What We Have Here Is a Failure to Communicate: Using a Model to Explain Textbook Representations of Human Evolutionary Theory

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Abstract

In this paper we develop a general model to explain the hostility toward, and ignorance of, human evolutionary theory (ET) in the social sciences. We first provide relevant theoretical background explaining the basics of ET. We then briefly describe the history of, and reasons for, social science attacks against ET. After providing this background, we turn to our study of social science textbooks, describe the logic of our model, and specify four explicit predictions derived from it. Finally, we present the results of our study and discuss the significance of our findings.

I.1 Theoretical Overview of Human Evolutionary Theory

Human evolutionary theory (used here interchangeably with ET) is a theoretical approach to the entire field of human science motivated by the desire to illuminate human behavior by subjecting it to evolutionary analysis (Barkow, Cosmides, & Tooby, 1992; Buss 1995; Tooby & Cosmides, 2005). More specifically, it approaches human nature from an adaptationist perspective, attempting to discern the specific adaptations that underlie and give rise to human behavior—especially social behavior (e.g., mating behavior, cooperation, coalitional behavior, family dynamics, etc.) (Sanderson, 2001). Although often seen as contentious or controversial (see section II below; see also Rose and Rose, 2000), its ability to elucidate human behavior follows from two simple and uncontroversial facts: 1) Evolution explains the nature of the biological world, and 2) Humans are biological creatures (Atran, 2005). If these premises are accepted—and most social scientists do accept them—ET should appear a natural, inevitable, and fruitful approach to the study of human behavior. In fact, ET provides a productive metatheory for the social sciences, unlike other popular theoretical perspectives such as rational choice theory, which assumes that individuals choose the ‘best’ action according to stable preferences with well-defined constraints (Simon, 1955; Ketelaar & Ellis, 2000; Kanazawa, 2001). Because of its insistence on viewing humans as evolved organisms, ET asserts that an understanding of natural selection and sexual selection is essential for a comprehensive understanding of human behavior (Mayr, 1985; Buss, 1995; Tooby and Cosmides, 2005).

1 There are several theoretical perspectives that apply evolutionary theory to human social behavior, including sociobiology, dual inheritance theory, behavioral ecology, and evolutionary psychology (see Smith, 2000), all with slightly different assumptions and methods, yet all similar at core. For simplicity, we use the umbrella term ET.
I.2 Natural and Sexual Selection

Darwin’s theories of natural selection and sexual selection are essential to understanding ET. Darwin was not the first thinker to propose that life evolves; rather, he was the first thinker to propose a plausible mechanism explaining why and how life evolves (Darwin 1859/1958). His proposal can be reduced to three principles: 1) Organisms vary in their ability to reproduce. Some cheetahs, for example, run faster than others and consequently can procure more resources; ceteris paribus, such cheetahs will survive longer and are likely to have greater reproductive success. 2) Organisms inherit traits from their parents. Fast cheetahs pass their running ability to their offspring. 3) More organisms are born than survive. Organisms that inherit traits that allow them to more effectively interact with their environment are more likely to survive long enough to reproduce. The faster cheetahs, for example, because they are better at obtaining important resources, will survive and pass on their traits. The statistical result of this process is a pool of “fitter” organisms (see Alcock, 2005, for many specific empirical examples).

A useful distinction can be made between natural selection proper and sexual selection. According to Darwin (1871), organisms not only compete for environmental resources, they also compete to attract and acquire mates. This process is termed sexual selection and leads to two different types of attributes: 1) attributes that enhance an organism’s ability to compete with members of its own sex for access to mates, and 2) attributes that attract the opposite sex (Andersson, 1994; Andersson & Iwasa, 1996). The first type of attribute is illustrated by the disparity in size between male and female elephant seals. Male elephant seals are an average of three times larger than females because they have a long evolutionary history of competing with each other for access to females (Le Boeuf, 1974). The second type of attribute is illustrated by the peacock’s elaborate train. Although the train appears to have no direct survival function, it serves to attract peahens; therefore, on average, peacocks with large, colorful trains leave more offspring than do those with less elaborate trains (Petrie & Halliday, 1994).

Darwin’s theories established a scientific paradigm for biology, and like all paradigms, it has been continually refined. For example, Hamilton’s (1964) theory of inclusive fitness shifted the focus of biologists from individuals and their direct reproductive success to genes and their differential replication (Griffin & West, 2002). Since genes are the real unit of natural selection, Hamilton argued that biologists needed to pay attention to inclusive fitness rather than direct fitness. If, for example, genes in one organism gave rise to the ability to detect shared genes in another—a brother or sister, son or daughter, cousin or nephew, for example—and also to the propensity to help those genes replicate (under the right circumstances), those genes (because of their phenotypic effects) would be selected for. The theory of inclusive fitness allowed biologists to explain many otherwise puzzling phenomena. To take a familiar example, humans are often willing to make enormous sacrifices for relatives, sacrifices they would not make for strangers or even for friends. Given this reality, it is not surprising that kin terms are universal (Brown, 2004) and are capable of provoking intense emotions (for a readable account of attempts to explain altruism biologically, see Dugatkin, 2006).

I.3 Roots of Sociobiology

Hamilton’s inclusive fitness theory was vitally important because it set the stage for the gene-centered view of evolution, a view that was clarified in the sixties and seventies by Williams (1966) and Dawkins (1976), among others, and provided the theoretical underpinning of modern ET. Also important to ET was the socially oriented biological thinking of Wilson (1975/2000) and Trivers (1971; 1972). Especially relevant are two theories developed by Trivers: reciprocal altruism and parental investment.

Reciprocal altruism consists of delayed but mutual acts of benefaction between organisms (Trivers, 1971). For example, if an animal shares food with another at time x and receives food back at time y, both animals may benefit. Although reciprocal altruism has been reported in animals as diverse as vampire bats (Wilkinson, 1984) and stickleback fish (Milinski, Pfluger, Külling, & Kettler, 1990), primates provide the best documented cases. Primates preferentially groom individuals who groom them; they preferentially support those who support them (Schino, 2007). Reciprocal altruism is important because it allows for the evolution of greater cooperation among non-related organisms, a kind of cooperation that is especially prevalent among humans (Barber, 2004; Lehman & Keller, 2006).

Parental investment explains the diversity of mating strategies in nature (see also Clutton-Brock, 1991; Dunbar, 1995). Because of its complexities, the theory cannot be properly explicated here; however, one important facet of it—an argument that goes back to Darwin (1871)—should be noted. Darwin argued that when choosing mates the sex that invests more in its offspring will be more discriminating. By definition, females produce larger gametes which require higher initial investment than do male gametes. This difference leads to adaptive strategies of high relative mating effort in males and high relative parental effort in females (Low, 2000). In many animal species, males invest enormous amounts of energy attempting to attract and procure mates—the elaborate bower of the bower bird, the huge train of the peacock—while females invest vast amounts of energy in birthing and caring for their offspring. In some cases,

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2 It is important to remember that the theory of evolution by natural selection was co-discovered by Charles Darwin and Alfred Russel Wallace. However, Darwin took the theory further and discovered the principles of sexual selection (Larson, 2004).

3 Hamilton’s rule for these conditions can be stated more formally: $C < R \times B$. Where $C$ is the cost in fitness to the actor, $R$ is the coefficient of relatedness between the actor and the recipient, and $B$ is the benefit in fitness to the recipient.
in fact, the male’s investment ends at copulation (Møller & Thornhill, 1998). Although humans show a large degree of biparental care, there is still a significant sex difference in parental investment. More importantly, there is a significant sex difference in the minimum possible parental investment. Women always bear the risks of pregnancy and the exorbitant energetic costs of bringing a fetus to term (Symons, 1979). Due to these sex differences, women are predicted to be choosier about whom they mate with than men, a prediction that has been amply demonstrated (Clark & Hatfield, 1989; Schmitt et al., 2003; McBurney, Zapp, & Streeter, 2005).

I.4 What Is an Adaptation?

Although nearly impossible to offer an exact, noncontroversial definition of adaptation, it is not difficult to forward a useful, working definition. An adaptation is an inherited attribute that developed through the processes of natural or sexual selection because it helped an organism interact more effectively with the environment and with other organisms, including conspecifics (Williams, 1966; Buss, Haselton, Shackelford, Bleske, & Wakefield, 1998). Some adaptations are quite clear and easy to discern. Take, for example, the cheetah’s running ability. Cheetahs’ bodies have been carefully refined by millions of years of natural selection to support and produce bouts of incredible running speed (Taylor & Rowntree, 1973). Other adaptations are more difficult to demonstrate. This is often the case when considering possible psychological adaptations. In these cases, it is important to collect a wide variety of evidence from multiple sources to reach convergent conclusions. It is also necessary to test plausible counterhypotheses.

To illustrate, consider the case of men’s age preference for potential mates, which is sometimes considered a product of socialization (Eagly & Wood, 1999). Using evolutionary logic, it is plausible to hypothesize that men will find women who have high reproductive value (ages circa 18–30) more attractive than other women (those outside of the age group). To establish the validity of this hypothesis, ETs use convergent data (Schmitt & Pilcher, 2004). For example, data from Western societies demonstrates that adolescent men prefer substantially older women as dating partners (Kenrick, Keefe, Gabriellidis, & Cornelius, 1996), while cross-cultural self-report, questionnaire, personal advertisement, and marriage license data indicate that older men prefer substantially younger women (Buss, 1989; Kenrick & Keefe, 1992). Ethnographic evidence from the Hadza—a hunter-gatherer society from Tanzania—also supports the hypothesis: Hadza men prefer young, fertile women (Marlowe, 1998, 2004). Taken together, the evidence shows that men do not simply prefer younger women; they prefer women in a specific age range. This data is difficult to account for from a sociocultural perspective because it shows that men’s preferences are age-specific and exist in societies untouched by Western media. Convergent data, therefore, allow ETs to falsify plausible counterhypotheses (the sociocultural hypothesis, for example), thus providing firmer support for their own (the age-specific adaptation hypothesis).

I.5 Adaptationism

According to ET, human behavior is most profitably studied from an adaptationist perspective (Tooby & Cosmides, 2005). Adaptationism is a heuristic that involves looking at physiological and psychological mechanisms and asking what their function or purpose is (Resnik, 1997). For example, most pregnant women worldwide suffer from morning sickness. The adaptationist perspective assumes that a universal, costly phenomenon such as this serves a purpose (i.e., aids in survival and/or reproduction). Although there is no universal agreement on the root cause of morning sickness, the adaptationist perspective has generated plausible hypotheses that are currently being tested. A leading candidate is that morning sickness protects the developing embryo from harmful toxins and microorganisms (Flaxman & Sherman, 2000, 2008). As adumbrated above, adaptationist hypotheses are subjected to rigorous testing before achieving provisional acceptance. This perspective has been criticized (see, for example, Gould, 1997), but it follows logically from two facts: 1) Natural selection is the only known process that creates biological order and function, and 2) All behavioral and cognitive processes point toward organized substrates or mechanisms, whether physiological or psychological, that play an important role in the explanation of human behavior. Even Skinner’s brand of behaviorism implied the existence of adaptations for operand conditioning (Skinner, 1974; Buss, 1995), some perhaps quite complicated. This does not mean that every particular behavior is an adaptation in itself (Atran, 2005). There is, for example, no adaptation for being a fan of the Los Angeles Lakers. Or, even more extreme, there is no adaptation for being disgusted by spider x at time y. It is probable, on the other hand, that there is a general adaptation for fearing or being disgusted by spiders (Buss, 1995; Vernon & Berenbaum, 2002), and that there are adaptations for coalitional reasoning, which are co-opted by team sports (Wrangham, 1999; Kurzban, Tooby, & Cosmides, 2001; Wagner, Flynn, & England, 2002; Winegard & Deane, 2008). Adaptationism has proved to be a powerful tool in analyzing human behavior and is integral to the program of ET.

I.6 Ultimate and Proximate Explanations

ETs study and analyze behavior from a number of different explanatory levels (Tinbergen, 1963; Goetz & Shackelford, 2006). Two of the most fruitful are the proximate and the ultimate (distal). The ultimate level addresses a trait or behavior’s evolutionary function, the proximate the physiological (or psychological) makeup of the particular trait or behavioral mechanism (see figure 1). To consider in more detail, take the example of male status-seeking behavior. There are a variety of ways to explain such behavior from the proximate level: Status and recognition give pleasure; status and recognition give power; status and recognition give access to enjoyable activities. These proximate explanations are all true, but from the ultimate perspective, status-seeking behavior exists because it has a long evolutionary history of translating into reproductive success (Boone,
It is especially important to keep this distinction in mind when analyzing humans because there is a tendency to conflate ultimate evolutionary causes with proximate psychological mechanisms. This leads to strange claims about human motivation that are palpably at odds with empirical evidence, such as that every thing a man does, he does for sexual purposes (Buller, 1999; for an egregious example of this confusion, see Kanazawa, 2007). While this statement may have some validity from the ultimate level of explanation, it is patently absurd from the proximate. Mozart wrote music because he had a passion to do so, not because he desired sex.

Fig. 1. The ultimate level refers to the selection pressures in the past which led to certain traits or behaviors in organisms. The proximate level refers to the psychological/physiological mechanisms that produce the behavior in a specific environment at a specific time. Proximate mechanisms are influenced by various factors such as the environment, cognition, etc. Thus, behavior can be explained from either level without conflict. See text.

I.7 Not All Adaptations Are Currently Adaptive

Because biological evolution occurs relatively slowly, environmental changes can outpace genetic ones. This fact is especially important when considering humans because of our ability to rapidly alter our environment. Our minds were not designed to solve the problems of living in a heavily populated, technological society. For example, even though the risk of being killed by an automobile considerably outweighs that of being killed by a snake (41,611 deaths from motor vehicle accidents in USA in 1999, versus 10-15 per year from snake bites) (National Transportation Safety Board [NTSB], 1999; McNamee, 2001), fear of snakes is a common human phobia, while fear of automobiles is not. Or consider our propensity to eat foods high in sugars, fats, and salts (see figure 2 below). Before the creation of supermarkets and fast food restaurants, ripe fruits and meat from hunted animals provided our ancestors’ with energy-rich, metabolically efficient foods. Because these foods once required considerable effort to acquire, natural selection favored neural systems that rewarded the pursuit and consumption of them (Gerber, Williams, & Gray, 1999). In most modern societies, these foods no longer require effort to obtain. Yet our taste preferences remain and are further exploited by the calculated refinement of various food products, creating an array of tasty snacks (e.g., candy bars, ice cream, potato chips) that tap into our ancestral proclivities. For these reasons, many ETs believe that a search for psychological adaptations should begin with our purported “environment of evolutionary adaptedness” (EEA). This is the environment that our ancestors spent the majority of their existence in; consequently, many current psychological adaptations were shaped by forces that prevailed in the EEA (Barkow et al., 1992; but see Smith, 2000; 2001). It is important to understand that the EEA is not a concrete place in time, but rather a statistical composite of selection pressures affecting a species in its ancestral past. ETs do not believe that one could travel back in time, as it were, and land in the EEA. Whether or not a strong version of the EEA hypothesis turns out to be true, a plethora of evidence indicates that a weaker version will remain necessary to fully understand human behavior (for further discussion, see Crawford, 2000).
Fig. 2. Model depicting the interactive relationship between preexisting adaptations and the modern environment. In this example, the pressure was procuring proper nutrients. This pressure led to a neural reward system for seeking and consuming sugars, salts, and fats. The dashed line represents a break between our ancestral environment and current conditions in the industrialized nations. In the modern environment shown below the dashed line, the same neural reward system is active but many novel foods and technologies exploit it, as shown by the arrow on the left. This is a clear example of social change outpacing genetic change (adapted from Crawford, 1993).

I.8 Concluding Remarks on ET

ET is a theoretical approach that consists of using Darwin’s theories of natural and sexual selection to explain human behavior and cognition. ET uses adaptationism as a heuristic to create hypotheses about the purpose or function of specific adaptations. Importantly, ETs realize that not all adaptations are currently adaptive. This research program has ramifications for all disciplines because humans, whatever else they might be, are the end products of millions of years of natural and sexual selection. Due to this fact, Wilson (1998) advocates the unity of all branches of human study and calls this process *consilience*. ET offers promise that this ambitious goal can be fulfilled (see table 1) (Alcock, 2001).
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II Attacks on Evolutionary Theory

It is perhaps worthwhile to examine the historical reasons for the development of an anti-evolutionary mindset in the social sciences. Many early psychologists and social theorists such as Marx, Freud, Galton, Spencer, James, Shaw, Dewey, Cooley, and Thorndike enthusiastically embraced Darwinism and attempted to use the principles of evolution to sharpen their analyses (Jones, 1980; Degler, 1991). During this period, eugenics was as likely to be embraced by left-wing reformers as by right-wing traditionalists (Kelves, 1985). However, the enthusiasm of left-wing thinkers began to wane in the early twentieth century. In anthropology, Franz Boaz, Ruth Benedict, and Margaret Mead all wrote influential books that assailed the idea of biological universals and ushered in a form of environmental determinism (Richards, 1987). In psychology, a parallel process occurred, with John Watson leading the environmentalists’ cause (Plotkin, 2004). At this point, ET was almost exclusively a right-wing style of thinking as most of the left were won over by theories of environmental determinism. In fact, the ideas of ET and some form of exploitative social order became nearly synonymous, as illustrated by Richard Hofstader’s (1942/1992) warning in the early 1940s that “a resurgence of social Darwinism in either its individualist or imperialist uses is always a possibility so long as there is a strong element of predacity in society” (p. 203). Opposition to Nazism seemed to bury ET, as many saw Nazism as the inevitable outgrowth of biologically oriented theories of social behavior.

For about twenty years after the end of World War II, environmentalism so thoroughly dominated popular thought that most intellectuals accepted it without reflection. The major exceptions to this trend were psychologists influenced by the burgeoning cognitive revolution (Chomsky, 1959; Neisser, 1967). In this milieu, E.O. Wilson (1975/2000) published *Sociobiology*, which became the centerpiece of a new debate about the legitimacy of applying ET to analyses of human social behavior (Segrastâle, 2000). This time, the social sciences were nearly unified in their disdain for and rejection of ET.

This unification, however, was not equal across disciplines. Because psychology had already integrated the nativism of the cognitive revolution, and because it had a tradition of respecting and profiting from biologically oriented thought (e.g., physiology, psychiatry), it was more accepting of modern ET than the other human sciences (Benjafield, 2005; Hunt, 2007). On the other end of the spectrum, sociology was and continues to be strongly opposed to integrating ET into its research program. Ellis (1977), van den Berghe (1990), and Massey (2002) offer several reasons for this. First, many sociologists lack biological competence. Second, sociology has a history of antireductionist thought; therefore, many sociologists argue that the reductionistic strategy of biology is irrelevant for explaining higher-order social phenomena. Third, sociology is an overtly moralistic discipline: Many sociologists show as much concern for a theory’s political significance as they do for its explanatory power (Lopreato & Crippen, 1999).

III General Purpose and Logic of Our Study

We were interested in discerning the reasons for the perpetuation of hostile attitudes toward ET. We assumed that erroneous information was a key factor, as well as exposure to authorities who denigrated ET. Given these assumptions, textbooks were a logical source to examine. A literature review revealed two previous studies relevant to our goal. Cornwell, Palmer, Guinther, and Davis (2005) investigated 262 introductory psychology textbooks over a 30-year span beginning in 1975. They found that 48 percent of the textbooks presented ET in an accurate manner (tabulated from figure 2), while 57 percent presented it in a positive or neutral manner (tabulated from figure 3). In another study, Martin and Machalek (2006) investigated 35 of the top-selling introductory sociology textbooks. Of the sample, 69 percent of the books covered ET. A content analysis revealed that many egregious errors were made in their presentations of ET. Pre-dominante among the errors were charges of genetic determinism and biological reductionism.

Our study expands upon these two studies in important ways. First, we developed a general model to explain and make testable predictions about the perpetuation of errors and hostility toward ET (see figures 3 and 4 below). Second, we quantified specific types of errors and marked their occurrence in the textbooks we analyzed. Third, we compared textbooks from separate disciplines, psychology and sociology. These features of our analysis will help social scientists assess the accuracy of textbooks across disciplines. They also facilitate dialogue about possible ways to solve the problems that arise from the transmission of distorted information about ET.

For several reasons, we chose to focus on sex/gender textbooks. First, previous exposure had convinced us that sex/gender textbooks are especially liable to make erroneous claims about ET. Second, the history of ET led us to believe that politically charged subjects, such as race and sex/gender, are more likely to be presented in a normative framework which distorts science (e.g., Fausto-Sterling, 1992; Hubbard, 1997; Rushton & Jensen, 2005). Third, ET provides a powerful framework for generating novel theories about sex differences. ETs have used these theories to create and test a wide variety of interesting predictions about sex differences in cognition and behavior (e.g., Geary, 1998; Kimura, 1999; Halpern, 2000; Buss, 2003). Thus, it is important that sex/gender researchers and students become acquainted with accurate presentations of ET.

IV Hypothesis and Predictions

Below, we develop a general model to explain the continuing ignorance of and hostility toward ET in the social sciences. Specifically, we suggest that there is a self-perpetuating cycle, led by social science faculty, which results in the transmission of biased information about the basic tenets of ET (figures 3 and 4). Our model can be broken down into a few basic components.

*IV. 1. Antecedent Factors*
Social science professors’ attitudes toward various theoretical perspectives do not develop in a vacuum. We posit four general factors which influence knowledge of and attitude toward ET. 1) **Biological Illiteracy**: Since biology is not a regular part of the curriculum of the social sciences, many professors are functionally illiterate about the basic tenets of ET. 2) **Historical Contingency**: The historical trajectory in many of the social sciences has moved toward environmentalist explanations of social behavior and away from biological or genetic explanations (Degler, 1991; Lopreato & Crippen, 1999). 3) **Anti-Reductionism**: As noted above, many social scientists, especially in sociology, distrust reductionism in science, believing that social phenomena must be explained by social factors (Durkheim, 1895/1982). Thus, the search for the biological underpinnings of social behavior appears fruitless or even dangerously misguided. 4) **Moral/Political Factors**: Many of the social sciences are populated by scholars who see theory as a tool to fight for social justice (Sowell, 1987; Lipset, 1994). This, combined with skepticism about the possibility of scientific objectivity, has led to suspicion of ET and consequently its lack of use as a major theoretical perspective (see section II) (Sanderson & Ellis, 1992).

**IV. 2. Faculty and Textbook Selection**

The antecedent factors listed above give rise to faculty members who display negative attitudes toward ET. These faculty members are likely to select textbooks which reflect their own ideological positions; thus textbooks which contain accurate, non-hostile summaries of ET are unlikely to be used in social science classrooms. Previous studies of textbooks suggest this is indeed the case (Cornwell et al., 2005; Martin & Machalek, 2006). It is important to emphasize that most social science professors probably select textbooks based on their popularity and/or general ideological orientation, rather than what the textbooks explicitly say about ET. However, due to the general ideological predilections of many social scientists, this selection process automatically eliminates the textbooks which portray ET in a positive manner. For example, a textbook written from a Marxist or symbolic interactionist perspective is unlikely to present ET and, if it does, unlikely to present it accurately.

**IV. 3. Students**

We do not assume that students come into the social sciences with negative attitudes or intrinsic antipathy toward ET. In fact, it seems probable that most social science students lack knowledge of biology, or, at most, have nominal biological literacy (Uno & Bybee, 1994; Wright & Klymkowsky, 2005). This lack of knowledge makes undergraduate textbooks extremely powerful tools for the pedagogical transmission of information about ET. If most textbooks are hostile and/or inaccurate, then students will more than likely misunderstand ET and harbor hostility toward it. Most of these students will leave academia, but a few, who have absorbed the dogmas of their discipline, will continue on to become researchers and teachers.

**IV. 4. A Cycle of Hostility**

The components of our model described above create a cycle of hostility toward ET: Faculty who are hostile select more hostile and less accurate textbooks and assign them to students who, in turn, become hostile. Some of these students become professors who then perpetuate erroneous views of ET by selecting similarly inaccurate and hostile textbooks.

Four testable predictions can be derived from this model (Figures 3 and 4): (P1) Sex/gender textbooks will systematically misrepresent ET as measured by number of types of errors made and attitude; (P2) Sex/gender textbooks with higher levels of hostility will make more types of errors when discussing ET; (P3) Sex/gender textbooks that are more popular will make more types of errors when discussing ET than less popular textbooks; (P4) Sociology sex/gender textbooks will contain more types of errors and display more hostility than will psychology sex/gender textbooks (see section II for background).
Fig. 3. General model of self-reinforcing ignorance of and hostility toward ET. See text and figure 4 below (adapted from Ellis, 1996).

Fig. 4. Continuation of figure 3. See text.
V Materials and Methods

V. 1. Textbook Selection

We began identifying social science textbooks focusing on sex and/or gender by contacting Monument Information Resource (MIR), a company that compiles information on undergraduate textbook usage in the United States. MIR provided us with separate databases for all psychology and sociology courses taught in the fall of 2007 with titles similar to "Sex and Gender," "Women's Studies," and "Human Sexuality." For each course, information was provided on the institution where the course was taught, the course title, the instructor, the expected enrollment, and any required or recommended books. For both psychology and sociology databases, we sorted the books by title and used online resources, such as reviews and publisher's descriptions, to initially identify introductory textbooks to sex and gender that were broad in scope, including discussions of both social and biological factors that influence gender-differentiated behavior. We excluded textbooks published prior to 1995, edited volumes, encyclopedias, readers or article compilations, specialized academic books (e.g., those on sexual violence, human sexuality, gender and aging, gender and religiosity, gender and math, gender and labor markets, gender and group processes), and non-academic books (e.g., those marketed toward parents or lay audiences). In cases where it was unclear if a book was appropriate, we obtained it and collectively made a judgment. We selected the nine most popular psychology textbooks and the six most popular sociology textbooks. Future studies will examine books that are less widely used.

We obtained rankings of each textbook's popularity by summing the student enrollment in all courses where the textbook was required or recommended in the 2007 academic year. For the textbooks used in our sample, the mean expected student usage per semester was 2,990; the median was 2,180 (see Appendix A for the list of textbooks included in the sample). After obtaining the textbooks, we began the coding process.

V. 2. Procedure for Coding Texts

In order to find the pages in the textbooks that covered ET and code them, we developed a list of six key words (evolution, Darwin, natural selection, sexual selection, biology, evolutionary psychology, and sociobiology) and used the index to sum the number of pages mentioning these terms. These sections of the text were analyzed and coded; all other pages were excluded.

V. 3. Procedure for Coding Errors

We made a list of seven common and egregious errors that social scientists are suspected of making when discussing ET. The list was compiled by consulting popular evolutionary psychology textbooks. In these textbooks, readers are clearly told to avoid the errors that we compiled (Cartwright, 2000; Bridgeman, 2003; Buss, 2008).

V. 4. The Coded Errors

Below is a list of the seven errors we coded and an explanation and example of them. Note that biological determinism, naturalistic fallacy, and intentionalistic fallacy are errors wrongly attributed to ET, while mechanical demonstration, moralistic fallacy, conservative agenda, and ad hominem are errors or fallacies used to argue against ET. Some specific textbook examples are provided in Appendix A.

1. Biological Determinism. The assertion that biology can explain all social behavior and that humans are entirely determined by biological forces. For example, the claim that war is inevitable because it is hardwired.

2. Naturalistic Fallacy. The assertion that what exists is either somehow good or right simply because it exists. For example, the claim that inequality is justified because it currently exists and has existed for many years.

3. Mechanical Demonstration. The assertion that if a scholar lacks knowledge of the specific proximate mechanism for a behavior, then that scholar is unable to legitimately make any claims about the evolutionary function of the behavior. For example, the claim that we cannot reasonably discuss the evolutionary function of human food preferences because we do not have knowledge of the specific physiological pathways involved.

4. Moralistic Fallacy. The assertion that what is deemed good must be able to exist and that any theory that circumscribes its possibility cannot be true. For example, the claim that there are no sex/gender differences because such differences are judged undesirable and are thought to have negative political ramifications.

5. Conservative Agenda. The assertion that ETs have a conservative and/or right-wing political agenda and that this agenda significantly influences their research. For example, the claim that scholars should ignore ETs because they are used or have been used to justify the status quo, and that the ETs themselves either openly or secretly favor this.

6. Ad Hominem. An attack aimed at a person rather than an argument. For example, the claim that people should ignore the work of scholar X because he hates women.

7. Intentionalistic Fallacy. The assertion that humans intentionally and consciously attempt to enhance their inclusive fitness. For example, the claim that the existence and usage of contraceptives disproves ET's account of the evolution of sexual motivation.

When coding the textbooks for errors, we accepted a statement as fitting one of the seven only if it was explicit. Where there was ambiguity we erred on the side of not coding the passage as an error.

V. 5. Attitude Ranking

We coded the attitude of the textbooks on a 5-point Likert scale with 1 being extremely hostile and 5 extremely positive. Here we used the general tone of the text. Importantly, we understood attitude and accuracy to be independent constructs with no a priori relationship. For
example, consider the following passage:

Thus males are hardwired genetically to be promiscuous sexual predators, ever on the prowl for new potential sexual conquests, whereas females have a built-in biological tendency toward monogamy, fantasies of romantic love and commitment coupled with sexual behavior, and a certain sexual reticence that can be over come only by chivalric male promises of fealty and fidelity. (Kimmel, 2008, p. 24)

Regardless of whether or not it is an accurate presentation, the hostile rhetoric would receive a one on the attitude scale. On the other hand, the next passage, although inaccurate, is not written in a hostile tone and would receive a neutral (three) score:

The theory [sociobiology] implies that such human social behaviors as war, rape, and racism have been "built in" through our evolution and that it is impossible to make fundamental changes in the relations between the sexes. (Lips, 2005, p. 77)

When giving a final score for each textbook, we averaged over the entire section as identified by our search criteria. Therefore, one or two passages were not given undue consideration and were treated equally with all other passages in the section.

V. 6. Coder Reliability

We used two coders, one of whom coded seven textbooks while the other coded ten. Two textbooks were coded independently to check for reliability. Coding of the two texts was identical for errors and the correlation for attitude ratings was very high.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Discipline</th>
<th>Attitude</th>
<th>Types of Errors</th>
<th>Popularity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kimmel, M.S. (2008)</td>
<td>Soc</td>
<td>1</td>
<td>3, 5</td>
<td>8</td>
</tr>
<tr>
<td>Lindsey, L. (1997)</td>
<td>Soc</td>
<td>1</td>
<td>3, 5</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: Attitude: 1 = extremely hostile, 2 = extremely positive. Types of Errors: 1 = biological determinism, 2 = naturalistic fallacy, 3 = mechanical demontration, 4 = essentialist fallacy, 5 = conservative agenda, 6 = ad hominem, 7 = intuitionist fallacy. Popularity refers to the textbooks' student usage.

![Fig. 5](image-url) The number of types of errors in a textbook is listed on the x-axis, while the number of books is listed on the y-axis.
We began our analysis by tabulating the number of types of errors made in each textbook and ranking their attitude toward ET (P1). As predicted, most of the textbooks made multiple types of errors (see figure 5). Of our sample, only three made no types of errors, while twelve made two or more, and one made all seven of the coded types of errors ($M = 2.8$, $Med = 3$, $SD = 1.97$). Most of the textbooks also displayed a hostile attitude toward ET ($M = 1.87$, $SD = .64$). Four textbooks displayed extremely hostile attitudes, while the most favorable attitude displayed was neutral and occurred in three textbooks (see section V.5).

We then examined each of our remaining predictions. As predicted (P2), textbooks with higher hostility rankings (lower score on the attitude scale) made more errors ($r = -.59$, $p = .018$). This relationship was statistically significant.

Also as predicted (P3), textbooks with higher student usage made more errors (See figure 6) ($r_s = -.42$, $p = .11$). This relationship was not quite significant.

Finally, as predicted (P4), sociology textbooks averaged more types of errors (see figures 7 and 8) (sociology: $M = 3.83$, $SD = 1.94$; psychology: $M = 2.11$, $SD = 1.76$). Specifically, more sociology books contained types of errors 1, 2, 4, 5, and 6 (see table 2). A large disparity is shown for types of errors 2, 4, and 5, as expected from our historical analysis of sociology’s relationship with ET. Sociology textbooks also showed higher levels of hostility ($M = 1.5$) than psychology textbooks ($M = 2.1$).

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**Fig. 6.** The number of types of errors the book made is on the x-axis, while the books popularity ranking is on the y-axis.
Fig. 7. The specific error is listed on the x-axis, while the percentage of books making the error is on the y-axis. The textbooks are split between sociology and psychology for comparison.

Fig. 8. Comparison of the mean number of errors made by sociology and psychology textbooks.
VII Specific Discussion

ET provides a powerful metatheory for the social sciences because of its unique ability to explain many components of human cognition and behavior. We believe that much of the current resistance to ET stems from misunderstandings rather than willful negligence and distortion. In this study, we developed a model to explain this phenomenon, hoping that knowledge of its causes might help stop its perpetuation. Consistent with Cornwell et al. (2005) and Machalek and Martin (2006), we found that textbook representations of ET were hostile and full of various types of errors. Importantly, we found both that more popular textbooks make more types of errors and that more hostile textbooks make more types of errors. This provides strong support for our general model and also for our belief that hostility toward ET is based primarily on misunderstanding rather than willful distortion.

Our model can also clarify the types of errors expected to occur in different disciplines, as shown by our results. For example, the types of errors made by sociology textbooks are not random, but rather related to certain ideological predilections. Moral/political factors play a large role in sociology and the errors that sociology textbooks made are clustered around these concerns (see figure 7). Interestingly, the types of errors made more by psychology textbooks are related to specific concerns expected from psychologists, including empirical rigor and attention to proximate (psychological) behavioral mechanisms. This suggests that ETs should address discipline-specific concerns in an effort to facilitate understanding. It also suggests that our model could be refined by adding more antecedent factors.

In future research, we plan to improve our attitude rankings by having undergraduate students, blind to our hypotheses, read and code appropriate textbook passages. We also plan to study the long-term effects of exposure to different textbooks. For example, does the incoming sociology student have a more favorable attitude toward ET than a graduating sociology student? Does this process intensify in graduate school? And if it does, are the causes the same? Another interesting question is whether the distortions of ET are traceable to only a few scholarly sources or whether they are widely dispersed. Cornwell et al. (2005) began this process by looking at which scholars were cited in the ET sections of introductory psychology textbooks. They found a few scholars had undue influence, and we suspect that the same is true in most textbooks.

VIII General Discussion

Denis Diderot, an Enlightenment philosopher, explained that “all things must be examined, debated, investigated without exception and without regard for anyone’s feelings” (Diderot, 2008). His sentiment nicely summarizes the spirit of scientific inquiry, a spirit most people consider vital for political, intellectual, and personal development. Yet, as our results show, this spirit has been thwarted in the most important area of all: the social sciences. Regardless of political interests or ideological commitments, few would argue that this should be applauded. What is worse, ET is not an abstract theory of interest to academics alone; it has ramifications that touch aspects of everyone’s lives (Wilson, 2007). Without lucid, error-free presentations of ET, thousands of students are introduced to a distorted caricature and are unable to accurately and independently assess the value of ET. Even those who most oppose ET should lament this because it curdles conversation and disallows legitimate argument. The best way to discover the shortcomings of a theory is to allow as many scholars as possible a fair chance to scrutinize it. Science at its best is a truly communal undertaking; theories are erected and refined by myriad people and should be blind to individual concerns or prejudices. The integrity of this undertaking is damaged when biases are allowed to seep in that affect the presentation of scientific information. Finally, it is important to iterate that science itself is neutral about what ought to be done in the world. Science can only inform us about the way things are.
Appendix A.

What do introductory evolutionary psychology textbooks say? A small, qualitative example of how evolutionary theory is misrepresented in mainstream textbooks on sex/gender.

Note: All mainstream textbook quotes are taken from textbooks which were included in our sample. Rebuttal quotes are taken from nine of the most popular introductory evolutionary psychology textbooks. A full list of all textbooks used appears at the end of the appendix.

<table>
<thead>
<tr>
<th>What the ‘Mainstream’ Textbooks Say Genetic/Biological Determinism</th>
<th>What Evolutionary Theorists Actually Think, as Indicated by Introductory Evolutionary Psychology Textbooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Thus males are hardwired genetically to be promiscuous sexual predators, ever on the prowl for new potential sexual conquests, whereas females have a built-in biological tendency toward monogamy, fantasies of romantic love and commitment coupled with sexual behavior, and a certain sexual reticence that can be overcome only by chivalric male promises of fealty and fidelity&quot; (Kimmel, 2008, p. 24).</td>
<td>“Much of the resistance to applying evolutionary theory to the understanding of human behavior stems from the misconception that evolutionary theory implies genetic determinism. Contrary to this misunderstanding, evolutionary theory in fact represents a truly interactionist framework” (Buss, 2008, p. 18).</td>
</tr>
<tr>
<td>“According to this approach [the evolutionary approach], the power differences between the sexes are not the result of learning or culture but the natural and inevitable outcome of our genetic heritage” (Lips, 2005, p. 75).</td>
<td>“. . . The genetic fallacy is the mistaken idea that genes are destiny, that genetic traits cannot be changed” (Gaulin and McBurney, 2004, p. 78).</td>
</tr>
<tr>
<td>“Essentialism also implies that patriarchy is the only system that’s ever been since what makes something ‘essential’ is its universal and inescapable nature” (Johnson, 2005, p. 52).</td>
<td>“The idea of genes controlling behavior suggests the image of the robot-welders nowadays used in car factories. . . . Robot welders . . . are computer controlled, and execute a precise and unchanging sequence of actions. They respond to their programming very much as a puppet responds to the person pulling the strings. But this image of puppet-on-a-string control by genes is as wrong as the view that the physical form of an organism is preformed and mapped by its genes” (Badcock, 2000, p. 65).</td>
</tr>
<tr>
<td>“Body-machine models of gender assume that the machine runs by itself: that biological causation is independent of society” (Connell, 2002, p. 32).</td>
<td>“Evolutionary psychologists firmly reject both genetic determinism and environmental determinism and, instead, contend that both genes and environment must be considered in understanding the human mind” (Rossano, 2003, p. 28).</td>
</tr>
<tr>
<td>“Evolutionary psychology holds the essentialist view that some ‘essence’ or underlying</td>
<td>“Human behavior and psychology are the products of evolution and can be investigated</td>
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</table>

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biological component makes men and women different” (Brannon, 2007, p. 1).

profitably using an evolutionary framework, although any approach that ignores the fact that culture is an integral part of the biological process will, of necessity, be incomplete” (Barrett, Dunbar, & Lycett, 2002, p. 21).

“When evolutionary psychologists discuss the effect of genes on psychology they think in terms of predispositions rather than causes. Genes do not cause men to commit violent acts; if they do anything they predispose men to such acts; whether men actually carry them out will depend on their life Histories, cultural contexts and other genetic predispositions (such as conscience)” (Workman and Reader, 2004, p. 25).

<table>
<thead>
<tr>
<th>Naturalistic Fallacy</th>
<th>Evolutionary Theorists’ Response</th>
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</thead>
<tbody>
<tr>
<td>&quot;Second, and perhaps more importantly, this argument implies that the contemporary Western model of gender relations is the only correct or appropriate model because it is natural and adaptive . . .&quot; (Renzetti &amp; Curran, 2003, p. 58).</td>
<td>“Most important, discoveries in a Darwinian world about the natures of the sexes have no direct implications whatever for how they should live and relate to one another” (Bridgeman, 2003, p. 21).</td>
</tr>
<tr>
<td>&quot;Although Buss occasionally says that he is not justifying those kinds of behavior and acknowledges that there is some variability within the sexes, he spends far more time and energy explaining why these patterns are necessary to preserve the human species” (Caplan &amp; Caplan, 1999, p. 18).</td>
<td>“Examples can be found in nature of almost any conceivable social system or pattern of individual behavior, but this does not mean that these are good or desirable patterns for human behavior. Who, for example, would hold up the dung beetle as an example of an ideal natural diet for humans” (Palmer and Palmer, 2002, p. 12)?</td>
</tr>
<tr>
<td>&quot;And if we believe in evolution, essentialism backs us into the corner of arguing that privilege and oppression are actually a positive adaptation, that societies organized in this way will thrive more than those that aren’t” (Johnson, 2005, p. 52).</td>
<td>“The naturalistic fallacy is a straightforward concept: one cannot logically deduce moral tenets from the natural state of the world. In other words, recognizing that something is natural does not necessarily imply that it is good or moral. It is often said that the is of nature should not be confused with the ought of morality. Most evolutionary biologists are quite clear on this issue” (Rossano, 2003, p. 49).</td>
</tr>
<tr>
<td></td>
<td>“Evolutionary psychology explains behavior; it does not justify it. In a nutshell, the naturalistic fallacy confuses is with ought. It</td>
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<tr>
<td>Political Ramifications</td>
<td>Evolutionary Theorists’ Response</td>
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<tr>
<td>&quot;Evolutionary biologists since Darwin have abandoned the more obviously political intentions of the social Darwinists, but the development of a new field of sociobiology in the 1970s revived evolutionary arguments&quot; (Kimmel, 2008, p. 24).</td>
<td>&quot;Many believed that applying biological principles to humans was a way of advocating the doctrine of genetic determinism and therefore supporting the maintenance of the status quo. In the case of the industrialist Social Darwinists, the Eugenicists, and many others who distorted evolutionary theory to suit their own agendas, the latter charge was certainly true” (Palmer &amp; Palmer, 2002, p. 12).</td>
</tr>
<tr>
<td>&quot;It is hardly a coincidence that this depiction of prehistoric social life bears an uncanny resemblance to the traditional, middle-class nuclear family of Western Societies” (Renzetti &amp; Curran, 2003, p. 57).</td>
<td>“Evolutionary psychology is controversial in some circles. Some psychologists oppose it strongly, others are skeptical, and others are just becoming aware of its existence. There are a number of reasons for this state of affairs, including the indisputable fact [sic] some people have seriously misinterpreted evolutionary ideas to excuse such evils as racism, sexism, and social injustice in general. Make no mistake: We reject repression in all its many forms” (Gaulin and McBurney, 2004, p. 23).</td>
</tr>
<tr>
<td>&quot;More importantly, biological determinism ushers in social and political conservatism&quot; (Lindsey, 1997, p. 47).</td>
<td>&quot;If there is a universal human nature with an evolutionary (and therefore genetic) foundation, then is evolutionary psychology providing scientific endorsement to social inequity? For example, suppose we find evidence that men and women have different evolved tendencies, with men being more aggressive and competitive and women more nurturant and verbal. Does this mean that we are providing scientific evidence that men should be soldiers and CEOs and women should be nurses and teachers (or stay-at-home moms)? Evolutionary psychologists would respond with an emphatic ‘no’ . . .” (Rossano, 2003, p. 48).</td>
</tr>
<tr>
<td>&quot;Biological determinism and reductionism have been especially rampant in the discussion of gender and race differences, and they have been the basis for conservative views about the proper role for women and racial-ethnic groups in society” (Anderson, 2006, p. 25).</td>
<td>“In a way this [that evolutionary theory defends the status quo] is a leftover reaction to the failed movement of social Darwinism. The</td>
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</tbody>
</table>
fallacy in this stance is similar to that of genetic determinism in dealing with diseases or disabilities, because genes work in environments, and only by understanding the genes can we change our environments in such a way that our genes work for us rather than against us. By knowing how we are made we can improve the quality of life” (Bridgeman, 2003, p. 19).

“An exposé of the political abuse of evolutionary ideas may suggest that there is some sort of natural and therefore suspicious affinity between Darwinism and unacceptable political philosophies. Here, we should be wary. Scientific ideas can be taken up into pre-existing debates without inspiring them, and indeed with little logical connection to them. Sexism, racism, militarism, and imperialism, for example, all existed before the Darwinian revolution and will probably exist for a long time thereafter” (Cartwright, 2000, p. 337).

“Knowledge about our evolved psychological adaptations along with the social inputs that they were designed to be responsive to, far from dooming us to an unchangeable fate, can have the liberating effect of changing behavior in areas in which change is desired” (Buss, 2008, p. 19).

<table>
<thead>
<tr>
<th>Miscellaneous</th>
<th>Evolutionary Theorists’ Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Most sociobiologists ignore the chimpanzee because she is notoriously promiscuous&quot; (Lindsey, 1997, p. 47; for the same argument see Hyde, 2007, p. 52).</td>
<td>Total pages textbook devotes to chimpanzee as summed from index:</td>
</tr>
<tr>
<td></td>
<td>Badeock, 2000: 5 pages</td>
</tr>
<tr>
<td></td>
<td>Barrett, Dunbar, &amp; Lycett, 2002: 7 pages</td>
</tr>
<tr>
<td></td>
<td>Bridgeman, 2003: 13 pages</td>
</tr>
<tr>
<td></td>
<td>Buss, 2008: 11 pages</td>
</tr>
<tr>
<td></td>
<td>Cartwright, 2000: 7 pages</td>
</tr>
<tr>
<td></td>
<td>Gaulin &amp; McBurney, 2004: 0 pages</td>
</tr>
<tr>
<td></td>
<td>Palmer and Palmer, 2002: 1 page</td>
</tr>
<tr>
<td></td>
<td>Rossano, 2003: 57 pages</td>
</tr>
<tr>
<td></td>
<td>Workman &amp; Reader, 2004: 3 pages</td>
</tr>
</tbody>
</table>
List of Evolutionary Psychology Textbooks Used


List of 15 Most Popular Textbooks on Sex/Gender (Data Calculated from MIR)


REFERENCES


Kanazawa, S. (2007). The evolutionary psychological imagination: Why you can’t get a date on Saturday night and why most suicide bombers are Muslim. *Journal of Social, Evolutionary, and Cultural Psychology*, 1, 7-17.


