards appears to vary as a function of what the conditionals *are about*. For example, when presented with the conditional “*If a card has an ‘R’ on one side, then it has a ‘2’ on the other side*” and cards showing *R*, *J*, *2*, and *8*, an average of only 4 percent of subjects choose the *R* and *8* cards (the *P* and *not-Q* cards), and 79 percent choose either the *R* card alone or the *R* and *2* (*P* and *Q*) cards (Evans 1982, pp. 157–159). In contrast, when presented with the conditional “*If a person is drinking beer, then that person must be over 19 years of age*” and cards showing *drinking beer*, *drinking Coke*, *22 years old*, and *16 years old*, 73 percent of subjects choose the *drinking beer* and *16 years old* cards (the *P* and *not-Q* cards), while only 20 percent choose *drinking beer* alone and none choose both *drinking beer* and *22 years old* (Griggs and Cox 1982). As these examples illustrate, differential performance on Wason selection tasks is due primarily to an increase in the frequency with which the *not-Q* card is selected.

Since all conditionals in selection tasks apparently have the same logical form, the performance differential seems to indicate that subjects are reasoning about the *content*, not the logical form, of the conditionals. In particular, since the above drinking-age problem represents a *social exchange*, a situation in which an obligation is incurred in order to receive a benefit, Cosmides (1989) argues that it activates a cheater-detection module, which looks for violations of the conditional rule (*drinking beer* while being *sixteen years old*), whereas the abstract letter-number problem falls on deaf modules, which didn't evolve to solve abstract non-adaptive problems. Cosmides supported this analysis by presenting subjects with artificial abstract and social-exchange problems and finding the same "content effect" biased in favor of improved performance on the social-exchange problems.

Second, when the logically correct cards differ from those representing cheating, subjects appear to ignore logic and choose the cards that represent cheating. For example, Cosmides (1989) gave two groups the following instructions: "You are a member of an island culture in which men get facial tattoos upon getting married. The island has a native plant called 'cassava root,' an aphrodisiac that makes men who eat it irresistible to women. Since sex between unmarried people is taboo on the island, the island's elders have enacted the following rule..." She then gave one group a "standard" social-contract conditional "*If a man eats cassava root, then he must have a tattoo on his face*" and the other group the "switched" conditional "*If a man has a tattoo on his face, then he eats cassava root.*" Both groups were shown the same four cards: *eats cassava root*, *eats molo nuts*, *tattoo*, and *no tattoo*. She found that 75 percent of subjects chose *eats cassava root* and *no tattoo* (the *P* and *not-Q* cards) in response to the "standard" social-contract conditional, but that 67 percent chose the same cards in response to the "switched" conditional, despite their being the logically incorrect *not-P* and *Q* cards in that version of the problem. Thus, Cosmides concluded, subjects don't apply logical principles in solving selection tasks, but simply focus on whether someone has accepted a benefit without fulfilling an obligation. And this, she claims, is evidence of cognitive specialization for detecting cheaters in social exchanges.

But neither result is good evidence of a cheater-detection module. Indeed, both results are compatible with a non-modular mind that applies domain-general logical principles in solving Wason selection tasks.

First, there is no genuine content effect in Wason selection tasks. The idea that there is presupposes that the conditionals in selection tasks have the same logical form and differ only in their contents (Over 2003). But there are distinct kinds of conditional, each with unique logical properties (Edgington 1995). In particular, the conditional in the letter-number problem is an *indicative conditional*, which makes the truth of one proposition conditional upon the truth of another, whereas the conditional in the drinking-age problem is a *deontic conditional*, which makes *an obligation* conditional upon the truth of a proposition. Indeed, all of the problems on which Cosmides found

that subjects do best involved deontic conditionals. And deontic conditionals actually impose obligations *categorically* in their *Q* parts, while indicating on whom the obligations fall in their *P* parts (Fodor 2000). Since deontic conditionals actually require *Q* (of those of whom *P* is true), attention is immediately drawn to the *not-Q* card, and the frequency with which it's selected increases accordingly. Thus, differential performance on Wason selection tasks actually demonstrates a *logic effect*. Subjects apply different logical principles to indicative and deontic conditionals (as they would apply different logical principles to conditionals and conjunctions), and select *not-Q* with greater frequency in response to deontic conditionals because the correctness of *not-Q* is made more perspicuous by the logic of deontics. Moreover, differential performance on selection tasks is an artifact of pairing *arbitrary* indicative conditionals with deontic conditionals. Several studies have found that, when subjects are given "real-world," rather than arbitrary, indicatives, the frequency of logically correct responses equals that for deontics (Cheng and Holyoak 1989; Manktelow and Over 1990; Sperber et al. 1995).

Second, the idea that subjects ignore the logic of conditionals in order to focus on whether cheating has occurred falsely presupposes that changing the wording of conditionals in selection tasks changes how subjects *mentally represent* their logical forms. In Cosmides' "switched" problem, for example, subjects were presented with a background story that clearly required *a facial tattoo* of those *eating cassava root*, but were then asked to evaluate compliance to the conditional rule "*If a man has a tattoo on his face, then he eats cassava root,*" which not only didn't make sense in the context of the background story, but didn't contain the obligating word "must," which was present in the "standard" social-contract version of the problem (cf. Cosmides 1989, p. 217). Under such circumstances, language-comprehension mechanisms process the conditional *together with the background information* and output a mental representation of the logical form of the conditional that makes sense given the background information (as we all do, for example, when we represent the logic of the expression "all is not lost" as "not all is lost"). Thus, subjects didn't select the "logically incorrect" cards in Cosmides' "switched" problem; they selected the logically correct cards relative to their *representation* of the (deontic) logical form of the conditional. In other words, subjects simply applied logic to a sensible interpretation of the problem. (Similar arguments apply to results obtained by Gigerenzer and Hug (1992) and Fiddick et al. (2000).) So "logically incorrect" results in Wason selection tasks fail to show that subjects don't reason using general logical rules. There is, then, no good evidence of a cheater-detection mechanism.

### "Our Modern Skulls House a Stone Age Mind"

Evolutionary Psychologists offer the following single argument in support of the claim that each human psychological adaptation is adapted to Pleistocene conditions. The

10,000 years since the end of the Pleistocene, they argue, “is only a small stretch in evolutionary terms, less than 1% of the two million years our ancestors spent as Pleistocene hunter-gatherers. For this reason, it is unlikely that new complex designs—ones requiring the coordinated assembly of many novel, functionally integrated features—could evolve in so few generations” (Cosmides et al. 1992, p. 5). Thus, Evolutionary Psychologists conclude, our psychological adaptations must be adapted to the Pleistocene conditions under which they evolved.

This argument, however, commits a couple of simple fallacies. First, the issue is not whether “new complex designs” that require the “coordinated assembly” of many features could have emerged in the 10,000 years, or 400 generations, since the Pleistocene. Without doubt, selection could not build a human mind from scratch in a mere 400 generations. But, from the fact that a “new complex design” could not have evolved since the Pleistocene, it doesn’t follow that *old* complex designs, which evolved during the Pleistocene or even earlier, could not have been significantly *modified* by selection in 400 generations. Since the argument doesn’t address this possibility, it fails to show that the psychological adaptations of contemporary humans must be identical to those of our Pleistocene ancestors.

Second, the argument assumes that the 1 percent of human evolutionary history since the Pleistocene is unimportant in comparison to the 99 percent spent as hunter-gatherers. But, as Wilson says, “it makes no sense to express evolutionary time as a proportion of the species’ history” (1994, p. 226). It doesn’t matter whether a lineage spends only 1 percent of its evolutionary history in a new environment, Wilson argues; what matters is what kinds of change occur during that 1 percent of its evolutionary history. Thus, “rather than marvelling at the antiquity of our species, we should be asking what kinds of evolutionary change can be expected in 10, 100, or 1000 generations” (p. 226).

There is, in fact, ample evidence that Evolutionary Psychologists greatly underestimate the evolutionary change that may have occurred since the end of the Pleistocene. In considering such change, we need to address two questions. First, have the environments inhabited by human populations since the Pleistocene changed in ways that have altered the selection pressures on human psychology? Second, if so, has there been sufficient time for an evolutionary response to these changes?

The answer to the first question is undoubtedly yes, and this is due largely to environmental changes produced by human activity. The agricultural and industrial revolutions, for example, precipitated fundamental changes in the social structures of human populations, which in turn altered the selection pressures on a variety of interpersonal behaviors. For example, while Pleistocene humans lived in groups of 50–150 individuals, post-agricultural humans have lived in increasingly larger groups, which has affected the challenges humans face when mating, forming alliances, or negotiating status hierarchies. In addition, changing social structures have wrought radical

changes in the kinds of task that must be performed to acquire the resources necessary for successful child rearing. Even if hunter-gatherers had evolved “Darwinian algorithms” to solve the problems involved in acquiring resources necessary for child rearing in savanna environments, such Darwinian algorithms would be useless in the world of Wage-Laborer Man, since the tasks leading to acquisition of food and other resources have changed so drastically. Thus, environmental change since the Pleistocene has assuredly created strong selection pressure for psychological evolution.

But has there been sufficient time since the Pleistocene for an evolutionary response to these environmental changes? The question is *not* whether there has been enough time for human populations to evolve minds that are adapted to twenty-first-century environments. The question, instead, is whether there has been enough time for *modification* of the psychological adaptations possessed by our Pleistocene ancestors. And there are two reasons for answering in the affirmative.

First, there are clear cases of post-Pleistocene adaptive evolution in physiological and morphological traits. For example, “the persistent domestication of cattle, and the associated dairying activities, did alter the selective environments of some human populations for sufficient generations to select for genes that today confer greater adult lactose tolerance” (Laland et al. 2000, p. 132). The evolution of lactose tolerance was driven by *niche construction*, a process in which a population actively modifies the niche it inhabits, thereby modifying the selection pressures driving its own evolution. Niche construction typically accelerates the pace of evolution as successive generations of a population continually modify the sources of selection acting on themselves and subsequent generations. And humans have been supreme niche constructors. The development of agriculture and industry greatly altered human niches, and developments in medicine have continually altered the toll of disease on survival and, as a consequence, opportunities to reproduce. Indeed, niche construction has pervaded nearly every aspect of human life in recent centuries, ranging from methods of shelter construction to methods of food preparation and preservation (think of pasteurization, for example), from methods of contraception to organized education. And there is no reason to think that niche construction has driven only physiological and morphological evolution. For, on the psychological side, techniques of teaching, whether skill- or information-based, have altered the cognitive niche in which humans develop, and the recent development of information technologies is radically altering the cognitive niche to which future generations will adapt.

Second, the idea that human psychological adaptations cannot have evolved since the end of the Pleistocene depends on a false assumption about the rate at which selection can alter traits in a population. Recent work has shown that evolution by natural selection can occur very rapidly. Reznick et al. (1997) split populations of guppies living in high-predation environments, leaving a part of each population in its high-predation environment and moving the other part to a low-predation environment.

They found that life-history traits of the transplanted guppies evolved significantly in a mere 18 generations. The descendants of the transplanted guppies matured to a larger size and achieved reproductive viability at a later age than the non-transplanted guppies, they produced fewer litters (with fewer and larger offspring in each litter), and they allocated less of their total resources to reproduction during their early reproductive lives. Moreover, Reznick and his colleagues identified both the genetic basis of this change and the mechanism by which selection drove it (namely, differential mortality by predation). If this much evolution can occur in 18 generations, the 400 human generations since the end of the Pleistocene has certainly been sufficient time for selection-driven evolution in human psychological traits.

Thus, it is overwhelmingly likely that there has been some adaptive psychological evolution since the end of the Pleistocene, which has rendered contemporary humans psychologically different from their Pleistocene ancestors. There is no reason to think that “our modern skulls house a Stone Age mind.”

### “Human Nature”

One of the most obvious things in the world is that people differ in their attitudes, preferences, and behavioral responses to similar situations. This is true not only of individuals from different cultures, but of individuals within the same culture. According to Evolutionary Psychologists, however, “variable manifest psychologies or behaviors between individuals and across cultures” are “the product of a common, underlying evolved psychology operating under different circumstances” (Tooby and Cosmides 1992, p. 45). This doctrine relies heavily on the claim that variation exists only among the *outputs* of our psychological adaptations as a function of variation in the inputs to invariant psychological adaptations. Manifest psychological variation, according to Evolutionary Psychologists, is never a function of variation in the underlying psychological mechanisms of “normal” human beings. Thus, according to Evolutionary Psychologists, there are no *psychological polymorphisms*—that is, there are no alternative forms of psychological adaptations that are maintained by selection’s acting on underlying genetic differences between individuals.

There are two arguments offered in support of this view. The first argument is as follows (see Tooby and Cosmides 1992, pp. 78–79). “Complex adaptations are intricate machines... that require coordinated gene expression, involving hundreds or thousands of genes to regulate their development” (p. 78). Since sexual reproduction is a process in which random halves of each parent’s genes are “recombined” to form the genome of a zygote, if parents differed in any of their complex adaptations, randomly recombining the genes for those adaptations would make it highly improbable that offspring would receive all the genes necessary to build any of the adaptations. Consequently, if individuals differed in their complex adaptations, no adaptation could be

reliably reproduced across generations. "Therefore, it follows that humans, and other complex, long-lived, outbreeding organisms, must be very nearly uniform in those genes that underlie our complex adaptations" and that this genetic uniformity "tends to impose near uniformity at the functional level in complex adaptive designs" (p. 79). It follows that no psychological differences result from genetic polymorphisms maintained by selection, since such polymorphisms would constitute alternative adaptive designs. Thus, Evolutionary Psychologists conclude, there must be "a universal and uniform human nature" (p. 79). To the extent that genetic differences influence psychological differences, Evolutionary Psychologists argue, they can affect only "quantitative variation" in qualitatively identical adaptations (in the way that genetic variation can affect the size of one's stomach, for example, but not whether one has a stomach).

Evolutionary Psychologists do, however, recognize an important exception to the universality of human nature. Since mating and reproduction pose different problems for the two sexes, selection has designed certain sex-specific suites of complex adaptations for solving these problems. With respect to phenomena such as mate choice, then, human nature bifurcates along the fault line of sex, with each sex possessing its own "nature" (Tooby and Cosmides 1992, pp. 81–82).

This argument, however, is multiply problematic. First, as Wilson (1994) points out, if the argument were sound, there would be no genetic polymorphisms in any sexually reproducing species, but there are many well documented examples of such polymorphisms. For example, males of the marine isopod crustacean species *P. sculpta* come in small, medium, and large, and these sizes perfectly correlate with distinct mating strategies (Shuster and Wade 1991). Large males secure and "guard" harems of females in the recesses of sponges, acquiring their copulations with the harem members. Small males acquire copulations by "sneaking" past inattentive large males and thereby gaining access to the females in the harem. Medium males morphologically resemble females, so they "mimic" the female courtship display and thereby gain entry to a large male's harem, where the medium male then copulates with the females inside. These three "adaptive designs" have equal reproductive success, and the genes underlying them have been identified. Yet such a genetic polymorphism constitutes a clear violation of the assumptions at play in Tooby and Cosmides' argument. So the argument is mistaken.

Second, the argument mistakenly assumes that selection acts only on qualitative variation and that, as long as individuals are "qualitatively identical," quantitative differences are selectively irrelevant. But this assumption is false. Indeed, sexual dimorphism, which Evolutionary Psychologists take to be a "qualitative" difference, is actually the result of very ancient selection on quantitative differences in gamete size. This form of selection, called *disruptive selection*, favored the two extremes of gamete size (favoring large gametes for the nutrients they could store and small ones for their

motility in reaching the larger gametes), while selecting against medium-sized gametes. So observable quantitative variation may actually be acted on and maintained by selection; and, when it is, it is a genetic polymorphism.

Third, the argument mistakenly assumes that, since adaptations require hundreds or thousands of genes for their development, if individuals differ in some adaptation, they must differ with respect to hundreds or thousands of genes (which the argument purports to show is impossible). As we have seen, however, Evolutionary Psychologists consider *male* and *female* to be distinct adaptive designs. Yet this adaptive difference is a product of a *single gene* difference, the *SRY* gene on the *Y* chromosome, which codes for testis-determining factor. Of course, *SRY* produces its effects only against a background of hundreds or thousands of genes shared by males and females; but the *differences in adaptations* result from a single gene difference against that background. As Wilson (1994) argues, there could be many other adaptational differences in humans that are likewise due to single gene differences.

Consequently, the argument fails to show that selection did not and does not produce and maintain some psychological polymorphisms in human populations. And this, in turn, means that the argument fails to show that selection must have created “a universal and uniform human nature.”

The other argument for a universal human nature I call “the argument from *Gray's Anatomy*.” As Tooby and Cosmides argue, “the fact that any given page out of *Gray's Anatomy* describes in precise anatomical detail individual humans from around the world demonstrates the pronounced monomorphism present in complex human physiological adaptations. Although we cannot yet directly ‘see’ psychological adaptations (except as described neuroanatomically), no less could be true of them” (1992, p. 38). Selection, in other words, has designed in humans a “universal architecture,” in the sense that “everyone has two eyes, two hands, the same sets of organs, and so on” (Tooby and Cosmides 1992, p. 78). Since selection has presumably designed our minds as well as our bodies, we should expect selection to have designed a universal psychological architecture, which constitutes our “universal human nature.” But there are problems even with this seemingly commonsensical argument.

First, as Wilson points out, “uniformity at the coarsest scale does not imply uniformity at finer scales” that are still selectively relevant (1994, p. 224). Every human may have a brain with two hemispheres, a cortex, an occipital lobe, and so on, but this doesn't imply universality of more micro-level psychological mechanisms. Since Evolutionary Psychologists claim that our universal psychological adaptations are modules, which are finer-grained brain structures, they need to demonstrate universality at this “finer scale.” But the argument from *Gray's Anatomy* fails to do so.

Second, the “coarsest scale” to which Evolutionary Psychologists retreat in their argument from *Gray's Anatomy* is incommensurate with their definition of human nature

as consisting of “qualities that define us as a unique species” (Buss 1999, p. 47). For the universals appealed to in this argument (two hands, two eyes, a stomach, skin) characterize the whole primate order and sometimes the whole class of mammals and even all vertebrates. So the analogical appeal to this “coarsest scale” of uniformity supports no conclusion about universal psychological adaptations that purportedly “define us as a unique species.”

Third, the basic structural plan that typifies the “universal architecture” of a species—and that, at ever coarser scales of description, typifies the body plan of an order, class, and subphylum—consists primarily of features that have *persisted* down lineages and through speciations for tens to hundreds of millions of years. Thus, while selection probably played a role in designing the structural plan of humans, it didn’t design that structural plan during human history, but during the history of the common ancestor of humans and other primates or vertebrates. So we can’t really infer anything about psychological adaptations, which purportedly resulted from selection during relatively recent human history, from the fact that all humans (except the “abnormal”) have two eyes, two hands, one nose, and a mouth.

Of course, this doesn’t mean that there are *no* psychological universals of the sort that might interest Evolutionary Psychologists. It just means that there are no a priori considerations definitively showing that there are such universals awaiting discovery by Evolutionary Psychologists. It also means that, insofar as Evolutionary Psychology takes psychological adaptation as its object of inquiry, it must be prepared to investigate psychological variation just as studiously as any potential psychological universality. In other words, evolved “human nature” isn’t constituted solely by psychological universals, but is at least partially constituted by adaptive variation.

This, however, prompts some questions. What if there are psychological universals? What should we make of them? As we saw earlier, Evolutionary Psychologists are mistaken in thinking that the totality of human psychological adaptations reflects adaptation to Pleistocene environments. Selection is undoubtedly continuing to modify trait frequencies in human populations. That means that any psychological universals we might happen to discover are temporally bound. They characterize human populations at a given moment in evolutionary history, and they are subject to change. Today’s universals may be possessed by only a fraction of the species, or even extinguished, tomorrow. Thus, as Hull (1989) argues, it is a mistake to think that any universals we might discover reveal to us the “nature” of our species, in any interesting sense of “nature.”

Moreover, if there are psychological universals, at least some of them will be the result of genetic drift, rather than selection (since some portion of all fixated traits are due to drift). Of course, Evolutionary Psychologists argue that drift-fixated traits are not typically incorporated into the “complex organized design” of the organism (Tooby and Cosmides 1992, p. 52). For this reason, they don’t take drift-fixated

psychological traits to be part of “human nature.” But nothing in orthodox neo-Darwinian evolutionary theory justifies treating adaptations as somehow more “central” than drift-fixated traits, as somehow a part of the core “nature” of a species in a way that drift-fixated traits are not. To privilege adaptations in this way is to adopt what Godfrey-Smith (1999) calls a form of *natural theology*: It is to replace God with Natural Selection as the Creator, but to still maintain that the Creator’s “intention” (as manifested in what is selected-for) represents the “nature” of a species, departure from which is “abnormal.” But this particular way of wielding evolutionary theory is not intrinsic to evolutionary theory; it is an unjustified addition to it. Consequently, there is no *evolutionary* justification for the adaptation-centered concept of “human nature” employed by Evolutionary Psychology.

### Conclusion

There can be little doubt that evolution has occurred and that *Homo sapiens* is among its products. There can also be little doubt that the evolutionary history of our lineage has left its mark on human psychology just as assuredly as it has left its mark on human morphology. The human mind, unquestionably, is the product of evolution. But what follows from this fact? I have argued not only that *none* of the central tenets of Evolutionary Psychology follow from this fact, but that all of the theoretical tenets of this paradigm are either misguided or unsubstantiated. This does not imply, however, that evolutionary psychology (as a *field of inquiry*) is bankrupt. It implies, rather, that Evolutionary Psychology is not the paradigm that will guide evolutionary psychology toward a more adequate evolutionary understanding of human psychology.

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