

The essential woman: Biophobia and the study of sex differences

In the past twenty years over 110,000 studies of women, gender and sex differences have appeared in academic journals. The questions that researchers have posed, the methods they have used and the recommendations they have made have been profoundly guided by the zeitgeist of the post-war years. In the West, incomes rose, educational opportunities increased and women began to discern their very unequal standing in the world of work, public achievement and recognition. These forces informed an implicit belief that society was perfectible and that we should aim to equalize the standing of women and men. Quite right too.

But something else was going on—the political ideology that drove this laudable quest for social equality began to drive psychological theories too. The only acceptable account of sex differences was one which explicitly acknowledged the socially constructed, arbitrary and malleable nature of sex differences. Women's studies became steeped in a politically-driven rejection of essentialism (the idea that the sexes differ at a fundamental psychological level) and committed on the one hand to social constructionism (there is no objective truth 'out there', only negotiable subjective representations) and on the other to extreme environmentalism (all sex differences result from factors external to the person). Neither road has taken us very far towards an accurate understanding of why men and women differ.

Social constructionists effectively remove gender from the human mind and instead allow it to float freely in an insubstantial ether as a 'social construction' or an 'emergent property' or an 'interpretative repertoire'. This is why it is possible to read statements such as the following written in all seriousness: 'Gender distinctions as dichotomous categories are perpetrated and maintained by social mechanisms and are socially constructed' (Epstein 1997). The prevailing dogma is that the distinction between men and women is a collective and tyrannical fiction. There are no real biological or psychological differences other than ones that we (arbitrarily?) construct through discourse. For these writers, the question of the causes of sex differences never rears its head because positivistic science (with its traditional obsession with causality) is disparaged as simply another rhetoric among many—and an outdated

one at that (Woolgar 1996). Humans are the sole focus of interest and any comparison between our behaviour and that of lower animals is unjustified, demeaning and reductionist. This is because humans have language, language enables discourse and it is through discourse that social reality, including gender, is constructed. (This is especially true of educated, middle-class Western humans judging by the disproportionate attention they receive.) The study of discourse is the study of implicit meaning and all meaning is subjective so there can be no one authoritative or 'privileged' reading of a text. Although social constructionists recognize the implications of this observation for their own analyses, they nevertheless 'deconstruct' (often in dense literary and psychoanalytic terms) the ways in which gender is created in social talk. To give a flavour of their approach to gender differences, I quote from one of the most frequently cited writers of this genre (Hollway 1984, pp. 227–8)

Hence recurrent day-to-day practices and meanings through which they acquire their effectivity may contribute to the maintenance of gender difference (reproduction without a hyphen) or to its modification (the production of modified meanings of gender leading to changed practices) . . . I am interested in theorising the practices and meanings which re-produce gendered subjectivity (what psychologists would call gender identity) . . . Gender differentiated meanings (and thus the positions differentially available in discourse) account for the content of gender difference.

In this article, Hollway goes on to explain how different discourses about sexuality locate women and men in different positions relative to one another. She writes of the 'discourse' of the stronger male sex drive, the 'discourse' of the Madonna-whore distinction and the permissive 'discourse' which appeared to (but did not) liberate women's sexuality. Now each of these topics is of some considerable interest to evolutionary psychology, as we shall see, but in that discipline rather than locating them as discursive fictions they are taken as answerable empirical hypotheses about which evolutionary theory makes clear predictions. Men's sex drive should be stronger—and it is (Oliver and Hyde 1993). Women should experience a reputational cost if they gain a reputation for promiscuity—and they do (Cashdan 1996). Women should find casual sexual liaisons less satisfactory than men—and they do (Townsend *et al.* 1995). Nor are these findings exclusive to a single culture or language community—they exist independent of so-called 'constitutive' discourse. For social constructionists the key question of the origins of these discourses is strenuously avoided:

But to assume the mechanical reproduction of discourse requires asking how it got to be like that in the first place. And that question is in danger of throwing theory back into answers according to the terms of biological, Oedipal or social and economic determinisms (Hollway 1984, pp. 238–9).

In short, better not to ask the question if you think you may not like the answer.

But elsewhere in the social sciences some academics were indeed resorting to 'social determinism'. Sex differences come from outside the child. Babies are not

born wanting to play football or dress dolls. These preferences are imposed by parents and by the media, and then encoded into children's cognitive frameworks, magnifying and reifying the differences between masculine and feminine behaviour.

Socialization explanations of sex differences are built on the foundation of the tabula rasa infant shaped, rewarded and punished until it conforms to societal demands for sex-appropriate behaviour. They took shape in the era of behaviourism and learning theory. The account was a simple one. Parents treat boys and girls differently, reinforcing the correct behaviour in each. Boys are encouraged to fight, climb trees and play football. Girls are forced to wear dresses, play with dolls and share. Despite the fall from grace of radical behaviourism, nobody seriously doubts that reinforcement can shape behaviour. The question was whether it was strong enough to account for the worldwide patterns of sex difference that we see. The 'Baby X' paradigm was hailed as conclusive evidence of socialization differences (e.g. Will *et al.* 1976). A six-month-old baby was wrapped in a blue or a pink blanket, identified as a boy or a girl and then handed to a woman who was asked to look after it for a few minutes. When told it was a girl, the women more often offered the infant a doll in preference to other toys. Surely this showed that parents treat infants differently as a function of their sex? But there was a problem. Despite many attempts to replicate the effect, it seemed even weaker than it had on first sight appeared (and recall the effect was found only for toy selection—there were no differences in social behaviour to the infant). It was certainly not strong enough to support the whole edifice of sex differences (Stern and Karraker 1989). And even if parents gave their children different toys, such a finding would be trivial unless it could be shown that the toys changed the child's subsequent behaviour.

But the real crunch came when Lytton and Romney (1991) collected 172 studies from around the world which had examined the way in which parents treat their sons and daughters. Considering them all together, the evidence for differential treatment was virtually nil. Parents did not differ in the amount of interaction with the child, the warmth they showed, their tendency to encourage either dependency or achievement, their restrictiveness, their use of discipline, their tendency to reason with the child or the amount of aggression that they tolerated. There was one area that showed a difference. Parents tended to give their children sex-appropriate toys. But sex-differentiated preferences for toys have been found in infants from nine months of age (Campbell *et al.* 2000). Children play more with sex-appropriate toys even when their parents do not specifically encourage them to do so (Caldera *et al.* 1989). It is quite likely that parents are not using toys to turn their children into gender conformists but are simply responding to the child's own preferences. Anyway, if parents' behaviour towards their children was being guided by their desire for them to conform to traditional gender stereotypes then we would expect to find that the most sex-typed adults have the most sex-typed children. Yet studies find that there is no relationship between traditional household division of labour, parents' attitudes to sex-typing, their sex-typical activities and their reactions to

children's behaviour on the one hand and children's degree of sex-typing on the other (Maccoby 1998).

Following Skinnerian views came social learning theory which emphasized a hitherto neglected (but altogether central primate) capacity—imitation. No-trial learning. We can acquire a piece of behaviour merely by watching it performed by others. But the trick was to co-opt this observation into an explanation of the acquisition of sex differences. This was done by proposing that children selectively imitate their same-sex parent. Laboratory studies were done in which children were exposed to adult 'models' performing a variety of novel behaviours. If social learning theorists were right, then the statistical analysis would show a significant interaction between sex-of-model and sex-of-child—girls would imitate women and boys would imitate men. Dozens of such studies failed to find such an effect (Huston 1983; Maccoby and Jacklin 1974). Undeterred, Perry and Bussey (1979) devised a cunning experiment that avoided the pitfalls of the previous studies where children had a one-off exposure to an adult model. They showed children a film of eight adults selecting a preferred fruit. In one condition all four men made one choice (e.g. orange) while all four women made another (e.g. apple). In another condition, three men and one woman chose an orange while three women and one man chose an apple. In another condition half the men chose oranges and half the women chose apples. They found that the extent to which children copied an adult preference depended upon the proportion of their sex that made that choice. In the first condition, there was a high degree of same-sex imitation, in the second a much smaller amount, and in the third condition, there was no significant difference between the girls and boys in their choices. What this meant was that children were not slavishly imitating a same-sex adult but rather judging the appropriateness of a particular (in this case wholly arbitrary) preference on the basis of the proportion of male or female adults who made it. These results helped to make sense of previous work which had already shown that children tended to imitate activities that they already knew to be sex-typed regardless of the sex of the model who was currently engaged in it (Barkley *et al.* 1977). What was important was the child's internal working model of gender and behaviour.

Until then, the differential treatment and selective imitation views had painted a thoroughly passive view of the child. There he or she sat, being slowly filled with sex-contingent (or, as it turned out, gender neutral) reinforcement and exposure to adult models. Some developmentalists rebelled. They knew that children are active participants in their own development, Piaget had shown this already. Now Perry and Bussey had put the child's own understanding of gender centre stage. Martin and Halverson (1981) argued that children have a natural tendency to think categorically. They form categories about all sorts of things from animals to sports and it would be surprising if they did not, very early in life, form categories of male and female. Once these categories are formed, all incoming information that is gender-typical gets shunted into the correct binary slot and over time a stereotype is built up about what males and females look like, do and enjoy. It is this internal model or

schema, not the surveillance of parents, that drives the child towards sex-appropriate behaviour. It was clear that what Perry and Bussey had done, in their search for the mechanisms of imitation, was to lay bare the process of creating gender schema. At the very same time that this proposal was being offered for child development, Bem (1981) was proposing an identical scheme to explain adult differences in sex-typing. The degree to which we 'type' information as gender-relevant is an individual difference variable. Women who strongly sex-type information become more stereotypically feminine than women who are less inclined to tag information with gender labels. The cognitive revolution had come to sex differences—it was not a matter of behavioural training, it was a matter of mental categorizing, organizing and recalling.

But the cracks soon began to appear. Children show sex-typed behaviour before they are able to label the sex of other children (Ruble and Martin 1998). Toy choice, play styles, activity levels, and aggression are found as early as two years of age (Brooks and Lewis 1974; Fagot 1991; Freedman 1974; Howes 1988; Kohnstamm 1989; O'Brien and Huston 1985; Roopnarine 1986) but children are not able to correctly sort pictures of boys and girls into piles until their third year (Weinraub *et al.* 1984). Although children can point to pictures of boys and girls when instructed to do so somewhat earlier at about 30 months (Etaugh *et al.* 1989; Fagot and Leinbach 1989), for a gender schema to operate spontaneously and successfully, children should be able to categorize without specific verbal cueing to do so. Children prefer sex-congruent toys before they are able to say whether the toy is more appropriate for a boy or a girl (Blakemore *et al.* 1979). They prefer to interact with members of their own sex and show sex differences in social behaviour before they can label either toys or behaviours as being more common among boys or girls (Serbin *et al.* 1994; Smetana and Letourneau 1984). Having gender labels at the age of two does not predict sex-typing either at the same age or one year later (Campbell *et al.* submitted). Even where a cross-sectional study does find a behaviour difference between children who can label and children who cannot, it is found for some behaviours not others or for one sex but not the other (Fagot *et al.* 1986). Children seem to need neither the ability to discriminate the sexes nor an understanding of gender stereotypic behaviour to show sex differences. Even in later years, as children's gender stereotypes become more crystallized and peak at about 7 years of age, there is no relationship between a child's gender knowledge and how sex-stereotypic their own behaviour is (Martin 1994; Powlishta 1995; Serbin *et al.* 1994). As Carol Martin (1993) ruefully concluded after twenty years of immersion in the field: 'Seldom are individual differences in behavior and thinking explained by differing levels of gender stereotype knowledge.'

But perhaps children really recognize gender at a much earlier age than experimenters' artificial request to point to pictures of boys and girls reveal. Perhaps they lack the verbal or cognitive skills to execute such a task until they are three. After all, animals seem to make no mistakes about the sex of their conspecifics and they lack the sophisticated cognitive machinery that we possess. Researchers turned to infants

using an ingenious method of uncovering their ability to categorize the world. Infants, like adults, get bored when they are exposed for too long to the same thing and they turn away—a phenomenon called habituation. Leinbach and Fagot (1993) showed a group of infants aged between 9 and 12 months a series of photographs of different men's or women's faces. Every now and again a face of the opposite sex would be shown. The infants would show a sudden recovery of interest when this unexpected face appeared. This suggested that infants had an implicit category of male and female for, if they did not, how could they detect the category shift when the 'unusual' face appeared? This seemed to solve the cognitive problem—infants understand sex much earlier than we thought. But wait—the same type of study has also been performed in the laboratory using different categories such as animal species, rising and falling tones, numbers, colours and patterns (Bhatt and Rovee-Collier 1996; Wagner *et al.* 1981; Xu and Carey 1996; Younger and Cohen 1983). All these studies show that infants can habituate and recover from habituation. Would we want to conclude, therefore, that 6 month-old infants brought to the laboratory with them an acquired understanding of the difference between a zebra and a kangaroo? Given their limited exposure to such novel stimuli, how could they? Rather, we infer that in the laboratory, infants develop (rather than reveal) categories for dividing up the world. So while infants can be experimentally primed to make a male–female distinction, this is no evidence that they have brought it with them from the outside world.

Even if they did have it, it would be of no use to them unless they knew to which sex they themselves belonged. Gender schema can only guide behaviour when sex-of-self is incorporated into the schema. Children sort pictures of themselves correctly into the boy or girl pile at about the same time they sort pictures of others—around 36 months (Thompson 1975; Weinraub *et al.* 1984). Indeed they do not seem to even recognize themselves in mirrors until about 20 months (Amsterdam 1972). (This is tested by surreptitiously placing a blob of rouge onto the child's nose and allowing them to view themselves in a mirror. If they try to wipe their own nose they have self-recognition. If they try to wipe the nose of the child in the mirror, they do not.) In any case, self-recognition is a necessary but far from sufficient condition for knowing one's gender.

Gender schema theory was all too cognitive and the cognitive data would not fit the behavioural time course. And there was the question too obvious to be asked—why do children choose to socialize themselves to behave sex-typically? Is the process one of simple social conformity? If so, is gender a special case or do children also categorize themselves in other ways (swats, athletes) and strive to conform to these categories as much as they do to boy or girl? There lurks beneath cognitive theories a pervasive feeling that there is a something different and special about gender and that the engine that drives categorization and conformity is an innate propulsion—perhaps not to be aggressive or nurturing—but at least to realize oneself as a male or female.

At the heart of gender schema theory lay stereotypes. Initially very crude (boys like trucks, girls like dolls), they become increasingly complex with age (men are more competitive, women more cooperative). We construct them from the bits and pieces of observation that we can—from the media, from watching others, from gossip and myths. And it is stereotypes that form the foundation for another explanation of sex differences—social role theory. According to this formulation the division of labour in society, rather than the child's natural tendency to form categories, is the starting point for sex differences. Men occupy roles that require competitiveness, autonomy and aggression. Women occupy roles that require nurturance, caring and cooperation. These roles draw out of their occupants the commensurate qualities and skills. These in turn set up stereotypes that embody beliefs in the appropriateness of expected characteristics. 'Expectancy-confirming behavior should be especially common when expectancies are broadly shared in a society, as is the case for the expectancies about women and men' (Eagly 1987, p. 15). These expectancies are internalized, resulting in sex differences in both behaviour and self-perception.

During the past twenty years there has been a significant change in the nature of women's labour as women move into many arenas traditionally occupied by men. We might therefore expect to see a shift in both stereotypes and self-perceptions by men and women. No such shift has occurred (Helmreich *et al.* 1982; Lewin and Tragos 1987; Lueptow 1985). Furthermore, we would expect to see a fair degree of cultural specificity with 'traditional' societies showing more marked stereotypes than more egalitarian ones. We do not (Williams and Best 1982). Social role theory supposes that sex differences are responsive to stereotypes and hence that stereotypes should be more extreme and polarized than actual sex differences. They are not (Swim 1994). We are left with the alternative suggestion that stereotypes are reasonably accurate assessments of the typical differences between men and women and that rather than stereotypes causing sex differences, the reverse is the case. If this is true then we at least have a means of explaining the typical division of labour between the sexes (women elect to spend more time than men do in parenting activities). As it stands, the cause of universal differences in child care remains completely opaque and Eagly (1987, p. 31) acknowledges—literally as a footnote—that there may be some biological factors involved.

Nobody can seriously doubt that environmental factors modify the expression of sex differences. The foci of environmental theories—reinforcement, imitation, cognitive schema, conformity—all modulate our actions. The pleasure of social approval, the ability to learn through observation, and the desire to be like others are part of human psychology everywhere. The question is whether these processes alone can explain the *origins* of the cross-cultural differences between male and female. Altering reinforcement contingencies for sex-typical behaviour can change it: boys and girls will show cross-sex play where the environment is manipulated to encourage it and where social approval is contingent on it. But when that intervention is removed,

children revert to the same-sex preference that characterizes children everywhere (Serbin *et al.* 1977; Theokas *et al.* 1993). Cultural icons, especially teenage ones, can subtly and not so subtly alter our prevailing image of femininity. Demeanour and language that used to be frowned on in young women as 'masculine' is now unremarkable. But there is no link between girls' approval of these new female behaviours and their level of aggression (Muncer *et al.* 2001) and as yet we have not seen any change in the universal tendency for men to be more violent than women. As new opportunities open to women, they eagerly accept them. Women's performance in hitherto masculine areas of academic achievement (such as science and mathematics) and business entrepreneurship has been remarkable. Yet, for the majority of women occupational choice still rests as heavily on the social as the monetary rewards and the extent to which the work can be effectively combined with motherhood (Browne 1995; Geary 1998).

When we can open up new opportunities for expression, enjoyment and achievement for women, we should do it because it is morally right. But that is very different from saying that gender has no biological basis and that the nature of men and women is wholly constructed by society. The problem with such a position is that it fails to address the issue of why sex differences take the particular form that they do. If gender differences are arbitrary, it is a curious coincidence that they follow such a similar pattern around the world. Even if sex differences were driven by differential parental treatment, we would still want to ask why a trait is considered more desirable for one sex than another. If they were driven by selective imitation, we would still want to ask why children might show an untutored interest in their own sex. If driven by gender schema, we would need to ask why sex-specific conformity is so attractive to children. If driven by the division of labour, we still need to explain the preference of men and women for agentic and expressive occupational roles. Social constructionist and environmental theories explain the transmission of the status quo—but without asking where it came from.

Evolutionary psychology

Evolutionary theory addresses this very question. And the Darwinian algorithm is so elegant that it can be stated in five words: random genetic variation, non-random selection. Evolutionary psychology is the application of evolutionary principles to the study of the evolution of mind (Tooby and Cosmides 1992). Natural and sexual selection pressures which shaped species-typical aspects of our anatomy (bipedalism, cranial capacity, gestation length) are assumed to have orchestrated the architecture of the human mind which in turn drives behaviour. Evolutionary psychology holds that psychological attributes that conferred significant benefits in terms of survival and reproduction upon their bearer (relative to others who did not possess such attributes) are present today in the form of evolved modules designed to solve such specific ancestral problems as detecting social cheaters (Cosmides and Tooby 1992),

enhancing paternal certainty (Wilson and Daly 1992), optimizing mate selection (Buss 1989), speedily acquiring language (Pinker 1994), comprehending the mental state of others (Baron-Cohen 1997) and weighting the costs of risky encounters (Campbell 1999).

The distinguishing features of evolutionary psychology are fourfold. First, it is ultimately concerned with mechanisms of mind and not simply behaviour. This distinguishes it from sociobiology where comparisons are made between animal and human behaviours and implications are drawn about a common evolutionary pathway or about convergent evolution under similar selection pressures. Primate behaviour is often described and discussed by evolutionary psychologists (and I will be doing this too) because many human adaptations are shared with other species and emerged prior to human speciation (Foley 1996). Such behavioural comparisons are a starting point for attempting to locate the mental mechanisms which produce it. A good starting point for such an analysis is with a description of function—what does this behaviour achieve? To answer this we need a description of the circumstances under which the behaviour appears and whether or not it solves an adaptive problem. But evolutionary psychology also asks about the relevant inputs to the mental device and the range of outputs that can appear. This is important in understanding flexibility of action—how the life-stage and competencies of the organism together with perception of the past and current environment affect the strategy that is implemented. The same mechanisms can give rise to different manifest behaviours. Competition for resources, for example, can lead to combat, the formation of advantageous alliances, and to dispersion to new niches. The same mechanism can produce different manifest behaviours given different inputs; babies raised in China speak a different language from infants raised in England but that does not invalidate the existence of a universal mental device for acquiring the ability to produce the language heard in the community. We are searching for the deep structure not only of language but of other universal human actions including kin recognition, mate selection and sexual jealousy despite the fact that their behavioural expression may vary.

Secondly, evolutionary psychology conceives of the mind as modular. We presume that the environment of adaptation presented similar classes of problem again and again, resulting in selection of those specific mental abilities that were advantageous in solving it. The presence of a predator produces activity in the fear-centre of the amygdala at a pre-conscious level that triggers alertness and evasion even before we have consciously registered exactly what the threat is. (The path to the sensory cortex is slower and more roundabout than the direct pathway to the amygdala.) The ability to detect fast-approaching objects on a collision course represented a sufficient threat to us in our evolutionary past that infants today will fall backwards when an object is made to 'loom' (by simply increasing its size) on a screen in front of them. This reflex was sufficiently useful as an adaptation that it is now hard-wired. The mind is a collection of modules (many requiring environmental input,

like language) that reliably develop under a wide latitude of environments. Some are simple reflexes but many more are not. The ability to detect social cheaters requires conscious consideration of the information available but the mechanism that governs it works far more speedily and efficiently than it could by the application of formal logic (Cosmides 1989). Humans have a tendency to commit various cognitive 'errors' that have been successful rules of thumb in our evolutionary past. One is the availability heuristic—we judge the likelihood of events in terms of the ease with which we can recall instances of their occurrence. When asked whether accidents or cardiovascular disease accounts for more deaths in the United States, most people reply that accidents do. In fact, accidents account for 5 per cent of deaths annually compared to 50 per cent from heart attacks and strokes. Accidents are more vivid and memorable and their prominence in our memory misleads us (Tversky and Kahneman 1974). In ancestral communities only about half of infants born survived to adulthood and many of these deaths would have been traumatic. The ability to attend to and recall such lethal threats (and consequently to overestimate their frequency) had advantages. Our ability to attribute, with much greater than chance accuracy, beliefs and desires to other people's actions conferred a special advantage when the main selection pressure was the behaviour of other people (Baron-Cohen 1997).

Thirdly, evolutionary psychology does not conceive of the mind as a fitness-maximizing device—and it is here that it parts company with Darwinian anthropology (Tooby and Cosmides 1990). Anthropologists who share a Darwinian view focus on the way in which current human communities show evidence of optimality in their interaction with others and their environment. For example, optimal foraging theory is concerned with the net gain or loss in calories that are contingent on different organization of foraging. Their measure of fitness of a strategy is the extent to which it is the single most efficient means of calorie replenishment. (Notice also that the focus is on behaviour rather than on the mental module that organizes it.) The assumption is that humans do whatever they can to maximize their adaptation to the current environment and hence the usually unspoken presumption is that the mind is an all-purpose fitness maximizer. Somehow it reads the environmental problem accurately (food located at minimum two kilometres away), generates a number of possible solutions (the net utilities of various permutations of travelling alone, carrying the baby, leaving child at camp, travelling early before the sun gets hot, relying on left-overs from relatives) and adopts the most successful strategy. As I have noted, evolutionary psychology focuses on mechanisms not behaviour and on domain-specific adaptations not on an all-purpose adaptation generator. Just as important, evolutionary psychologists argue that present behaviour is a function of the *past* adaptive success of genetically-encoded mental modules. For them, there is no point in speaking of currently adaptive behaviour. Adaptiveness is a property of the past for that is where selection occurred. To know if a current behaviour is adaptive we would have to return in several hundred thousand years, find what

traits had gone to fixation and trace the reproductive success of humans who had the rudimentary adaptations compared to those who did not. What we do know is that where we find a species-typical module (such as language), this mechanism was selected at some point in human history. Because the current environment differs from the one in which we evolved, it is quite possible that an adaptation is not currently adaptive. Our preference for fat and sugar was useful at a time when meat and berries were nutritious and rare. They are currently responsible for obesity and heart disease in an environment where sources are too plentiful. Indeed, our appetite for sugar is so strong that rather than simply refusing it, we go to extraordinary lengths to develop chemicals that mimic the taste while removing the calories. The question for any putative adaptation is 'What did it do for us back then?' Although we can and do surmise on the apparent mismatches between evolved adaptations and current environments (Crawford 1998), we cannot meaningfully speak of adaptations-in-the-making until the unknown future environment has a chance to make its genetic selection.

Lastly, evolutionary psychology is chiefly concerned with species-typical adaptations. It seeks to explain the emotions, algorithms and strategies that are common and central to all human experience (even though their surface manifestation may vary from one culture to the next and they may only be activated given appropriate environmental input). This sets it apart from behaviour genetics. Behavioural geneticists are engaged in a statistical attempt to partition the variance between people with respect to a given psychological trait. Using adoption and twin studies, they attempt to fit mathematical models that distribute the differences between people to environmental and genetic sources. The whole enterprise depends essentially on the presence of variance. But for species-typical traits no genetic variance exists. Because we have all evolved to have one heart and two lungs then (genetic abnormality aside) there is no variability on this attribute. The trait has gone to fixation and falls out of the purview of behaviour genetics. The very existence of a heritable component for any trait tells us that it has not reached fixation and is not possessed uniformly by every human being. Evolutionary psychologists are not uninterested in variability (and in my final chapter I shall have more to say on this) but to see the long view of evolution we must dwell not on the noise but on the signal—those traits that were acted upon by selection to the point that they came to characterize the whole species.

We need a crucial caveat, however, when we talk of universality. Humans come in two distinct morphs—women and men—differentiated by the size of the gametes that they contribute to sexual reproduction. The bulk of selection pressures—disease, predators, famine—affected both sexes equally and no sex differences are expected in psychological mechanisms that allow us to cope with these threats. The majority of traits that were advantageous were passed on by sexual recombination to both daughters and sons regardless of whether they were contributed by the mother or the father. (Later in the book this statement will have to be complicated by the discussion of genomic imprinting—a process by which the expression of some traits depends upon the parent that contributed them.) Where the sexes differ most

clearly it is the result of sexual, not natural, selection. The strategies that enhanced reproductive success for females were not identical to those that enhanced it in men. Through sex-linkage and sex-limitation evolution has coupled genetically encoded adaptive strategies to the sex of the individual receiving them.

What evolutionary psychology offers is the hope of integration in the understanding of human behaviour. Using the most powerful theoretical development of the past one hundred years, we are finally able to address the 'Why?' question and to ask it together with other disciplines that have long ago accepted the premise of adaptation. Psychologists must work with and depend on other disciplines if the enterprise is to be successful. We need primatology to help us understand the common and unique paths of adaptation in the anthropoid line. We need paleoanthropology to track the evolving size and shape of the brain. We need archaeologists to describe the man-made tools and art that were part of the early emergence of *Homo sapiens*. We need anthropology to describe and document the varieties of human solutions to ecological and social problems. We need geneticists to map the genome and tie complex traits to their even more complex interacting genetic loci. We need biologists to identify the mutual paths between genes, hormones and environment. We need developmentalists to document the trajectory and constraints on the successful emergence of human capabilities. We need neuroscientists to identify the evolution and modification of structures that govern specific human emotions and actions. We need pharmacologists to help us understand the actions of neurotransmitters and their relationship to categories of experience. As psychologists, our contribution is to identify the characteristics and the parameters of the mind mechanisms that drive behaviour. It will be a long and cooperative undertaking if it is to be finally successful. The meteoric rise of evolutionary psychology over the past two decades has been impressive—but it has not gone unchallenged.

Bad politics?

Sociobiology functions as a political theory and program. (Bleier 1984, p. 46)

Evolutionary psychology is not only a new science, it is a vision of morality and social order, a guide to moral behaviour and policy agendas. (Nelkin 2000, p. 20)

... the biological accounts of male–female difference and male dominance that have emerged since the mid-nineteenth century have merely used the language of science, rather than the language of religion, to rationalise and legitimise the sexual status quo. (Bem 1993, p. 6)

Nevertheless, the social construction of the categories 'woman' and 'man' has been historically justified by reference to biological differences, and the modern tendency to provide essentialist and reductionist explanations which include the effects of genes and hormones can be viewed as a contemporary manifestation of this long-standing tradition. (Muldoon and Reilly 1998, p. 63)

Sociobiologists are ... constructing a framework of ideas about what is natural and what is not. Women who enter professions that are typical of men are therefore seen as unnatural

and going against their biology; so too are men who take up professions using abilities considered typical of women. These 'unnatural' women and men are considered to threaten the fabric of society, as seen and maintained by those (scientists, politicians, business leaders and the general public) who see genes as paramount in causing sex differences in behaviour. (Rogers 1999, pp. 48–49)

Ought science to be seen as truth-telling, or as politics by other means, or can it be both things at the same time? (Fausto-Sterling 1997, p. 58)

As the above quotes show, one line of attack has come from those who are more concerned with the political implications of evolutionary psychology than its truth value. As they see it, any attempt to identify a universal human nature and to posit a biological basis for it is equivalent to abandoning all hope of amelioration. For them, evolutionary psychology is about the maintenance of the status quo and the rejection of liberal progress. Many of the most vehement objections come from feminists who have been particularly offended by the proposal that universal sex differences may have a biological basis. But let's unpack their arguments and take them one at a time.

Charge 1: Evolutionary theory is biological determinism

Evolutionary theory is certainly biological. It argues from the premise that the genes associated with phenotypic characteristics that increase survival and reproductive success will increase over generations. In rejecting Lamarck, it rejects the idea that individuals are capable of passing on *by genetic means* skills or abilities that they themselves have acquired through cultural transmission or trial-and-error learning in the course of their lifetime. For feminists, the real issue is whether there are other biological differences between males and females aside from the bodily changes that are triggered by the twenty-third chromosome pair. In short, are some genetically influenced traits sex-linked (carried on one of the sex-determining chromosomes) or sex-limited (carried on autosomes and triggered by the presence of male or female hormones)?

It is widely agreed that there are two sexes possessing different reproductive organs and that the two sexes may also differ with regard to body form such as average differences in height, strength and fat distribution (Lewontin 1994). However, some writers do not even concede these facts—Muldoon and Reilly (1998, p. 55) believe that 'the objectivity of 'hard science' in this area can be questioned, so much so that the biological definition of sex itself becomes untenable'. They suggest that there is no biological basis for our belief in male and female as 'dichotomous, mutually exclusive categories' (see also Bem 1993). Notwithstanding these authors' uncertainty, most feminists broadly agree that there are two discriminable sexes. Indeed most feminists are willing to go as far as acknowledging that biological differences are the result of evolution—provided that biology stops at the neck (Bem 1993). Even though the brain is the most expensive organ in the human body in terms of calorie consumption, even though feminists accept that hominid brain size itself was a

result of natural selection and even though the production of the very hormones that orchestrate bodily differences originate in the brain, feminists reject the notion that evolution could have had an impact on the minds of the two sexes. Though successful reproduction is the reason for our existence today and though the sexes play vital and different roles in that process, feminists reject any notion that their minds may have been sculpted by thousands of years of evolution to set different goals or pursue different strategies.

Most 5-year-old children also agree that people are either male or female. They will also tell you that boys are rougher and fight more than girls do. They are correct. The sex difference in physical aggression is evident in naturalistic studies of playgrounds, in experimental studies of undergraduates, in psychometric inventories and in criminal justice statistics (Eagly 1987; Hyde 1986; Kruttschnitt 1994). This sex difference is cross-cultural and trans-historical (Daly and Wilson 1988). There are no human societies in which women commit more violent crime than men. We also know that in animal species like our own, in which females provide the bulk of parental investment, the same sex differences exist (Geary 2000). We have seen too that children show sex differences in aggression before the age at which they can correctly label the sex of others or sort photographs correctly by sex. Together these facts strongly suggest a very fundamental difference between the sexes in aggression and one that, however biologically mediated, may be traced back ultimately to differential evolutionary pressures on the two sexes. It is important to bear in mind that evolutionary theory predicts sex differences in a few psychological domains only—those that are relevant to male and female roles in sexual reproduction. There would be no evolutionary reason to suppose that men and women should differ on average with regard to sociability, intelligence, sense of humour or openness to experience (to name but a few) and they do not. There is every reason to think that they should differ in nurturance, hostility and assertiveness, and they do (Feingold 1994).

The 'determinism issue' relates to the erroneous belief that genes alone direct development and behaviour. Patently, this is not the case—although it is straw man that is frequently used to bait evolutionists. Take three examples culled from many dozen similar pronouncements:

... sociobiologists argue that these strategies are given by biology and thus imply that they are eternally fixed features of human sexual relations. (Sayers 1982, p. 60)

By reducing human behavior and complex social phenomena to genes and to inherited and programmed mechanisms of neuronal functioning, the message of the new Wilsonian Sociobiology becomes rapidly clear: we had best resign ourselves to the fact that the more unsavory aspects of human behavior, like wars, racism, and class struggle, are inevitable results of evolutionary adaptations based in our genes. (Bleier 1984, p. 15)

[Genes] are therefore seen as the source of human behaviour, including sex differences in monogamy and polygamy, aggression and the perception of beauty. This is clearly a reductionist's position. Of course, genes have a part in the development of sex

differences and other behaviours, but it need not be any more important than other influences from both inside and outside the body, and the part played by genes might not be separable from these other influences. (Rogers 1999, p. 44)

Where are these evolutionary psychologists who allege that genes operate without reference to hormones, experience or environment? Wherever they are, I have not been able to locate them. Rather it is environmentalists that continue to set up mythical distinctions between nature and nurture in order to maintain a clear line between the politically correct and incorrect. As Margo Wilson and her co-workers (1997, p. 437) explain: “Biology” is the study of the attributes of living things, and only living things can be “social”. So whence this idea of antithesis?... The irony is that developmentally, experientially and circumstantially contingent variation is precisely what evolution-minded theories of social phenomenon... are all about.’

Surely it is evident that ultimate success of a given individual in evolutionary terms depends upon manifest behaviour which in turn derives from a particular gene–environment complex. Smuts (1995) provides a good example of this. Cooper and Zubek (1958) took strains of maze-bright and maze-dull rats that had been so successfully bred that there was no overlap in their maze performance. They then reared a new generation under normal, enriched or impoverished conditions. All of the rats who were raised in the enriched environment performed as well as the maze-bright rats who were reared normally. All the rats raised under impoverished conditions performed as poorly as maze-dull rats reared normally. Behaviour depends upon the confluence of genetic disposition and environmental influences.

The environment interacts with genetic predispositions in a variety of ways (Buss *et al.* 1998). Some environmental parameters are necessary for the emergence of adaptations; absence of contact with a language-using community can severely disrupt the development of language and early close contact with a reliable care-taker seems to be important for later social and emotional functioning. Early developmental events may channel individuals into different pathways by setting different expectations about the environment. Father-absent children are more inclined to pursue short-term mating patterns with the expectation that paternal investment is a statistically rare event. Families and communities characterized by high levels of competition and hostility set children on a more aggressive life strategy than those whose early experiences of others are more stable and cooperative. Other genetic tendencies are only expressed if the environment provides the necessary trigger—nicotine addiction has a high genetic component but whether it is activated depends upon environmental (and sometimes chance) factors such as exposure to peers who smoke. Environmental experiences can alter the expression of adaptations—sexual jealousy seems to be activated only when people experience a deep attachment to an exclusive romantic and sexual partner. The choice of one strategy rather than another depends upon a variety of contemporaneous factors such as the life-stage of the individual, the prevailing sex ratio, the number of alternative avenues of action

and her behavioural and psychological competencies. Humans are characterized by facultative responses to the demands of their environment. Differences between societies and between individuals are seen by evolutionary psychologists as environmentally induced variation in the expression of similar genotypes.

In evolutionary theory, genetic predispositions orchestrate universal trends in human psychology and behaviour and thus create what is often called human nature. It also directs particular male and female natures in some psychological modalities. However, superimposed upon these, we must take into account the impact of the environment in both development (nutrition, education, opportunities congenial to the development of particular abilities) and facultative adaptation (the particular environmental constraints that inform decisions about behavioural strategies).

Charge 2: Evolutionary theory is simplistic and reductionistic

Evolution is the process of selection which causes differential survival and reproduction of individuals as a function of their performance in a particular ecological niche. I can think of few other theories that can be expressed so succinctly. Yet pejorative accusations of 'simplistic' notwithstanding, it is apparently not simple enough to escape misunderstanding. Fausto-Sterling (1992), a biologist and vocal critic of evolutionary psychology, correctly explains the evolutionary premise that the sex which makes the lower parental investment (typically males) tends to display greater promiscuity in its mating habits. She then points to female promiscuity in phalaropes (sea snipes), exclaiming, 'You name your animal species and make your political point.' The non-political point which she completely misses is that in the phalarope it is the male not the female that makes the greater parental investment. Hence this example is entirely consistent with evolutionary theory and merely demonstrates what the theory has always argued—it is parental investment not sex per se that drives mating strategy.

The truly remarkable thing about evolution is that, although the theory itself is simple, it leads to highly varied and often counter-intuitive hypotheses. An evolutionary analysis of incest developed by Westermarck argued that people develop an aversion to later sexual contact with those with whom that they spent their infancy and childhood years (normally siblings). One counter-intuitive prediction was that children raised in kibbutzim should avoid marriage with their kindergarten peers despite their non-relatedness. This prediction turns out to be true (Sheper 1983). A different strand of evolutionary thought has been concerned with homogamy (the tendency for like to mate with like). Together these two pieces of work can explain the recent reports that siblings separated at birth and then reunited in adulthood tend (to their distress) to find one another sexually attractive. This seems to me to be simplicity at its best—a simple theory that is able to explain apparently unrelated and unexpected findings in the real world. There was a time when simplicity used to be called elegance and constituted one of the criteria for quality—if the data equally support two theories then the simpler one was the better one.

The charge of reductionism comes in two forms. The first objects to the 'reduction' of complex human behaviour to the action of genes and we have already discussed the fact that no serious evolutionary psychologist believes that genes can operate independently of the environment (although many feminists apparently fear that they may). The second highlights a failure to include the full range of variables that are needed to account for a given behaviour. No scientist really wants this contrived simplicity, any more than their critics do. We would all love to offer complete theories that fully account for the range and diversity of human behaviour. But reductionism is a necessary evil. It is a stepping-stone that allows us to work towards the truth by first decomposing the explanation into its constituent elements. If (as many feminists prescribe) we reject reductionism and take on the full complexity of a phenomenon as it appears in the real world, we are faced with an insurmountable problem. We can offer only a description and nothing more. We cannot generalize beyond the historical moment and the actors involved. Feminists, like Gestalt psychologists, argue that the whole is more than the sum of the parts. If we wanted to remove or introduce variables to observe their effect, we would have 'committed reductionism' in accepting the potential decomposability of the event. Now many feminists are happy to accept these limitations. But in so doing they become historians (not psychologists) describing (but not explaining) non-generalizable and unique events by the use of a subjective interpretation (that is itself the product of a particular moment in history, geography and culture).

Charge 3: There are no human universals and hence no such thing as human nature

The denial of human universals is central to the liberal agenda because of critics' erroneous acceptance of the naturalistic fallacy and their mistaken belief that biology is destiny. If something is universal it may reflect fundamental human nature and if such a thing exists at a biological level then attempts to ameliorate the status quo are doomed. This shaky reasoning underpins the enormous kudos given to anthropologists who return with reports of novel and bizarre behaviour in exotic locations. Obvious hoaxes such as Carlos Castaneda's dissertation on Don Juan or the discovery of the Tasaday (who were inventions of the Marcos government) were eagerly and, for many years, uncritically embraced. An anthropological challenge to the traditional equation of masculinity with aggression and femininity with gentleness was also welcomed. Margaret Mead (1935) conveniently found, within a hundred mile area, three tribes in which these equations broke down; the Arapesh (both sexes gentle), Mundugumor (both sexes aggressive) and the Tschambuli (sex role reversal). Since that time, her claims have been discredited by other researchers and these have been carefully reported by Freeman (1983). Her determination to demonstrate the existence of the three other logical permutations of sex and temperament lead to some strange interpretations of her observations. Though she argues that among the Mundugumor both sexes are violent, the men express it by murder, rape and

head-hunting raids while the women express it by serving tastier dishes to their husbands than their co-wives can. Among the allegedly gentle Arapesh, young men were not initiated into adulthood until they had committed homicide. Among the sex-role reversed Tschambuli, the make-up worn by men celebrates their killing of an enemy and the aggressive women were frequently beaten by their gentle husbands. Anthropology vocally encourages reports of cultural difference rather than cultural similarity (Geertz 1984) and this no doubt affects the way in which field workers interpret the behaviour that they witness.

Critics often seem confused about just what is meant by human nature. Consider the following quote from Sandra Bem (1993, pp. 21–2): ‘As a biological species, human beings do not have wings, which once meant that it was part of universal human nature to be unable to fly. But now human beings have invented airplanes, which means that it is no longer part of universal human nature to be unable to fly.’ Now the idea that sitting in a seat a few thousand miles above the ground constitutes an alteration of ‘human nature’ is an odd distortion of the concept. The evolution of wings might have led to a radical alteration of human nature but we have not evolved them. Has air travel in any way led to an alteration in our physical morphology? Do we seriously suppose that aeroplane passengers show a different psychology or physiology to those who have not flown?

It is equally hard to know what to make of Fausto-Sterling’s (1992, p. 199) claim that ‘there is no single undisputed claim about universal human behavior (sexual or otherwise)’. Presumably even the most ardent cultural relativist would accept that everywhere people live in societies, that they eat, sleep and make love and that women give birth and men do not. The problems seem to arise when we move from basic biological functions to behaviour. Though everywhere women are the principal care-takers of children, the fact that there may be variation in how that task is fulfilled leads some anthropologists to conclude that mothering is not universal. This is analogous to arguing that because people eat different food in different parts of the world, eating is not universal. Evolutionary psychologists do not argue for cultural invariance in the expression of evolved adaptations. As Tooby and Cosmides (1992, p. 45) put it: ‘manifest expressions may differ between individuals when different environmental inputs are operated on by the same procedures to produce different manifest outputs.’ At a behavioural level, the expression of the mechanism may vary but that does not question the universality of the generative mechanism itself.

Fortunately, Donald Brown (1991), trained in the standard ethnographic tradition, has documented the extent of human universals. The list is astoundingly long but here is a taste of the hundreds that he finds: gossip, lying, verbal humour, storytelling, metaphor, distinction between mother and father, kinship categories, logical relations (not, same, equivalent, opposite), interpreting intention from behaviour and recognition of six basic emotions. Of special interest to the study of gender we find: binary distinctions between men and women, division of labour by sex, more child care by women, more aggression and violence by men, acknowledgement of differences

between male and female natures and domination by men in the public political sphere.

Now this latter observation is a nice example of the extreme reluctance of anthropologists to acknowledge universals. In 1973, Steven Goldberg wrote a book documenting the universality of patriarchy. He was inundated with letters informing him that he was wrong and pointing out counter-examples. (Other feminists were more willing to accept the premise, see Bem 1993; Millett 1969; Rich 1976.) Over the next twenty years he carefully examined the available ethnographic documentation for each example cited and in 1993 authored a second book in which he is emphatic that no society has yet been found that violates his rule. There are societies that are matrilineal and matrilocal and where women are accorded veneration and respect—but there are no societies which violate the universality of patriarchy defined as ‘a system of organisation . . . in which the overwhelming number of upper positions in hierarchies are occupied by males’ (Goldberg 1993, p. 14). Such a state of affairs is deplorable but mere denial of the facts will do nothing to alter it—women’s engagement in the political arena will.

Charge 4: Evolutionary psychology is used to naturalize and legitimize the status quo

Evolutionary psychology has considered a number of highly charged and socially relevant issues including infanticide, sociopathy, wife abuse and rape. In these areas, feminists (e.g. Fausto-Sterling 1992) have objected that such work opens the door to frivolous exonerating pleas in the criminal justice system (‘I beat my wife because it is man’s nature to experience extreme sexual jealousy because of internal fertilization’). The misuse of scientific research by defence attorneys is doubtless widespread but is certainly not confined to evolutionary theory. Contemporary work on neuroanatomy, hormones and clinical disorders can be misapplied in this way. Perhaps then we should abandon biologically based work which addresses behaviour that may be subject to criminal sanction? However, environmental factors are far more commonly misused. Parental abuse and neglect, inadequate educational opportunities and drug addiction have all been used to mitigate guilt and reduce sentences. The issue here is not evolutionary theory but the prevailing legal philosophy of responsibility and free will.

This objection also takes the form that an evolutionary explanation of, for example, patriarchy will allow policy makers to view it as natural and therefore benign. It is deeply ironic that evolutionary psychologists have been the ones to argue most forcibly against the naturalistic fallacy—the belief that what is natural is morally right or desirable. This is not a post-hoc attempt to make their position socially acceptable but flows from the very nature of the theory itself. Natural selection operates as a sieve, allowing some variants in particular environments to pass through and others to die. This sieve knows nothing of good or bad, kind or cruel, desirable or unacceptable. It does not result in progress in the form of the survival of ‘better’ species or individuals. Humans have proliferated exceedingly successfully and one

feature which we possess is a large brain relative to our body size. That does not make high intelligence better than low intelligence, although it did make it a useful adaptation for *Homo sapiens* trying to survive in a particular ecology several hundred thousand years ago. If intelligence was 'naturally' good then ants and spiders would have developed enormous cortexes or would have become extinct—neither of which has occurred. It is vital to make a distinction between what we as humans hold to be morally desirable and what natural selection has retained as an adaptation. Malaria, tuberculosis and death in childbirth are natural but we hardly regard them as good. Indeed we have poured enormous (positivist) scientific effort into their eradication with considerable success. Our vision of a more perfect world cannot be found in evolutionary theory which can tell us only about our past, not our future.

Charge 5: Culture and technology have so changed the environment that we are freed from natural selection

Evolutionary psychologists hold that evolution has provided us with 'fitness tokens'—desires, pleasures, aversions and goals that mould our preferences and habits. Teenagers do not attend discos in order to increase their share of the future gene pool but selecting the best possible mate is an activity that occurs across cultures and exerts an untutored fascination in most teenagers. A teenage couple who have sex after such an event are not seeking to increase their reproductive success—if they were, they would not employ contraception. Consensual sexual contact is inherently pleasurable (evolution has seen to that) and they are only enjoying that evolved pleasure. Natural selection worked to make sexual contact enjoyable because in ancestral environments contraception was not available and sex eventually led to pregnancy and increased reproductive success. The principal aim of evolutionary psychology is to understand the origins and the parameters of these mental adaptations. Such adaptations have not magically disappeared with the advent of new technology or social institutions in the past one hundred years.

But, some argue, the world today looks nothing like the environment of evolutionary adaptation (EEA). Population density is greater. Social and political structures are more complex. We live in parts of the world that would have been uninhabitable then. International conflicts, air pollution and multinational companies dominate the world. At first glance, there is an enormous gulf between the hunter-gatherer societies in which humans spent 99 per cent of their existence and the contemporary societies we inhabit. But these changes have been wrought by the human mind and this mind was adapted in the EEA. As Crawford (1998, p. 291) points out, we have not created a world 'designed for individuals who can fly, who choose mates indiscriminately, who have litters of offspring, who have fur to protect them from the cold, who make little investment in offspring once they are born, who do not mind being cheated in a social contract, who do not value close relatives, and so on'. At a social level, the size of intimate human groups has not substantially changed from the EEA (Dunbar 1993) and gossip is the major form of conversation with friends and relatives,

as it is among hunter-gatherers. Even culture seems to support rather than undermine our evolved predispositions (Durham 1991). Cultures everywhere value altruism, reciprocity, fairness and in-group bias. Culture devalues selfishness, cheating, theft and in-group violence. Whole cultures which endorsed mass suicide or abstinence from sex would not last long. Cultural values are derived from adapted predispositions and because of this generally favour rather than oppose factors which in the past have enhanced survival.

It is true, however, that adaptations now encounter a range of environments that are richer and more diverse than they were evolved to deal with. The stimulation of the dopaminergic reward pathways of the brain was a useful device for increasing appetitive behaviour but it can now be directly stimulated by illegal and addictive drugs. At the same time, some of our adaptations have been usefully recruited in the service of other unintended but beneficial outcomes. The pleasure that soccer brings to millions may derive from our natural fascination with ingroup–outgroup agonistic encounters, with male–male competition and with the demonstration of young male strength and agility. Our enjoyment of gossip is exploited in soap operas. Despite our knowledge that we are watching miniature representations of human beings (as pixels on an electronic machine) who are pretending to be people that they are not, we still find our emotions engaged in the drama of other people’s lives so artificially presented to us.

The mind and body that we have today exist in their current form because we come from a long line of individuals who survived at least past puberty and successfully reproduced. Many did not survive. In Western society medical advances have led to the survival of severely premature infants and of individuals with diseases that would have been lethal in the EEA. We have seen significant increases in longevity in past decades. Infertility treatment has become widely available, as has contraception. It may well be the case that medicine, politics and personal choice have already begun to perform the roles of natural and sexual selection using criteria that are novel (the ability to pay) or no criteria at all (universal availability). Evolution is slow and we cannot know what the long-term effects will be.

Bad science?

Another set of objections has come from those who question the scientific status of evolutionary psychology. We can begin with the most radical critiques from those who regard the whole scientific enterprise as an androcentric activity and those women who engage in it as ‘sleeping with the enemy’. Their wrath is not specifically directed at evolutionary psychology per se but at any use of the hypothetico-deductive method.

Charge 6: Evolutionary theory, as part of traditional science, fails to recognize that there can be no objective truth

Many feminists have objected that the very questions posed by scientists are laden with tacit political agendas and that the scientific method itself can never be value-free

(Fausto-Sterling 1992; Harding 1991; Hubbard 1990; Keller 1992). The solution they offer is for researchers to announce their politics at the same time as their results so that the reader may be aware of the possible bias of their data collection, analysis or interpretation. This has the side-effect of allowing the reader to pick and choose articles in terms of the author's politics and to be prejudicially positive to articles that gel with their own agendas. Fausto-Sterling (1992, p. 212), for example, writes of the difficulty that she experiences in distinguishing between 'science well done and science that is feminist'. She is also surprisingly honest about the double standard that she employs in evaluating data which are not congenial to her ideological position: 'I impose the highest standards of proof, for example, on claims about biological inequality, my high standards stemming directly from my philosophical and political beliefs in equality' (Fausto-Sterling 1992, pp. 11–12). Theories that are not consistent with a feminist viewpoint usually fail to achieve this higher standard. Feminists are keen to promote high-quality research—but this aim is made difficult by their inability to distinguish between feminist science and good science. Many feminist journals will refuse to publish data that are unacceptable to their ideological position. This state of affairs has already inhibited open debate among those who fear that they will incur feminist wrath and if it continues, it will seriously jeopardize academic freedom.

There is a more liberal possibility. Traditional scientific method is a cyclical loop joining theory and data via hypotheses. It is a system that requires explicit and internally coherent reasoning at the level of theory-building and honesty and clarity about the method and results of data collection (but not about the ideological position of the authors). It also crucially depends upon the endeavours of many scientists working separately and together. The system allows freedom of politics to individuals, is self-correcting (unsupported hypotheses are modified or abandoned) and open (replications can be undertaken by detractors as well as supporters). Though hypotheses, or even whole theories, may be laden with tacit ideology, the data that they require for falsification are collected from ordinary people who have no axe to grind. Scientific method can be the antidote to hidden agendas.

Charge 7: Evolutionary theory does not resonate with women's experience

Two strands of contemporary thinking have come together to create a new criterion for the acceptability of an explanation: it must reflect our lived experience and it must 'feel' like it is subjectively true. The first of these (which I wholeheartedly endorse) is the feminist demand that researchers should address women's experiences, recognizing them to be potentially different from those of men. The second is the postmodern rejection of grand theory (feminist theory excepted) which emphasizes close qualitative description of experiences and discourse which are contextually and historically bound. This effectively replaces theory with subjectively interpreted description. Since there are multiple possible descriptions of any event and no objective criterion for deciding between them, the best one is the one that resonates with the feminist

reader's own experience and intuition. (Parenthetically, it should be noted that the rejection of any objective set of truths necessarily excludes men's oppression of women as a historical truth.) This emphasis upon personal resonance has been formalized and endorsed by writers who encourage women to transcend positivist empirical methods and to seek alternative ways of knowing that incorporate and are true to their own life experiences (Belenky *et al.* 1986). But this personalized and introverted approach to knowledge which places resonance with the reader's experience above the truth, generality or coherence of the argument was taken to new heights by a book that recounts the biographical memories of five women. The authors proclaim that 'The way forward is seen through the collective understanding opened to women by the collective method of memory-work. Such an approach allows us to evaluate our understanding in the inter-subjective realm, to explore resonances with the experience of other women.' The other women of whom they speak are the five feminist psychologists who co-authored the book (Crawford *et al.* 1992, p. 14).

Many women feel that evolutionary psychology does not resonate with their own experience. They do not 'feel' that parental investment impacts upon their emotions or behaviour. It does not 'feel right' to them that differences in gamete size could create differences between men and women's behaviour or interests. However, intuition is not a reliable guide to the quality of an explanation. Children do not 'feel' as if their bodies are composed of 65 per cent water. People do not 'feel' that solid matter is made of atoms. 'Feeling right' is equally controversial with regard to psychological truth. Therapists can persuade clients that they are secretly in love with their father. Palm readers can persuade clients that they are destined for greatness. In an influential article, Nisbett and Wilson (1977) demonstrated that participants in psychology experiments perform no better than chance in guessing the causes of their behaviour when these are manipulated in experiments. Although we have conscious access to the products of lower-order processes (recalling our mother's name or the ability to speak in grammatical sentences), we do not have access to the processes themselves (we do not know how our memory or language production systems work) except by the formal knowledge gleaned by psychological science. Evolutionary theory is concerned with how the mind was shaped in the environment of evolutionary adaptation approximately 100,000 years ago. We cannot have any 'feel' for what the selection processes were or even what it felt to be a proto-human at that time. What are available to us are the psychological products of evolution. We like the taste of sugar, feel sick in the first trimester of pregnancy, experience fear when we look out from a tall building, see three-dimensional images in stereograms, enjoy sexual contact and feel anger when our child is threatened. Evolutionary explanations have been offered for all these experiences.

There are a number of feminists working in the evolutionary sciences. They have misgivings about the way in which women have been systematically excluded in their discipline both as objects of study and as collaborators (see Hager 1997). However,

few evolutionary feminists want to see the abandonment of empirical techniques, as do radical feminists in other branches of psychology. Instead, they seek to identify the evolutionary problems faced by women but ignored by male researchers, such as the evolutionary basis of patriarchy (Hrdy 1997; Smuts 1995) or male infanticide of infants (Hrdy 1981). Others highlight the selection pressures that operated specifically upon women, such as the care of slow-maturing, altricial young (Lancaster 1991) or the infant's greater need for maternal rather than paternal survival (Campbell 1999). They believe that their work is important because it can illuminate the evolutionary basis of sexual inequality and in so doing complement mainstream feminist work and inform a more solidly grounded agenda for change. Evolutionary feminist research on wife abuse and male proprietary jealousy; on clitoridectomy, infibulation and claustration; and on polygyny and the gendered inheritance of wealth are a few examples of how evolutionary theory and feminism can work together to improve the status of women.

Other critics of evolutionary theory, far from wishing to see the abandonment of scientific method, argue that evolutionary psychology is not scientific enough.

Charge 8: Evolutionary theory is tautological

In principal, this objection can be levelled at any functionalist explanation in the social or natural sciences. Some feminists argue that (male-dominated) governments allow the production of pornography in order to objectify women and to keep them in a state of fear about the possibility of rape. This is a functionalist explanation. It seeks to explain why the status quo is the way it is. The simple question 'What is this for?' is in fact the driving force of most scientific enquiry that goes beyond description or classification. When directed at evolutionary theory, the objection takes the form of allegations of the Just-So Story; the invention of plausible but unverifiable stories about how an adaptation occurred (Bleier 1984).

In fact the methods of evolutionary psychology have been clearly explicated by Tooby and Cosmides (1992) and others (Halcomb 1998; Sherman and Reeve 1997). Broadly, evolutionary psychology proceeds by (1) identifying an adaptive problem that proto-humans would have faced in the environment of evolutionary adaptation, (2) developing a description of the module that is suggested to have evolved in response to this problem, including the range of inputs that would have activated it and the impact of its outputs in terms of differential survival and reproductive success, (3) formulating a description of the current environment and a map of correspondence between the ancestral and present conditions that allows specific hypotheses to be generated about the current activating inputs, and (4) undertaking tests of these hypotheses which, where appropriate, allow comparison with alternative (evolutionary or non-evolutionary) accounts.

An adaptation is identifiable by evidence of special design such as complexity, economy, efficiency, reliability, precision and functionality (Williams 1966). The eye, for example, is so manifestly and complexly suited to the function of tracking the

environment and allowing the animal to orient itself that nobody could seriously doubt that it evolved to serve that function (Dawkins 1986). The ability to interpret the mental states of others also evidences special design—it is fast, accurate, automatic, follows complex rules, rarely makes mistakes and bestows obvious advantages on its bearers. Language also has these trademark features. But to make the techniques of determining an adaptation more concrete, let us take a different example. Let us posit for a moment that individuals prefer to avoid, rather than seek out, situations in which they are cheated or exploited. Universality is taken to suggest (but not prove) that the phenomenon may have been an evolutionary basis. The next step is to ask what purpose it might have served in the EEA about 300,000 years ago. The fossil record provides information about where we were living (on the savannah plains of sub-Saharan Africa) and roughly how (in small hunter-gatherer bands). We were highly social and survival depended as much on regulating social relationships as on ecological pressures. We can posit that it would have been important to detect social cheaters—those who failed to repay altruistic acts. If we could not do so, we would find our generosity exploited in the service of someone else's reproductive success. Let us hypothesize that one module of the evolving mind might have been devoted to detecting cheats.

Cosmides and Tooby (1992) made such an assumption and tested it on the Wason card task that goes like this. A person is presented with four cards; on one side is a number and on the other is a letter. The upturned cards read D F 3 7. They are then given the proposition 'If a card has D on one side it must have 3 on the other' and the person is asked which cards they need to turn over to determine whether this proposition is correct. This is a standard P not Q problem. They ought to turn over D and then a second card bearing a number that is not 3. Most people find this task quite difficult. But then Cosmides changed the task slightly. The subject is presented with a cheater detection problem. They are told that they are a barman and that they must ensure that nobody under the age of 18 is drinking alcohol. The four cards before them say Drinking Cola, Drinking Beer, Age 26 and Age 16 and they are again asked which cards they need to turn over. Most people rightly realize that if the person is 26 years old it does not matter what they are drinking and ignore this card. They also rightly realize that if a person is drinking cola, it also does not matter what age they are. Correctly, they turn two cards; Age 16 and Drinking Beer. The identical problem when translated into cheat detection becomes easy. And it is not just the fact that problem was made social rather than abstract. The cheater problem also seems to be activated only when a rule of exchange has been broken. If we change it to 'If a person eats chilli peppers then they drink beer', people seem as flummoxed as they were before because although the problem is still social, no rule violation is involved.

As evolutionary theory builds an ever more complete picture of the underlying principles, these same principles can be used to generate further explanations and accompanying hypotheses. For example, Trivers' (1972) key articulation of par-

ental investment theory pointed to the differential investment made by males and females in offspring and the dangers posed to males by concealed ovulation and internal fertilization. In consequence, males should be especially sensitive to signs of sexual infidelity and females to the threat of lost resources resulting from male abandonment. Over a dozen studies in a variety of cultures (including sexually liberated ones) now show that this prediction is correct. There may be some other theory that can also explain this effect, but if this is the case it is incumbent on those who propose it to demonstrate that it does. Once a rival explanation is proposed, it becomes possible to generate decisive empirical tests between the competing theories.

The EEA has become a particular source of concern to some. We have no time machine to travel to it and we must rely on an archaeological and paleoanthropological reconstruction. Because we believe that savannah living was the lifestyle that shaped our species, there is a tendency to caricature the EEA as something akin to an African hunter-gatherer community. This can be misleading if we fail to recall that evolution is deployed over vast stretches of time and that characteristics evolved at different time periods and conceivably in different ecologies. For example, humans' tendency to live in kin groups can be traced back over 25 million years to a common ancestor shared with other anthropoids, meat-eating may have evolved about 2 million years ago while the evolution of language is traced to a mere 300,000 to 100,000 years ago (Foley 1996). There were a variety of adaptively relevant environments. But every adaptation comes from a statistical aggregate of selection pressures spread over time—the environment presented the same problems over and over again with sufficient regularity to make a problem-solving adaptation a distinct advantage. The uncertainty that must surround the details of life at that time of each adaptation does not preclude the generating and testing of adaptational hypothesis. If they evolved, they are part of human nature and will manifest themselves today over a wide latitude of cultures given the appropriate environmental inputs. Some have argued that the study of contemporary human adaptations will help to build a more accurate picture of the EEA (Tooby and Cosmides 1990). Even if it does not, the status of current adaptations is not dependent on a complete account of their genesis. It is dependent on their ability to offer elegant and empirically supported explanations of contemporary human behaviour. Adaptations exist as part of our nature—from the infant's Moro reflex to our fear of heights—and a psychology that denies the available evidence in favour of a wishful world where humans are formless clay waiting to be moulded by cultural practices may serve politics but not truth.

Tests of evolutionary predictions, however, will never satisfy critics if they insist on moving the evidentiary goalposts. The standards of proof that are required from evolutionary theory are far higher than those demanded for social environmental theories. The interpretative constructionism espoused by many feminists is subject to the single standard of 'plausibility'. Ironically, this is the very standard that feminists

reluctantly agree that evolutionary psychology meets. Fausto-Sterling (1992, p. 187) admits that 'At one level it [evolutionary theory] all seems quite plausible' and Bem (1993, p. 30) acknowledges 'the consistent pattern of sexual difference and dominance that not only appears to exist across time and place but that a theory like sociobiology appears to so elegantly explain'.

Charge 9: Evolutionary theory is riddled with disagreements

The 'Modern Synthesis' brought together Darwin's nineteenth-century insights about natural and selection with our twentieth-century understanding of genetic transmission. Together they have inspired an ever-increasing body of empirical work that seeks to test and refine these ideas. In so doing, the modern synthesis has brought together biologists, anthropologists, geneticists, developmental and social psychologists and neuroscientists who, for the first time, have a common language with which to communicate. Notwithstanding this remarkable integration, Fausto-Sterling (1992, p. 169) asserts that 'arguments continue to rage' within evolutionary theory. The arguments to which she refers are those offered by Steven Jay Gould, an ardent Darwinian, which have been greeted with delight by many critics of evolutionary theory. His critiques are not rejections of adaptationist thinking but proposed modifications and admonishments of caution to his fellow Darwinians.

First, a possible modification—Gould believes that the trajectory of evolution is discontinuous rather than smooth (see Eldredge and Gould 1972). He believes that the normal equilibrium of evolving life is punctuated by dramatic events that select for new macromutations before the pace slows again. His claim is far from radical—there is no reason why evolution should proceed at a constant pace and periods of stasis, when species were freed from dramatic environmental change, were probably commonplace (Dawkins 1986; Dennett 1995). Failure to find evidence of intermediate forms of life that evolved and were extinguished in a matter of a few hundred thousand years is not especially surprising. For a species to be identified as a unitary entity some degree of stasis has to be involved—we would not even entertain the idea of a species whether alive or extinct unless all of its members shared common attributes over some space of time. Whether the emergence of new life-forms happens 'momentarily' as he proposes largely depends upon one's definition of a moment. The punctuated equilibrium argument depends upon the scale on which one draws evolutionary change. Gould himself appears to recognize this and agrees that 'Our theory entails no new or violent mechanism, but only represents the proper scaling of ordinary events into the vastness of geological time' (Gould 1992, p. 12). In this matter he hardly seems to part company from Darwin himself who wrote: 'the long periods, during which species have undergone modification, though long as measured by years, have probably been short in comparison with the periods during which they retain the same form' (see Dennett 1995, p. 290). So, for many evolutionists, Gould's thesis hardly constitutes a major threat to Darwinian ideas.

Gould also argues that chance can be an important component of evolution—and again this is far from heretical. It is universally acknowledged that evolution (defined as a change over time in the relative frequency of genotypes) can be the result of things other than natural or sexual selection (Majerus *et al.* 1996). However, only these latter forces can produce adaptations—by which we mean a feature of design that becomes common by the differential success of phenotypic variants in previous generations. Mutation, migration and differential mortality due to chance events can all change the gene pool but not adaptively. Although random catastrophic events may cause the extinction of a whole species (for example, dinosaurs from a meteor strike) they do not cause systematic changes in the gene pool of an existing species. This is because such events, by their definition and nature, are random. Every year people die as a result of being struck by lightning. The people who die carry genes that are effectively wiped out (if they are childless). But the genes that are eliminated are a random selection of genes. Chance does not systematically retain and reject different variants. Some critics appear to believe that the mere existence of noise or chance is a serious challenge to the whole theory. For example, Fausto-Sterling offers a hypothetical example of an island of birds composed of blue and speckled variants in which the speckled variants are blown onto a neighbouring deserted island. She points out that this is an example of evolution by ‘a chance natural event, not natural selection’ (Fausto-Sterling 1992, p. 172). But the example is flawed because the probability of the wind carrying only one colour of bird by chance is vanishingly small. A chance event would be unselective about what colour birds it affected. When a natural event (wind) selectively affects one variant (speckled birds) while not affecting the other (blue birds) then it is most likely for a reason—perhaps the speckled birds weighed less than the blue ones. This made them more likely to be blown away and would constitute a clear case of natural selection. To give another example, imagine a community of people who vary genetically in their tendency to store fat. A famine occurs and those with low fat reserves perish before the rains come. The genes for low fat reserves will be selectively culled. Although the famine was a chance event, its effect was systematic selection. Chance events that do not distinguish their targets can have evolutionary effects, notably the extinction of whole communities and species, but only chance events that have systematic effects on different variants can generate adaptations.

Gould and Lewontin (1979) coined the term ‘spandrel’ to describe epiphenomenal aspects of natural selection. They borrowed the term from architecture. In cathedrals and churches, spandrels are typically ornately decorated and give the appearance of having been put there specifically for this aesthetic purpose. But Gould and Lewontin argue that they are simply a by-product of the design—they had to exist as soon as the architect decided to join two rounded arches at right angles and thereby created a tapered triangular space. Their point was that we must not assume everything in nature to be a functional adaptation. Some apparent design features are merely side-effects of selection for something quite different. Bones are white and

we might be tempted to pose the question ‘What is the evolutionary advantage of white bones?’ if it were not for the fact that bones just happen to be made out of calcium which is white in colour. Blue or purple bones could have done the job just as well and the colour is of no evolutionary significance (although bones are). Because most genes are pleiotropic (they have multiple effects), some natural phenomena are simply side-effects that have survived because they have tagged on to an adaptive gene complex and, presumably, were not so detrimental as to outweigh the beneficial impact of its other phenotypic effects. Dennett (1995) argues that Gould is wrong—bones could not be made of just any old material. There were constraints on what material could be chosen (it had to be something that could be biologically manufactured, it had to be strong, it had to be attachable to tendons, etc.). Such constraints severely limit the material that could have been used—in fact they limit it to such an extent that calcium was the only one that would do. If we accept that evolution places constraints on possibilities, then white bones are in fact adaptations as much as anything else in the sense that calcium was the best available building material that the body had to hand. But if Gould’s fundamental message is simply that not everything is an adaptation then this hardly threatens evolutionary theory. Daisies float in water but no sensible person would ask what the adaptive significance of their buoyancy is. As Dennett puts it:

The thesis that every property of every feature of everything in the living world is an adaptation is not a thesis anybody has ever taken seriously, or implied by what anybody has taken seriously, so far as I know. If I am wrong, there are some serious loonies out there, but Gould has never shown us one. (Dennett 1995, p. 276)

Gould (1991) has also introduced another term—the exaptation—to describe ‘any organ not evolved under natural selection for its current use—either because it performed a different function in ancestors (classical preadaptation) or because it represented a nonfunctional part available for later co-optation’. His example is bird feathers that originally evolved to conserve heat but were later exapted for use in flying. This example highlights the co-option of a functional feature from one role to another but his definition also includes the co-option of spandrels (non-functional features). In one sense it is misleading to coin a new term for this process because all current adaptations arose from previous states of the organism and genetic mutation can only use available components to engineer change whether they were functional in some other realm or not. Feathers happened to be available and, along with a host of other mutational changes, were exploited for flying purposes. But Gould’s writing has had the effect of generating confusion about the agency that is responsible for co-option (Buss *et al.* 1998; Pinker 1997). In places, he implies that natural selection does the work, while in others he seems to suggest that it is the human mind. If he means the former then there is nothing very new being added to the concept of adaptation. But if he means the latter, then we are talking about a different process. Reading and writing are human abilities that are too recent to have evolved by natural

selection and may well represent exaptations of existing human abilities (language, symbolic communication, manual dexterity, representational thought). The human ability to creatively exploit our mental and physical capacities in new ways deserves study in its own right but cannot (yet) be examined in terms of natural selection.

There we have it. The pace of evolution, the role of chance and the status of spandrels and exaptations constitute the full extent of the 'raging disagreements' in evolutionary thought.

Let us now turn to the unity of feminist theory. Though the term is widely used, it is hard to pin down a definition. The nearest I have been able to find is this: 'Feminist theorists are concerned with how gender (which is the social construction of characteristics associated with sex) affects individuals' access to control of their own and other people's lives, power, and resources' (Gowaty 1992, p. 218). This certainly defines the subject-matter of the discipline, but where is the theory? Theories are usually taken to be higher-level explanations from which local hypotheses can be drawn, but explanation is absent from this definition. Even a more direct statement of feminist theory such as 'Women have been oppressed by men' is essentially a statement of historical fact rather than an explanation. The absence of agreement about just what constitutes feminist theory is perhaps not surprising when its very proponents acknowledge that 'There seem to be many kinds and varieties of feminism, as many kinds and varieties as there are individual feminists, with individual desires, notions and conceptions of what we are and want' (Gowaty 1992, p. 225). Indeed we are chastized for expecting that there should be a commonly agreed-upon theoretical explanation: 'Individuals unfamiliar with feminism or women's studies often assume that feminist theory provides a singular and unified framework for analysis' (Rosser 1997, p. 22).

At least nine brands of feminist theory are currently available (Percy 1998; Rosser 1997). *Liberal feminists* argue for the advantages of psychological androgyny, the establishment of a gender-blind society with equal opportunities for men and women, and are unique among other feminists in continuing to accept traditional scientific method. *Marxist feminists* argue that gender oppression can be traced to capitalism as a means of production and to the power structures reproduced by class in capitalist societies. Freedom from gender role constraints can best be sought in a Marxist economy. *Socialist feminism* seek to give a more equal weighting to class and gender. Socialist feminists integrate material, social and unconscious processes in explaining how race, gender, class and sexuality produce power relations that disadvantage women. *Afro-American feminists* reject the Eurocentric approach to knowledge embodied in individualism and positivism. They maintain that race is the primary oppression and that gender is secondary to this. They are particularly critical of scientific work that under-emphasizes the impact of social and economic inequalities between the races. They deplore the failure of mainstream feminism to address the problems of women of colour. *Radical feminists* believe that men's oppression of women is the most fundamental and widespread oppression in society. They urge

women to reject all theories developed by men including Marxism, psychoanalysis, positivism and existentialism. Women can gain true knowledge only by using and reflecting on their own personal experiences and those of other women. Lesbian separatists allege that compulsory heterosexuality and engagement in patriarchal society makes it impossible for women to understand their own oppression. Women must refuse to collaborate with men in any way that oppresses women, lesbianism is the preferred sexuality and artificial insemination the preferred means of reproduction. *Essentialist feminists* argue that women by virtue of their biological and psychological qualities are equal to or superior to men. Although originally rejecting any implication of biological differences as 'a tool for conservatives who wished to keep women in the home', they have now rethought their position 'with a recognition that biologically based differences between the sexes might imply superiority and power for women in some areas' (Rosser 1997, p. 29). *Psychoanalytic feminists* use neo-Freudian theory to argue for the unconscious internalization of female powerlessness. Psychoanalytic feminists trace gender differences to the distinct ways of dealing with psychosexual development. Although they reject the 'biological determinism' of Freud, they trace male dominance to the fact that women are the chief care-takers of infants and children, resulting in boys distancing themselves from their mother and adopting independent and autonomous styles while girls become enmeshed in over-dependent relationships with their mothers. *Existential feminists* emphasize the ways in which women are raised to see maleness as the natural human state in which women form the objectified 'other'. It is the importance that society accords to biological sex, rather than sex itself, that forces women into playing the role of the Other. *Post-modern feminists* reject the notion of a stable and unified self but rather see the self as a product of ideology, discourse and language. Equally, they reject the idea that women can speak with a unified voice. They argue against grand theoretical narratives and contend that gender, like the self, is neither real nor fixed but variously socially constructed in different contexts.

In most of the examples above, it is clear that the political agenda of feminism or a putative description of the status quo has superseded 'theory' as it is normally understood. Be that as it may, it is a surprise to many evolutionary psychologists to find themselves accused of internal wrangling when faced with the bewildering disarray of feminist theory. While evolutionary psychologists argue over the fine-tuning of their favoured theory, feminists appear to be unable to agree on what their theory should be.

Three questions

Are there inequities between women and men in society? Where did they come from? How shall we change them?

The first is a straightforward empirical question that we can answer with respect to a variety of criteria including relative income, likelihood of promotion, leisure time, voting rights, participation in political life, public recognition of achievement and so

on (while holding all other variables apart from sex constant). Most people would agree that such differences do exist and, in the main, women fare less well than men.

The second question is the subject-matter of this book. I will map some of the domains of women's lives that are characteristically different from men's and offer an interpretation of them from the viewpoint of evolutionary theory. I am addressing the distal causes of male–female difference stemming from disparate pressures on men and women several hundred thousand years ago. But these evolved differences can also set up a dynamic of their own. If fewer men than women excel in the field of interpersonal sensitivity and if fewer women than men excel at navigation, we can be misled into typologizing these activities as male or female. The differences between men and women are differences of degree not kind. The overlap on the distribution is great. Even for the most male-advantaged tasks (running a marathon, lifting weights) there are always some women who do better than the least able men (and vice versa). This is even more true of psychological characteristics. We must avoid restricting opportunities on the basis of crude stereotypes about what men and women are able to do. My concern with stereotypes is not so much that they drive people to conformity—I have already explained that stereotypes are more likely to be the product not the cause of sex differences—but that they may cause us, within the family or wider society, to debar entry on the basis of sex. For example, denying women the right to be fire-fighters or police officers is rationalized on the grounds of strength or endurance. But this is clearly wrong. The criterion should not be sex but the individual's ability to perform the tasks that the job entails. Women should be given entry not in the belief that they will act as role models to other women but because to deny them the right to take up a job for which they are qualified and able is a basic human injustice.

Whether or not we want to alter the status quo is not a matter for psychologists but for society at large. But the last half-century has shown that there is a public will to do so. But social engineering without a firm scientific understanding of sex differences is like a surgeon operating with a blindfold (Tooby and Cosmides 1992). In accepting the idea that womanhood is socially constructed and is without any psychological basis, we are already in danger of developing policies that are not in women's best interests. Women's natures, it seems, not only can but should be the same as men's. Women are not 'naturally' maternal so there is nothing special about mothering. As a result single mothers have been forced to put their children in day-care and made to work. Their feelings of loss and guilt have been brushed away because they are 'feminine' feelings incompatible with effective performance in the workplace (Hrdy 1999). Women employees who do not show the ruthless drive of their male counterparts are disparaged as poor role models for other women and blamed for women's failure to break the glass ceiling. Girls who resist the contemporary educational pressure to take science subjects are viewed as academic also-rans. If on the other hand we accept that women and men are different, we can think about a society that breaks down the barriers between children and work, that

allows women to see value in cooperation as well as competition and that allows women to capitalize on their linguistic advantages. If evolutionary theory is correct then we cannot design twenty-first century woman as if from scratch. Ideology, social policies, law and the media cannot in and of themselves make women into something they are not. What we can and should do is to give people choices that allow them the maximum freedom to be whatever they want. With that freedom, women's nature can take its own course.