

perfect concordance among all groups (irrespective of vision status) in terms of the muscle striations and contractions that produced the facial expression of these emotions (Matsumoto & Willingham, 2009). Thus, it appears that basic emotions are generated by evolutionary processes and require no further "step" in terms of explaining their origin.

In another investigation, Tate (2010) examined whether the desired number of sexual partners over a lifetime is more influenced by self-reported sex (a presumed evolutionary variable) or gender stereotype endorsement. Across three studies, Tate showed that psychosocial gender conceptions in the United States accounted for more variance in participants' desired number of sexual partners than did self-reported sex. Importantly, Tate (2010, Study 3) showed that endorsement of feminine gender stereotypes had the same magnitude of negative correlation with desired number of sexual partners for both men and women. Tate's results suggest that evolutionary processes may be the first step in explaining the desired number of sexual partners. Evolutionary variables may set initial desires that are similar across genders. However, in another step, cultural stereotypes and one's personal endorsement of them create the observed differences in this outcome.

From this stepwise framework, homosexuality and suicide are no longer problems for an evolutionary account. Homosexuality is easily explained as a phenomenon that does not affect reproduction at the population level and is therefore not selected against. Empirically, one would expect that homosexuality has a low incidence, which can be shown by demographic studies in the United States: for instance, at a rate of 2%–6% (Diamond, 1993). Of course, showing that homosexuality does not affect reproduction at the population level does not answer the question of how same-sex attraction arose in the first place. Havelock Ellis (1905, p. 314) provided a potential answer that he claimed Darwin endorsed. Ellis argued that humans might be fundamentally "bisexual" in their sexual attraction. Updating Ellis's account, we propose that human genetics may code for a conspecific attraction to all members of the species, or *anthropos*. This anthroposexual attraction could account for heterosexuality, homosexuality, and bisexuality simultaneously. In the stepwise framework, humans would start from the basic step of species-wide attraction to other humans. In what likely involves multiple steps, human attraction would then be differentiated into exclu-

sive heterosexuality, exclusive homosexuality, and also bisexuality by a variety of physiological, sociocultural, psychosocial, and experiential processes. This account can explain diverse phenomena such as the differences in self-reported incidence of homosexuality across cultures as well as historical occurrences of homosexual behavior among certain social classes but not others (e.g., homosexuality in the ancient Greek aristocracy). In short, explaining homosexuality with an evolutionary account is only difficult if that account assumes that everyone must be heterosexual.

In terms of explaining suicide, the Confer et al. (2010) argument again stumbles on its implicit assumption that every behavior has to be functional or *selected for*. Smirnov, Arrow, Kennett, and Orbell (2007) argued that heroism—self-sacrifice for a group's benefit—is consistent with an evolutionary perspective. The Smirnov et al. argument recognizes the importance of population outcomes, allowing individuals to contribute to or not impede those outcomes. The reasons given for attempted suicide also feature self-sacrificing for the group's benefit (Joiner et al., 2009). Although heroism and suicide have different social meanings and consequences, both may emanate from the same psychological source—the ability to overcome self-preservation. Again, a second step consisting of psychosocial, sociocultural, and experiential (including physiological) factors is needed to adequately describe cross-cultural and individual variability. Nonetheless, the tenor of the argument is the same: Evolution may code for similarity (self-preservation) across the species, and other factors create the observed differences between individuals within that species.

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### Trade-Offs, Individual Differences, and Misunderstandings About Evolutionary Psychology

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We appreciate the thoughtful commentaries on our original article (Confer et al., February–March 2010), the purpose of which was to clarify the logic of evolutionary psychology and clear up some of the more common misunderstandings about it. In this response, we address the key points raised by the commentators.

#### Evolutionary Trade-Offs and Individual Differences

We are delighted that Winegard, Bailey, Oxford, and Geary (2010) found our article to be useful in clarifying many misconceptions about evolutionary psychology, and we hope that other readers share that view. Furthermore, we agree with the main thrust of their commentary—the importance of evolutionary trade-offs, both as a set of causal processes (e.g., sexually antagonistic selection) and products of those processes (e.g., appar-

ently suboptimal individual-level adaptations). The field of evolutionary psychology has long embraced the importance of evolutionary trade-offs (e.g., Buss, 2011), and trade-off models have been central to much theoretical and empirical work in our lab as well as in evolutionary psychology labs worldwide (e.g., Alvergne, Faurie, & Raymond, 2008; Buss & Duntley, 2008; Gangestad & Thornhill, 2008).

In addition to the plausible trade-off examples of waist-to-hip ratio and sexually antagonistic selection for homosexuality that Winegard et al. (2010) provided, we note two other sorts of evolutionary trade-offs explored in our lab. One stems from error management theory (Haselton & Buss, 2000), a theory about evolutionary trade-offs. Given uncertainty about the biotic and physical environments, there are two fundamental ways to err—one can infer that states are present when they are not, or one can infer that states are absent when they are in fact present (false positives and false negatives, respectively). According to error management theory, if there is a cost asymmetry associated with these two types of errors iterated over evolutionary time, selection will favor biases to err in the less costly direction—that is, the decision rule with the lowest net cost over the sample space of instances. Examples of these adaptive biases include the auditory looming bias, the vertical descent illusion, the sexual overperception bias, and the commitment skepticism bias (Haselton & Nettle, 2006). These adaptive biases cause individuals to commit more errors of inferences, as when men infer sexual interest in women when it is absent. Without an understanding of evolutionary trade-offs, a superficial analysis might conclude that individuals are behaving in a suboptimal manner. But these biases occur precisely because of evolutionary trade-offs between the two types of errors, resulting in an inference engine that is biased toward producing a larger number of overall errors while reducing the number of more costly errors.

Evolutionary trade-offs have also been central to our lab's work on sexually antagonistic coevolution, evolutionary arms races between exploiters and victims, and parent-offspring conflict, to take just a few examples (e.g., Buss & Duntley, 2008; Perilloux, Fleischman, & Buss, 2008). In short, we agree entirely with Winegard et al. (2010) about the centrality of trade-offs in the causal processes and products of natural selection to the core conceptual framework of evolutionary psychology. As Winegard et al. correctly noted, models of evolutionary trade-offs will be central to understanding some forms of individual differences—a domain of intense current interest among evolutionary psychol-

ogists (e.g., Buss & Hawley, 2011). And although we agree with their argument that sexually antagonistic selection may provide a partial explanation for male homosexual orientation, we emphasize the word *partial*, note that this explanation does not currently explain *female* homosexual orientation, and therefore conclude that this “evolutionary mystery” still remains largely a mystery.

### More Misunderstandings About Evolutionary Psychology

Unlike the scientific cogency of the Winegard et al. (2010) commentary, the Tate and Ledbetter (2010) commentary is riddled with conceptual errors, scholarly lapses, unwarranted assertions, and fundamental misunderstandings about evolutionary theory. Although we have space to deal with only two in detail, we wish to alert readers to several others and refer them to our original article (Confer et al., 2010) for details: (a) Our original article never claimed that sexual strategies theory (SST) is the only type of evolutionary account; in fact, we discussed a variety of evolutionary psychological theories, including error management theory, evolved navigation theory, and kin altruism theory. (b) We did not state or imply that “all psychological functioning must serve survival and reproduction” (Tate & Ledbetter, 2010, p. 929); in fact, we did precisely the opposite by explicitly drawing attention to *noise* and *byproducts* as nonadaptive and nonfunctional products of the evolutionary process (Confer et al., 2010, p. 110). (c) “Cultural stereotypes,” contra Tate and Ledbetter (2010), do not provide autonomous causal explanations of sex differences in desire for sexual variety (see Confer et al., 2010, and Schmitt & International Sexuality Description Project, 2003). (d) Tate and Ledbetter's (2010) claim that homosexuality is “easily explained” because it does not “affect reproduction at the population level” (p. 930) reflects a deep confusion about the logic of evolution by natural selection (see below). And (e) the conceptually muddled “stepwise” proposal for serially incorporating multiple causal factors into an explanatory framework represents a large scientific step backward from the deeply interactionist framework of evolutionary psychology and implicitly adopts the false causal dichotomies that evolutionary psychology explicitly rejects.

One of the deepest misunderstandings, which occurs throughout the Tate and Ledbetter (2010) commentary, involves group selection and is evident in expressions such as “survival and reproduction at the population level” (p. 929), “homosexuality is easily explained . . . [by] reproduction at the population level” (p. 930), “self-sacrifice for a group's benefit” (p. 930), and self-preserva-

tion “across the species” (p. 930). Tate and Ledbetter appear to endorse a form of group selection that was largely abandoned in evolutionary biology in the 1960s, following the publication of G. C. Williams's (1966) classic book *Adaptation and Natural Selection*. Williams marshaled powerful arguments against the theory of group selection. The number of selective events on the alternative genes of individuals *within* a population is orders of magnitude greater than the number of selective events at the group level, undermining the potency of group selection and rendering it a weak force. The conditions required for group selection to become a powerful causal force in fashioning adaptations are rarely met in nature. These include high levels of reproductive isolation between groups, appreciable genetic differences between these isolated groups, low degrees of within-group competition, and high levels of “shared fate” between members of the group.

Although group selection is certainly possible, and may have occurred in some eusocial insect species such as honeybees, humans are an unlikely candidate for being a group-selected species. And even the few ardent group-selectionists today do not make claims for selection for the benefit of species or entire populations, as Tate and Ledbetter (2010) appear to do. Three major empirical findings strongly support our claim that standard natural selection—differential reproductive success as a consequence of heritable differences in design—and not group selection, would have been the primary causal process in creating human psychological, physiological, and anatomical adaptations. First, the dominant pattern of mating in the hundreds of traditional human cultures studied is exogamy—women tend to marry outside their group, collapsing the reproductive isolation needed for group selection to work. Second, traditional cultures tend to engage in high levels of fusion. Groups merge with other groups, sometimes by mutual agreement to increase coalitional strength and mate exchange and sometimes by hostile takeovers in which the rival men are killed and the women are retained as mates. Third, there is tremendous evidence for within-group competition in the form of mating rivalry, zero-sum hierarchy negotiation, scramble and contest resource competition, verbal derogation, and physical aggression (see Buss, 2011, for summaries of these empirical phenomena). All of these phenomena undermine the “shared fate” and between-groups reproductive isolation required for group selection to become a strong force in human evolution. Although all modern evolutionists acknowledge that group selection (now often called multilevel selection theory) is theoretically possible, there is no compelling reason

to believe that group selection can explain the evolutionary puzzles of homosexual orientation and suicide, as claimed by Tate and Ledbetter.

In contrast to the Winegard et al. (2010) commentary, which proposed a plausible partial explanation for male homosexual orientation anchored in sexually antagonistic selection, the Tate and Ledbetter (2010) commentary proposed to explain “heterosexuality, homosexuality, and bisexuality simultaneously” (p. 930) by invoking the claim that human genes “code for a conspecific attraction to all members of the species” (p. 930), coupled with the erroneous assertion that homosexuality is not “selected against” (p. 930) “at the population level” (p. 930). It is empirically known that the direct reproductive success of male homosexuals is substantially lower than that of male heterosexuals (Iemmola & Camperio Ciani, 2009). So unless there exists a reproductive benefit consistently associated with genes for homosexuality, which may be the case, then it certainly is selected against. That is why so many scientists worldwide view it as an “evolutionary puzzle.” Tate and Ledbetter, unlike Winegard et al., provided neither a hypothesis nor empirical evidence for a compensatory benefit.

Instead, they invoked a panhuman sexual attraction that is supposed to somehow explain all forms of sexual orientation. This claim flies in the face of all scientific evidence about human sexuality. First, it does not explain why heterosexual orientation is highly canalized in humans, characteristic of more than 95% of people. Second, it is contradicted by the fact that most people are attracted to sexually mature members of the opposite sex, not in a panspecies manner to infants, children, or those with observable cues to low reproductive viability. Third, most humans are not sexually attracted to close genetic relatives, reflecting an incest avoidance adaptation. Indeed, most people, far from being attracted, experience disgust and repulsion at the thought of having sex with a close genetic relative. These are merely three key facts from a larger body of evidence that contradicts the notion of a panhuman sexual attraction (Puts, 2009). In short, Tate and Ledbetter’s (2010) claim that “homosexuality is easily explained” (p. 930) is amply contradicted by the existing scientific evidence.

### The Future of Evolutionary Psychology

Evolutionary psychology currently provides the most powerful current metatheory for psychological science. It is not a static metatheory, but one that continues to mature and deepen with new theoretical and empirical

advances. Progress in psychological science requires a deep understanding of the framework of evolutionary psychology and the avoidance of common and stubbornly held misunderstandings about it. Our original article was designed to clear up some of the more common misunderstandings—an admittedly difficult task, given that (a) most psychologists receive no formal training in evolutionary biology, (b) evolutionary psychology is widely mischaracterized in many psychology textbooks, and (c) emotional, religious, and ideological antipathies to evolutionary psychology interfere with clear, dispassionate evaluation. The Winegard et al. (2010) commentary applauded us for clarifying these misunderstandings. The Tate and Ledbetter (2010) commentary badly mischaracterized our arguments and blithely declared that complex psychological mysteries are “easily explained” by invoking an outmoded form of group selection and proposing ideas such as a panhuman sexual attraction that are known to be scientifically false. Their commentary demonstrates that developing a deep understanding of evolutionary psychological science can be a formidable scholarly challenge.

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## Deep-Level Diversity and Leadership

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In the special issue on Diversity and Leadership (April 2010), the authors made a strong case for the importance of diversity in workplace leadership, rejected premature declarations that workplace discrimination is obsolete, and called for leadership theories that acknowledge and promote the value of diversity. We appreciate all authors’ stressing that the glass ceiling still exists, not only for women but for other historically low-power groups as well. We also agree that modern theories of leadership can benefit immensely from increased participation by scholars and practitioners who are not Western, White, upper-class men (Chin, 2010).

In spite of these strengths, we must admit our surprise at the way in which the authors of the special issue implicitly defined diversity. Specifically, they focused primarily on *surface-level diversity*, or heterogeneity in salient, visible characteristics (e.g., gender, race/ethnicity). However, in recent years, organizational researchers have increasingly focused on examining *deep-level diversity*, defined as heterogeneity in underlying psychological character-