

p , and deliver appropriate outputs, q , such that $p \rightarrow q$. While the two approaches can coexist at the level of describing the task demands that confront a particular agent, they can clash over psychological commitments.

Schmitt's equivocation becomes apparent toward the end of the target article:

The current perspective, in which sociosexuality is seen as resulting from a collection of psychological adaptations, is quite limited in scope. Still, this evolutionary framework may have some use as a heuristic for the future theorising on the psychology of human sexual strategies (sect. 8, para. 6).

Prior to this, Schmitt discussed the notion of adaptive responsiveness to local ecologies and raised issues of socialization and experience with regard to Eagly and Wood's (1999) social structural theory. What is more, Schmitt's data partially support the predictions made by the social structural theory, demonstrating a reduction of magnitude in sex differences as a consequence of sociopolitical and relational freedom. It is possible to view such flexibility as contradictory to the view that human psychology consists of a suite of adapted cognitive mechanisms. Surely, responses would be rigid in the face of ecological change.

I see no reason to adopt an ecological perspective on the underlying psychology of sociosexuality, partly because of theoretical commitments. Not only can there be no selection for a general psychological mechanism, for there are no general psychological problems, but also modularity renders the numerous problems facing an agent computationally tractable (Tooby & Cosmides 1992). More important, in this case Schmitt's own evidence of sociosexuality shaping up differently under various local ecologies in fact lends itself to evolutionary psychology. This is because Schmitt has presented clear data that strongly suggest distinct patterning within the human sociosexual response, not infinite flexibility. Indeed, it would appear that Schmitt has isolated the conditional architecture of an aspect of sociosexual cognition, and that it looks something like this:

If (p : male-biased sex ratio), **then** (q : adopt monogamy, i.e., long-term single partner investment)

If (p : female-biased sex ratio), **then** (q : adopt (male) promiscuity and (female) tolerance of promiscuity)

If (p : high-stress local environment), **then** (q : adopt monogamy)

If (p : low-stress local environment), **then** (q : adopt unrestricted sociosexuality)

These conditional rules are, of course, to be taken as descriptions of the kinds of computation that are necessary for a sociosexual cognitive architecture to implement; they represent a functional decomposition. It can be further hypothesized that these conditional rules set the parameters for sociosexual behaviour. Such rules will have been selected for over long historical time, in response to adaptive demands, and the combined effect of these four rules accounts for the cultural variance and consistency described by Schmitt.

If the four rules I have outlined capture human sociosexual cognition, then we can begin to extend Schmitt's analysis in the hope of further refining our knowledge. One obvious question to ask is how sociosexual cognition interacts with other related cognitions such as mate preference or targeting systems. Would mate preferences be different if there were a male-biased sex ratio compared with preferences under female-biased sex ratios? For example, you might expect to see male monogamy leading to much choosier males, but under Schmitt's analysis, rather than seeing this as an expression of an individual difference, it might actually be the best choice under the circumstances. If the same males are put in a different situation, where the sex ratio is female biased, you might see a change in behaviour. It would be interesting to map this potential dynamic.

Another route to understanding sociosexuality is through studying homosexual behaviours. One might speculate that homosexual males share a basic sociosexual cognitive architecture with het-

erosexual males; all that differs is the targeting or preference cognitions. However, homosexual exposure to sex ratios is somewhat hard to define, and it is not immediately clear how to understand the operation of sociosexual cognition in homosexual males. On the one hand, it could be that functionally speaking, although homosexual males are operating in an all male "mating" environment, it is equivalent to existing in a situation with a female-biased sex ratio. In heterosexual males, this leads to promiscuity, according to Schmitt, and in many groups of homosexual males, we see promiscuity. On the other hand, it is not always clear in some cultures which men are homosexual, and this might actually lead to a situation that is functionally equivalent to male-biased sex ratios. In this case "monogamy" would emerge. Homosexual promiscuity can also be explained in terms of the absence of a possible pregnancy – where no offspring can result, sexual psychology is freed from investment calculations. This might be a sufficient explanation; however, long-term partner investment also occurs within homosexual populations, and this is not so readily explained. Schmitt's analysis may help us to explain this.

Universal sex differences across patriarchal cultures ≠ evolved psychological dispositions

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Abstract: Schmitt's findings provide little evidence that sex differences in sociosexuality are explained by evolved dispositions. These sex differences are better explained by an evolutionary account that treats the psychological attributes of women and men as emergent, given the biological attributes of the sexes, especially female reproductive capacity, and the economic and social structural aspects of societies.

Schmitt's research is an ambitious attempt to evaluate evolutionary and cultural theories of mating within a multinational study. The research raises basic questions about the evidence required to demonstrate "fundamental differences in the evolved reproductive strategies of men and women" (sect. 2.1). We argue that Schmitt's cross-national evidence for a more promiscuous mating pattern among men than women is better explained by biosocial mechanisms that take into account the social structural context of sexual behavior than by evolved sex-typed psychological dispositions. As we show, the superiority of our alternative account becomes apparent when researchers consider the full spectrum of cross-cultural evidence and carefully scrutinize Schmitt's data.

Although Schmitt acknowledges that evidence of men's greater promiscuity across societies "does not mean that sex differences must be the result of evolved reproductive strategies" (sect. 6.7), he then ignores this insight. He concludes that the cross-cultural consistency of his data provides evidence for sex-typed evolved reproductive strategies that emerge across all contexts (sect. 7.5). We agree that sex differences that emerge across societies despite diversity in societal attributes suggest fundamental biological and psychological attributes of humans. However, the evolutionary origins of these sex differences are not revealed by their wide distribution.

If the greater promiscuity of men than women across cultures does not require explanation in terms of evolved psychological dispositions, what other mechanisms explain this effect? In our theory, psychological sex differences, including differences in sexual promiscuity, derive from the distribution of men and women into social roles within a society (Eagly & Wood 1999; Wood & Eagly

2002). The distal causes of these roles include the fundamental sex differences represented by each sex's physical attributes and related behaviors, especially women's childbearing and nursing of infants and men's greater size, speed, and upper-body strength. These differences interact with the contextual factors represented by the social, economic, technological, and ecological forces present in a society. The roles held by men and women within a society are defined by this interaction between physical sex differences and prevailing societal conditions because certain activities are more efficiently accomplished by one sex (see Wood & Eagly 2002).

The roles of men and women yield sex-differentiated behavior through the social construction of gender and the formation of gender roles. These roles consist of socially shared expectations and preferences that individuals have psychological characteristics that equip them for the tasks typically performed by their sex. Gender roles, along with the specific roles occupied by men and women (e.g., provider, homemaker), then guide social behavior through proximal processes that include sex-typed socialization, biological (hormonal) changes, self-regulation, and behavioral confirmation of others' expectancies (Eagly et al. 2000).

Our theory is social structural in its emphasis on the importance of social roles (hence its common name, "social role theory"). Yet, understanding the ultimate origins of the roles of men and women requires our biosocial extension of this theory, which takes into account the relations between the sexes' physical attributes and the prevailing social and ecological conditions (Wood & Eagly 2002).

We expect consistent sex differences to emerge across societies in the activities most closely enabled or constrained by sex-typed physical attributes and reproductive activities. In support of this idea, Murdock and Provost's (1973) analysis of productive activities in nonindustrial societies revealed a division of labor across societies in which women ordinarily had responsibility for tasks that could be performed close to home and despite interruptions, presumably because such tasks were compatible with women's childbearing and nursing of infants. Men more often had responsibility for tasks requiring speed of locomotion and bursts of strength, presumably because such tasks were facilitated by men's size and upper-body strength.

Societal control over women's sexuality, like other limits on women's power and status, emerged from the interaction between physical sex differences and societal conditions (Eagly et al. 2004). As socioeconomic systems became more complex, the division of labor between the sexes subordinated women because their reproductive activities limited their ability to contribute to tasks that yielded status and resources. Patriarchy thus emerged with socioeconomic developments, including warfare, intensive agriculture, and multifaceted economies, that yielded activities requiring extensive training and skill development, high-energy expenditure, and extended absences from home (Wood & Eagly 2002). Because women's reproductive functions limited their contribution to such activities, they failed to gain the economic and social capital inherent in these activities, especially control over goods that can be traded in the marketplace. Thus, when gender hierarchies form, men tend to be advantaged relative to women.

Consistent with our claim that control of women's sexuality and other aspects of patriarchy emerged with socioeconomic complexity, anthropologists' assessments of nonindustrial societies reveal variability in patriarchy across ethnographic samples of world societies. Examining sexual control, Whyte (1978) reported that, in 75 nonindustrial societies selected to be geographically representative of world societies, only 43% had an extramarital double standard favoring greater promiscuity by men. Similarly, Broude and Greene (1976) independently reported the absence of the sexual double standard favoring male promiscuity in approximately one-third of the 116 nonindustrial societies in their review. With respect to patriarchy in general, investigations of pastoral groups and simple nomadic foragers have revealed that these societies are not necessarily characterized by gender hierarchies (e.g., Knauff 1991; Salzman 1999). In such societies, approxi-

mately one-third apparently have egalitarian relations between the sexes (Hayden et al. 1986; Sanday 1981).

In contrast to the variability in sexual control and other aspects of patriarchy in anthropological data, restriction of female sexuality is universal in the nation states of Schmitt's International Sexuality Description Project (ISDP) sample. Despite counterforces that lessen patriarchy in postindustrial societies, United Nations indicators reveal gender inequality in all of the societies in his sample. Only by confining his sample to patriarchal societies and thereby excluding societies that are more gender-equal could Schmitt produce sex differences in sociosexuality that were consistent in direction. Although Schmitt noted the limitations in his sample (sect. 7.1), he did not acknowledge that his conclusions might differ with a broader sample of societies. A more diverse sample would likely have demonstrated that sex differences in sociosexuality are not nearly as uniform across human societies as they are in his sample (Wood & Eagly 2002).

Of course, evidence of cross-cultural variability in sexual control of women does not ipso facto invalidate the idea of evolved psychological dispositions orienting men toward promiscuous sexual strategies and women toward more restricted sexual practices. Instead, it is the specific form of this variability across cultures that challenges the idea that men's greater promiscuity reflects evolved psychological dispositions. That is, the double standard appears to have emerged with the development of socioeconomic structures within which sexual control of women acquired special utility, specifically with societal practices that imbued child bearing with economic implications for men. Whyte's (1978) analysis of 93 nonindustrial societies thus revealed an association between sexual control over women and aggregated indexes of societal complexity that included intensive agriculture, ownership of private property, technological developments, and community stratification. Although Whyte failed to identify the critical aspect of societal complexity, Gaulin and Schlegel's (1980) analysis of 196 nonindustrial societies suggested an economic explanation for this relation. Specifically, paternity certainty acquired economic impact when property was inherited through male lines, and consequently control over women's sexuality enabled men to ensure such certainty and consequent economic advantage. Thus, across cultures, sexual control became important with socioeconomic developments such as inheritance through male lines.

Schmitt acknowledges a few of these ideas but wrongly conflates our theory with Buss and Barnes's (1986) structural powerlessness theory. Although we, like Buss and Barnes, take into account the relative status of men and women in contemporary societies (Eagly & Wood 1999), it is the portion of our theory that considers the origins of sex differences that underlies our critique of Schmitt's reasoning (Wood & Eagly 2002). Our origin theory of sex differences, which diverges sharply from theories in evolutionary psychology, analyzes the socioeconomic conditions under which divided labor yields patriarchy and greater male than female promiscuity.

The relation between sexual control of women and societies' socioeconomic complexity challenges evolutionary psychology theorizing about evolved sex-typed reproductive strategies. It is critical that the sex difference in sexual restrictiveness was least prevalent in societies with simpler economies that are presumably more similar to the ones in which humans evolved as a species. In these simpler societies, any evolved psychological dispositions would plausibly have affected behavior similarly to the ways that they functioned in humans' ancestral past. Evolutionary psychologists thus reason that technology and other developments of more complex societies can derail the obvious effects of evolved dispositions on behavior (Pérusse 1993). Therefore, simpler societies should provide the strongest evidence for evolved dispositions favoring greater male promiscuity. Instead, simpler societies provide the weakest evidence and patriarchal societies the strongest evidence. Apparently, Schmitt observed sex differences under modern social conditions and inappropriately used these observations to conclude that human nature features evolved sex-

typed psychological dispositions that correspond to these observed differences. As Erlich and Feldman (2003) argued, “[the researcher] is simply confusing the preferences of women he knows in his society with evolutionary fitness” (p. 89).

Schmitt’s analysis of cultural conditions that affect mating strategies also gives priority to evolved psychological dispositions over more plausible accounts (sect. 7.5). To explain the cross-cultural variability, he invokes the concept of contingent evolved dispositions, whereby people contingently shift their mating strategies in adaptive ways depending on the demanding nature of the local environment. Specifically, following Gangestad and Simpson’s (2000) arguments, Schmitt argues that environmental stress shifts mating strategies toward larger sociosexuality sex differences because it is primarily women who become more sexually restricted when there is a greater need for biparental care.

Schmitt’s data provide limited support for this hypothesis about sex differences in response to environmental demands. His statement that “sex differences in sociosexuality were related as predicted to several indicators of environmental demand” is not supported by even one significant correlation between an indicator of environmental demand and the size of the sex difference (Table 10 of target article). Only when men’s and women’s sociosexuality scores were separately correlated with indicators of demanding environments did two of these five indicators show that the association between sociosexuality and demand was stronger in men than women (Table 10 of target article). Moreover, when Schmitt placed prevalence of low birth weight, an environmental variable consistent with strategic pluralism theory, in head-to-head competition with women’s parliamentary representation, an environmental variable consistent with social structural theory, only parliamentary representation was significant (sect. 6.7.2). Because parliamentary representation is a particularly indirect indicator of women’s status, we recalculated the regression model and replaced this predictor with the Gender Empowerment Measure, a more adequate indicator of women’s status (Eagly & Wood 1999). Then the findings even more strongly favored our social structural theory over strategic pluralism theory. Our theory thus correctly predicts that sex differences in sociosexuality become smaller with increasing gender equality (Eagly & Wood 1999). However, given the universality of patriarchy within Schmitt’s sample, our theory does *not* predict that these differences might be absent within any of these societies, even though Schmitt maintains that our theory has this implication (sect. 4.2).

In interpreting sex differences in sociosexuality, Schmitt gives considerable credence to Baumeister’s (2000) claim that women’s sexuality is more responsive than men’s to environmental and cultural influences (sect. 4.1 and 6.7.2). At best, however, this claim received only mixed support. Although Tables 9 and 10 of the target article reveal that sociosexuality more closely tracked some of the indicators of societal equality and environmental demands among women than men, the data in Table 6 of the target article reveal that sociosexuality is more variable in men than women. Men’s mean sociosexuality scores ranged from 28.42 to 65.58 across the nations, a difference of 37.16, whereas women’s scores ranged from 11.80 to 41.68, a difference of 29.88. Even more striking is the greater variability of men’s than women’s scores within every nation except for Latvia. These data are problematic for Baumeister’s (2000) assertions that female sexuality is more responsive to external influences than male sexuality (see also Archer & Mehdkhani 2003).

Schmitt also argues that mating strategies contingently shift in adaptive patterns depending on sex ratios. In his view, greater promiscuity in nations with lower sex ratios (i.e., more marriageable women than men) supports Pedersen’s (1991) sexual selection explanation by which cultures with more women than men possess mating systems driven by men’s evolved desires for promiscuous sex. However, these effects are equally compatible with Guttentag and Secord’s (1983) sex ratio theory, which assumes social psychological mediating processes. Specifically, in Guttentag and Secord’s economic model of mating, sex ratios af-

fect the values of the social exchanges between men and women in relationships. The minority sex has greater exchange power within relationship dyads because they have more relationship alternatives, higher expectations for outcomes, and less willingness to commit than the majority sex. However, these effects of sex ratios occur within the broader context of men’s greater structural power in patriarchal societies. Thus, when women are scarce, men’s lesser dyadic power is offset by societal mechanisms that control women’s alternatives through social norms that favor monogamy, limit women’s interactions with men, and shape female roles in domestic directions. When men are scarce, no such protective mechanisms arise to offset women’s relatively low dyadic power. Men then reap the benefits of their greater exchange power by participating in multiple relationships. In Guttentag and Secord’s theory, it is because sexual norms benefit those in power that in patriarchal cultures a surplus of men produces greater restriction of sociosexuality than a surplus of women.

Given that patriarchy and sexual control of women are not necessarily organizing features of foraging societies, it is likely that sex ratios would have very different effects from those Schmitt reports if his sample had encompassed more egalitarian foraging groups. However, before scientists accept any one mediating processes as accounting for the relation between sex ratios and mating patterns, critical tests are required of the relative merits of the socioeconomic mechanisms proposed by Guttentag and Secord (1983) and the evolved psychological dispositions proposed by Pedersen (1991).

In general, in thinking about how to conduct evolutionarily informed psychological research, we are impressed by Frans de Waal’s (2002) statement that “one cannot single out a trait for an adaptive story, as is often done in evolutionary psychology. Rather, one needs to (a) consider the entire set of traits and (b) trace the organism’s phylogeny, that is, the ancestral forms that produced it” (p. 188). In this spirit, instead of locating the evolutionary origins of promiscuity sex differences in evolved psychological dispositions, our biosocial model considers the broader patterns of behavior that emerge from the interaction between the bodily specialization of each sex and the attributes of societies’ economy, social structure, and ecology. Although we have not considered sociosexuality from a phylogenetic perspective, cross-cultural comparisons provide insight into the development of social behaviors across simpler societies and those that are more economically, socially, and technologically complex. As we have shown, these comparisons provide an effective strategy for evaluating theories of the origins of human behavior.

The second to fourth digit ratio, sociosexuality, and offspring sex ratio

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Abstract: Previous research has suggested that offspring sex ratio may be influenced by the actions of prenatal sex steroids, principally androgens. The relative length of the second (index finger) to the fourth digit (ring finger) has been reported to be a proxy to prenatal testosterone levels. This trait is sexually dimorphic, such that males display a significantly lower 2D:4D ratio (indicating higher testosterone exposure), and this dimorphism appears robust across different populations. We suggest that digit ratio (2D:4D) may form a useful marker to help explain variation in sex ratio and sociosexuality.