Problems in sexual selection theory and neo-Darwinism

Jerry Bergman

Sexual selection is a process whereby organisms can directly influence each other's evolution by selecting certain traits in their mates, and as a result, these traits will be more likely to be passed on to their offspring. Darwin concluded that sexual selection played a major role in evolution and cited many examples. A review of this theory, and especially Darwin's examples, indicates that it has a limited and, at most, minor role in altering gene frequencies. Evolution theory also has failed to explain the origin of sexual dimorphism. The Creationist model proposes that the sexes were designed to be different, but also physically and mentally compatible. For humans, a more harmonious physical and mental relationship will result if the couple behaves in harmony with the physical and mental constraints that the design of the sexes produces.

Evolutionary naturalism hypothesizes that all life forms originated from mutations that were selected because of the survival and reproductive advantages they conferred on their owners. Neo-Darwinists must explain the evolution of asexual reproduction and behaviour into sexual reproduction and behaviour. Evolution theory must also explain the many varieties of sexual dimorphism—such as the brightly colored feathers found in one sex, in contrast to the dull color tones that commonly exist in the other sex. The many other sexual variations that exist in nature must also be explained by evolution: in both ant and bee colonies, for example, two different female types exist—the workers and the fertile queen—and also several different male types.[1] The existence of sexual dimorphism is often explained by sexual selection.

The role of sexual selection in evolution

A cornerstone of Darwinian evolution is sexual selection.[2–4] Darwin devoted major portions of both his 1859 and 1871 works to this topic.[5,6] This theory postulates that the evolution of many traits results from the hypothesized tendency of animals to preferentially select mates with certain traits. Thus, selection favours the evolution of all traits that encourage mating, including physical traits. Applied to humans, the theory concludes that women with certain traits would be more apt to be selected by males as mates; thus, a greater percentage of females with these traits would marry (and consequently pass such traits to their offspring).

It has been hypothesized by Darwinists that because men desire certain traits in the women they marry—the most salient is a slender figure of certain proportions—these traits will gradually become more common in females. Darwin concluded that breast size, body hair distribution, eye color, and numerous other traits evolved because of sexual selection.[7] He then extended this conclusion to all animals that reproduce sexually. In the popular and scientific literature alike, almost every trait imaginable is attributed to sexual selection. Women are said to have 'small feet' because 'ages ago men began to admire women with small feet, and married them. Their daughters had small feet'.[8] Similar examples abound today. Among the problems with this example is that, unless the trait is sex-linked such as male pattern baldness, small feet would normally be passed on to children of *both* sexes. Even sex linked traits such as milk production involve genes inherited from both parents.

The major question, though, is 'why would men select small feet as more important than e.g. a belligerent domineering personality?' It would seem small feet as a separate trait would be of little relative concern to most men, or at least would pale in comparison to many other traits (such as the ability to get along with others). The claim that individual traits are selected for is commonly made in the literature and the fact that most traits are determined, or at least influenced, by more than one gene, and also are a result of a complex interaction of the environment and genes, is often ignored or inadequately considered.

The evidence for sexual selection is believed to be greatest among humans, because we are regarded by many

***Figure 1**. Bee colonies have two different female types and several different types of males.*

as the choosiest mate selectors of all living creatures.[9] Yet, no direct evidence of the evolution of any sexual trait due to sexual selection exists in human history.[10] Although in times past mild obesity in women had been associated with increased fertility, numerous contemporary studies have found the most commonly disliked trait in the opposite sex by both male and female humans is obesity.[11–13] Yet obesity in females, especially Western females, is far more of a problem today than ever before in history (over half of the female population in some nations is medically overweight) and dieting books and programs is a billion dollar business. Furthermore, no evidence exists that the genetic factors affecting the size and body proportions of women have changed significantly in a positive direction since about 2000 BC, when useful data first became available.[14]

Many animals show mate-selection preference only for their own species (and many show even less discrimination). To the causal observer, most young healthy animals of the same species look much the same, and only the deformed members usually stand out. Whether or not the differences between one healthy adult lion and other healthy lions are significant enough to affect mating, is an area that needs to be more carefully studied. Many creatures, such as many insects and other small animals appear to be morphologically largely identical except for certain neutral identifying spots and minor hair colour variations. If mate selection is based on physical traits, and, if so, what traits they discriminate, needs to be more carefully researched.

Evidence exists that more physical trait variations exist in humans than in most animals, and most animals are far less particular in mate selection than humans.[15,16] Many animals, both tame and wild, regularly try to mate with a wide variety of animals of both sexes, even with those which they cannot produce offspring and those that are unlikely candidates.[17,18] Williams adds that, although many examples of mate monogamy exist in wild animals, such as the coyote and Canadian Goose, 'The greater promiscuity of the male and greater caution and discrimination of the female is found in animals generally'.[19]

Although sexual selection is thought to be more important among humans than in most animals, humans as a whole show little evidence of its effects in the long term. In Jones' words,[20] 'There is little evidence (in spite of much prurient speculation about beards, breasts and buttocks) that' these attributes are influenced by sexual selection. In addition, sexual selection based on attractiveness would serve to reduce physical differences among humankind, because perceptions of attractiveness are remarkably consistent across a society and, to a large extent, across cultures and races.

A major factor working against sexual selection among humans is the fact that the vast majority select a mate to reproduce (or try to reproduce) with and thus *almost all persons are selected*. About 95% of all people in the West marry before age 50 (U.S. Bureau of Census, 1995), and the percent is even higher in most other cultures including China, India, and in all Muslim countries where having children is seen as a societal obligation. Even many of those who do not marry have children (and many more attempt to) in their lifetime. People of higher socioeconomic status often have smaller families and, for various other reasons, have *fewer* children than average.[21] For this reason, a *negative* correlation tends to exist between family size and educational level, socioeconomic status, intelligence, and occupational prestige.[22]

Wide-spread doubt about sexual selection

Although Darwin's sexual selection concept was a cornerstone of his theory, many well-known biologists never accepted it. Rice stated, 'Sexual selection is relegated by many to the rank of a somewhat doubtful hypothesis rather than theory'.[23] Smith even concluded that its lack of acceptance is why Darwin's sexual selection idea has received comparatively *little* attention from contemporary biologists.[18] He also claimed that in *no case* has it been demonstrated scientifically that sexual selection in wild populations has significantly changed an animal's physical traits.

This conclusion is not unexpected, because it would be necessary to show not only that the females selected males with certain traits in preference to those without those traits, but also as a result of the males choosing these females, they produced, on the average, a *larger* number of offspring. Even if sexual selection could be shown by this method, the influence of rape, called nonconsensual sexual activity in biology, is common among certain animals such as birds and even many primates.[24] This behaviour would work against sexual selection or, at the least, would complicate it because in rape one partner does not consent and, presumably, is therefore selection is not made on the basis of trait discrimination.

Furthermore, according to a symposium at the annual meeting of the *American Association for the Advancement of Science* on 17 February 2002, many biologists now feel that Darwin's sexual selection theory requires 'sweeping revisions'.[25] Stanford University biologist Joan Roughgarden concluded that 'a great deal of empirical evidence exists that refutes Darwinian sexual selection'.[26] One problem that she noted was the fact that the research supporting sexual selection 'may have been skewed by Darwinian biases'.[25] Her latest work covers the evidence for the 'sweeping revisions' that she feels are needed in sexual selection theory. The work of primatologists, including Sarah Blaffer Hrdy, Frans de Waal, Barbara Smuts, Patricia Gowaty, Meredith Small, and Jane Goodall, have all been critical in demolishing Darwin's theory of sexual selection, or at least in greatly modifying it. For example, recent studies of primates ranging from rhesus monkeys to chimpanzees have found that females commonly seek to mate with low-status, low-hierarchy males, which is the opposite of what was predicted by Darwinism and assumed to be true for decades.[27]

Sexual selection: the putative cause of the evolution of

sexual dimorphism

The origin of sex is a critical issue because sexual dimorphism is common in all higher animal phyla. The three major explanations for sexual dimorphism are sexual selection, intraspecific niche divergence and ecological competition.[28] Darwin tried to use sexual selection to explain most physical and behavioural sexual dimorphic differences. This included not only hunting skills and obvious secondary sexual characteristics, but also the high female voice and singing ability which, like her typically smaller body size,

> ' … seemed childlike, unthreatening, [and therefore] more sexually attractive. If so, those who retain high pitch at puberty made more desirable mates. Darwin agrees. In *The Descent of Man* he says that the first females used their high voices as musical instruments and ... we may infer that they first acquired musical powers in order to attract the other sex.'[29]

The high pitched female voice would appear to be a comparatively minor sexual attraction factor, even in cultures that have come to value this trait. Fisher also concludes that sexual selection evolved males that were

> 'good hunters and dependable providers ... [and] that could get along with other males and had self-confident, alert, amiable, popular personalities … [and also] large, strong males must have been in demand, too, because men are on the average 20 percent larger than women—a sexual dimorphism apparent in humans around the world.'[30]

The fact that most early evolutionists have argued that males were more evolved, but some have argued that, among mammals at least, human females were evolutionarily superior reveals the level of subjectivity of this field.[31,32]

Why sexual selection cannot produce evolution

Although sexual selection is believed to be an important component in the mating decisions of a variety of species, it can select *only* for traits that already exist and for which it is programmed to select.[33] Selection *requires* an inborn preference for certain traits (which also has to be explained by selection). If no preference for certain traits exists there can not be Darwinian sexual selection. The fact that reproduction in many mating situations has little to do with selection argues against this. For example, wild pregnant mice will often spontaneously abort her litter as the result of the scent of a new male that enters her territory is a case where no selection occurs but the female simply is responding to the scent of a male. Sexual selection does not explain sexual dimorphism for other reasons:

> ' … another baffling and subtle problem [is]—if sex, why sexes? If recombination, the shuffling together of the genetic material of two individuals, is such a good thing, why has evolution not come up with a scheme which allows everyone to mate with everyone else? As we are limited in our choice of partners to those of a different sex, having just two sexes seems to be very inefficient. Nearly all organisms (with the exception of a few single-celled creatures which have up to six sexes) exist as just males and females. This means that only half the population is available as a potential mate.'[34]

A major problem with the sexual selection hypothesis is that natural selection would actually select *against* sexual selection. The *more choosy* persons are about their mates, the *less likely* they are to mate and, thus, are less likely to pass on this trait to their offspring. Sexual selection would select for those who do *not* discriminate on the basis of *any* physical traits—and those who do not discriminate at all will leave far more offspring. And all other factors being equal, the more the offspring, then the more that often will survive and, in turn, reproduce. For this reason, sexual selection would favour those who are *not very selective regarding whom they choose as mates*—a major factor that would work against selecting for traits that cause sexual selection behaviour.

Sexual selection functions as a stabilizing force to resist change

At best, sexual selection functions to help *reduce* the number of unfit and deformed in the species, thereby reducing *dysgenics* (factors capable of reducing the quality of that species). Sexual selection primarily reduces devolution by eliminating deleterious mutations (hundreds of examples of this exist[35]). Numerous studies have found that animals that deviate in a significant way from the norm are more likely to be weeded out.[36] As hundreds of empirical studies have demonstrated,

> ' … sexually selected traits often depend on the overall fitness of the animal. A peacock that is infested with parasites is not likely to have a

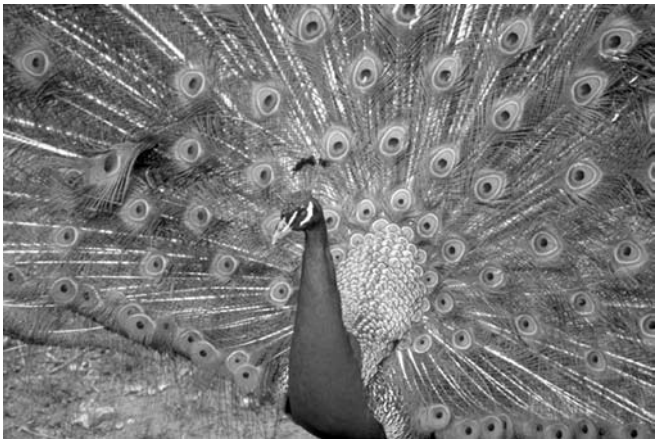

Figure 2. *The tail of a healthy male peacock—a sexually selected trait—supposedly advertises its fitness.*

handsome tail. The fact that it can survive in spite of such a tail therefore advertises that it must be fit enough to avoid parasites. The peacock's tail would then be an example of "truth in advertising". In cases where sexually selected traits honestly represent overall fitness, sexual selection can be considered merely a special case of natural selection.'[37]

Since sexual selection is often related to the health of the animal selected, good health in general is far more apt to be selected than almost any other trait, especially for humans.[33] This is often true, even in the case of minor morphological deviations. An example is the research that found male Japanese scorpion flies with the most symmetrical wings won the most mates.[38] Mollen even claimed he could adversely affect a male swallow's chances of finding a mate merely by making its tail less symmetric.[39]

Research on humans has found that the *most desirable* traits are generally *an average of existing* traits. When the faces of women were computer averaged, the *composite* was judged more attractive by a group of adults than any of the persons in the individual pictures, and the more faces used in making the computer composite, the more appealing the composite was judged to be.[40] Diamond concluded that

> 'people tend to marry individuals who resemble themselves in every conceivable character [and] … that we develop our beauty standards by imprinting on the people we see around us in childhood—especially on our parents and siblings, the people we see the most.'[7]

This factor would also tend to cause stabilization, not evolution. For this reason, both sexual and natural selection play a largely *conservative* role in evolution.

Sexual behaviour and sexual selection

The origin of the behavioural component called sexual *drive* is critical in sexual selection. Cambridge University zoologist Charles Goodhart claims that humanity 'lost' its fur coat and became a 'naked ape' before the start of the last ice age 'between 70 and 120 thousand' years ago.[41] He theorizes that a loss mutation caused the disappearance of most human body hair, and hairless apes were more sexually attractive and, thus, were disproportionally selected. Because males came to prefer hairless women, humans lost their warm fur coat. As a result, the hairlessness trait was selected for *both* sexes, because *all* children born of less hairy mothers tended to have less hair. He concludes that hair loss in males occurred because of sexual selection, in spite of the temperature drop (which would select *for* a fur coat, not against it). This may explain why men in most all cultures normally prefer women lacking beards, mustaches, or excessive body hair, but does not explain why many women prefer men who *have* body hair, especially on the head and face.[42]

This theory also cannot explain how 'pre-humans', the most evolved form of life then, could be successful at reproducing until this time, even though hairlessness was very rare (or unknown) at the time. Nor can the theory explain why (or even how) males developed their new preference for hairless females—a preference that did not exist among any other mammals then, including all of humanity's putative primate ancestors. He also cannot explain why women often selected for hairlessness in males, which counteracts female selection preferences both then and today. Sexual selection can just as effectively explain the development of hair in primates: females could have selected hairy mates, and as a result, this produced more hair on both sexes until all primates were covered with hair.

How this behavioural preference developed is a problem, because this change supposedly occurred at a time when a thick coat of hair would be critically important for survival. Presumably, the preference for hairlessness itself developed because of sexual selection—but since it would adversely affect survival, this preference would itself be selected against by the coming ice age! Since our hypothetical ancestors are regarded by evolutionists as extremely hairy, it would seem that those females that found hairy males sexually attractive would be more likely to reproduce, because at that time most men were hairy; consequently this drive would be selected, not the drive for less hair.[43] The opposite extreme in human hair growth (known as the hirsute condition) is well documented. Why was this not selected? Obviously, this entire highly speculative scenario is a post-hoc explanation that lacks empirical or experimental support and fails to account for some of the many unique traits of humans, as compared to all other primates.

Ramifications of evolution and the sexual selection theory

If evolution has shaped our genes so that 'it is to a man's evolutionary advantage to sow his seeds far and wide' and to women's advantage to seek mates with 'the best genes and the most to invest in offspring,' then certain behaviour would follow.[44] Any mutations that enabled a male to be *more* sexually aggressive and promiscuous would be positively differentially selected. Wright argues that evolution would select for male promiscuity because this behavioural trait would enable males to sire more offspring; consequently, these genes would more likely be passed on and become dominant in the gene pool. Sexually aggressive and promiscuous males are more apt to leave more offspring; thus, a greater number of the next generation will posses these genes.[45,46] The type of men who were created by evolution would be males who were most effective in carrying out the primary role in life, which Darwinism teaches is

> 'First and foremost … a fertilizer of women. His need to inject his genes into a female is so strong that it dominates his life from puberty to death. This need is even stronger than the urge to kill. It is a drive that was built into him long before he became

human. It could even be said that production and supply of sperm is his only raison d'etre, and his physical power and lust to kill are directed to that end, to ensure that only the best examples of the species are propagated. If he is prevented from transmitting his genes, he becomes stressed, ill and may shut down, or go out of control. He is a most unstable, volatile and unpredictable life form, and his possession of intelligence makes him without a doubt the most dangerous creature on earth.'[47]

Conversely, if humans were created in the image of God, they would behave in ways dramatically the opposite of the picture that Greenstein paints. Wright argues that it is in the woman's interest to seek a mate who will ensure that the children she bears are most likely to survive. This common scenario is frequently presented in both scholarly and popular literature. Yet biologist Greenstein argued for the opposite:

> ' … the monogamous marriage is an artificial arrangement as far as the male is concerned. He just wasn't designed [by evolution] for it. He finds the sexual commitment to one woman a strain. From the proto-male down to the present human, there is little attempt to limit promiscuity. Literature thrives on the eternal struggle in the male beast between carnal desire and noble fidelity. In real life it isn't hard to predict which way he'll go if given a safe opportunity. In one study of American and German men, over 40% of men interviewed expressed a willingness to indulge in casual sex, as opposed to 5% of women, and one wonders just how honest the other 60% of men were.'[48]

Greenstein then cites several other studies that concluded men were highly promiscuous in most societies and that marriage is a sacrifice that

> ' … the male will never come to terms with. He has voluntarily given up the opportunity to copulate with women to whom he is attracted. This hits home only after he has slipped the ring onto her finger. He realizes what he has done and wonders how to get out of the mess he has put himself into. If he is confident, aggressive and successful he may continue to seek and copulate with other women. If he dares not break the social taboo, he will fantasize.'[49]

Figure 3. *Christians and others disagree with the evolutionary claim that monogamous marriage is an artificial arrangement as far as the male is concerned.*

Of course, Christians and others disagree with this evolutionary claim and conclude that the monogamous relationship is the most satisfactory in the long run. Empirical research reveals a significant advantage for children reared in a stable monogamous marriage.[50] Virtually all social problems are statistically greater in children reared in other arrangements.[51]

Many feel that this evolutionary theory is a *post-hoc* explanation that is used to justify irresponsible male behaviour and the dual sex standard.[52–55] Little historical or empirical evidence exists for the generalization about male philandering and, in many societies, such behaviour is rare. The same reasoning that applies to men could *also* apply to women: women who are highly promiscuous also are likely to have more offspring and, consequently, are more likely to pass on their promiscuous genes. Conversely, the analogy used to explain women's lack of sexual aggression and promiscuity also could be applied to men: a man will seek a woman who is able to bear and properly raise only *his* children, so they will be more likely to survive to pass on the genetic drive for a woman who can bear and properly raise only one man's children—his.[9]

Darwin originally concluded that males usually have larger bodies, because this is to their advantage in fighting other males for females.[28] Many of Darwin's conclusions about humans come from observing animals, a practice that has often proven to be problematic:

> 'The Nobel Prize-winning behaviourist Konrad Lorenz saw humans as "killer apes" anxious to pass on our own genes by murdering the opposition, which may have explained his own early flirtation with the Nazis; and any decent airport has a row of paperbacks whose embossed covers purport to explain human nature as emerging from a history as primates with one or other sexual and social preference.'[56]

The tooth-and-claw theory revisited

Darwin's theory of evolution as a result of struggle for existence—where animals are at each other's throats competing for mates, food, territory and everything else—is now widely recognized to be a gross distortion of reality. Frans de Waal, a primatologist at the Yerkes Primate Center in Atlanta, is one of a number of scientists who began his research with the assumption that aggressive behaviour was the norm, yet found the opposite—such as for food, sharing was the norm. Researchers are finding that Darwin's law 'of struggle in nature is not a law at all but only a piece meal observation having little to do with how life diversifies and

Figure 4*. Researchers are questioning many common Darwinistic assumptions, such as the belief that animals often fight each other for mates. It is not known why so many animals carry on behaviour that we have long assumed was part of a mating ritual.*

develops'.[57] The old 'nature-as-wicked' approach is now rejected by 'a sizable number of naturalists' who have 'shifted towards nature-as-beneficent'.[57] Although the focus of this research is on competition and the struggle for food, much of the research has also been on the supposed competition for mates. Indeed, some researchers are questioning many common Darwinistic assumptions, such as the belief that animals often fight each other for mates. Actually, it is not known why so many animals carry on behaviour that we have long assumed was part of a mating ritual.

A major problem that evolution cannot explain is the enormous sexual behaviour gap between humans and, not only other primates, but *all* other life. The contrasts include physiological and behavioural differences, such as the observation that humans are the only mammals with a sexual drive related to social and intellectual compatibility. In Diamond's words, 'Human female sexual cycles are quite different [from those of other animals]. The human female maintains her sexual receptivity more or less constantly, instead of having it sharply confined to a short estrus phase', as do many animals.[58] In the end, sexual selection is often accepted by evolutionists because they have no better explanation:

> ' "Sexual selection"—that is, evolution's favoring of features that increase a plant's or animal's attractiveness and therefore its reproductive success—is the best explanation we have for the otherwise senseless extravagance of feathers and flowers, maybe also sportscars and bikinis.'[59]

The creationist explanation for sexual dimorphism

Jones recognized that neo-Darwinism cannot answer even some of the basic questions relating to sex and sexual selection. He concludes:

> 'Biologists have an adolescent fascination with sex. Like teenagers, they are embarrassed by the subject because of their ignorance. What sex is, why it evolved and how it works are the biggest unsolved problems in biology. Sex must be important as it is so expensive. If some creatures can manage with just females, so that every individual produces copies of herself, why do so many bother with males? A female who gave them up might be able to produce twice as many daughters as before; and they would carry all her genes. Instead, a sexual female wastes time, first in finding a mate and then in producing sons who carry only half of her inheritance. We are still not certain why males exist; and why, if we must have them at all, nature needs so many. Surely, one or two would be enough to impregnate all the females but, with few exceptions, the ratio of males to females remains stubbornly equal throughout the living world.'[60]

The creationist explanation for sexual dimorphism is that it is part of the Creator's design for life. The male and female reproductive systems are physically and chemically harmonious, which indicates that this complex system must have been designed simultaneously as *a unit* to be physically compatible. Likewise, all of the other sexual differences exist to enable the sexes to carry out their Creator-designed role. The Creator designed a drive in man so that he will 'leave his father and mother and shall cleave unto his wife, and they shall be one flesh' (Genesis 2:24 according to the Masoretic text) and, thus, establish the ideal atmosphere for rearing children. The scriptures also teach that the plants and animals that God made will reproduce according to their own kind, which rules out macroevolution (Genesis 1).

Hypothesizing the details of proto-sexual structures has proven so difficult that most evolutionists have not even tried, and those who have recognize the enormous problems in doing so.[16] Like engine and car body units that are designed to be functionally integrated, male and female sexual reproductive systems likewise must have been designed as a unit to function as a set.

Conclusion

The evolution of sexual dimorphism has been recognized as a major problem for naturalistic evolution since the very beginning of Darwinism. How sexual dimorphism could have evolved is rarely discussed, even in works devoted to the evolution of sex, and it still remains a major problem in evolutionary theory.[61] Works that purportedly discuss sexual

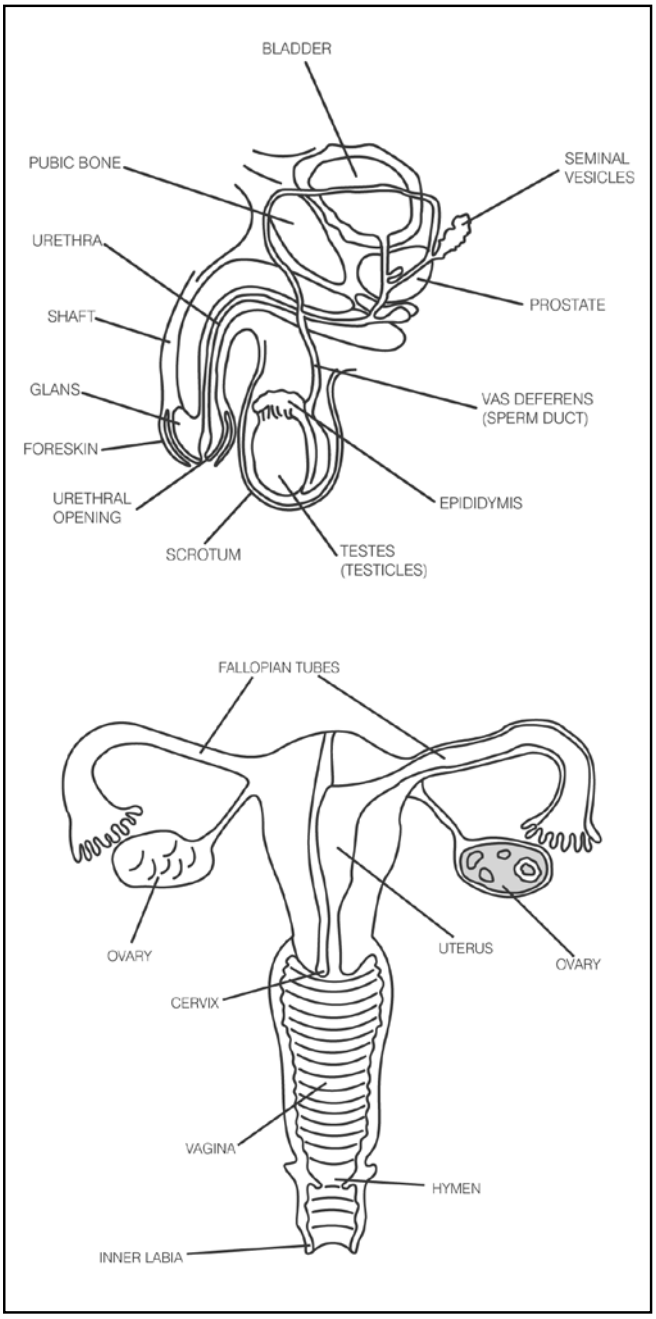

***Figure 5**. The human male and female reproductive systems are physically and chemically harmonious, which indicates that this complex system must have been designed simultaneously as a unit to be physically compatible.*

dimorphism cover only limited aspects of sexual selection and other topics related to microevolution.[62]

Evolutionists need to do much more empirical research on sexual selection by conducting many more relevant experiments. For example, they could shave the fur off male rats or other mammals and try to determine if females preferred them to the normal animal (or if it did not matter). Only this type of research can form the basis to establish empirical conclusions. Much research has been done on sexual selection of normal variations, which is helpful but limited, partly because, in spite of evidence for their selection, many the undesirable variations still persist, likely because selection serves primarily as a stabilizing force.

As Diamond notes, 'Human sex as a device to achieve fertilization would have to be rated as a huge waste of time and energy, an evolutionary failure'.[63] Conversely, creation provides a clear explanation: sexual dimorphism exists because it is part of the Creator's plan for humans and other organisms. Both the traits selected for and the behavioural mechanism that does the selecting are actually evidence of design. Evolution focuses on *survival* only; Creation focuses on what is good for human happiness and God's purposes for humans. Diamond also notes, 'The most hotly debated problem in the evolution of human reproduction is to explain why we ended up with concealed ovulation, and what good all our mistimed copulations do for us'.[63] Although evolution fails to explain many aspects of human sex such as 'mistimed copulations', creation effectively explains it as part of the Creator's plan to provide emotional fulfillment and to bond couples in order to ensure that the physical and psychological needs of the next generation are met effectively.

Acknowledgments

I wish to thank Wayne Frair, Bert Thompson and Clifford Lillo for their comments of an earlier draft of this manuscript.

References

1. Klotz, J.W., Genes, *Genesis and Evolution*, Concordia Pub House, St. Louis, p. 184, 1970.
2. Campbell, B. (Ed.), *Sexual Selection and the Descent of Man*, 1871–1971, Aldine Publishing Company, New York, 1972.
3. Ghiselin, M.T., *The Economy of Nature and the Evolution of Sex*, University of California Press, Berkeley, 1974.
4. Eberhard, W.G., *Sexual Selection and Animal Genitalia*, Harvard University Press, Cambridge, 1985.
5. Darwin, C., *The Origin of Species by Means of Natural Selection*, D. Appleton and Company, New York, 1859 (1897 edition).
6. Darwin, C., *The Descent of Man and Selection in Relation to Sex*, D. Appleton and Company, New York, 1871 (1896 edition).
7. Diamond, J., *The Third Chimpanzee; The Evolution and Future of the Human Animal*, Harper Perineal, New York, p. 119, 1992.
8. Wiggam, A.E., *Let's Explore Your Mind*, Pocket Books, New York, p. 63, 1949.
9. Reed, E., *Woman's Evolution: From Matriarchal Clan to Patriarchal Family*, Pathfinder Press, New York, 1975.
10. Kropotkin, P., *Mutual Aid*, New York University Press, New York, 1972.
11. Klien, R., *Eat; Fat*, Pantheon, New York, 1996.
12. Millman, M., *Such a Pretty Face; Being Fat in America*, Norton, New York, 1980.
13. Beller, A.S., *Fat and Thin: A Natural History of Obesity*, McGraw Hill,

New York, 1977.

14. Wentinck, C., T*he Human Figure*, Livingston, Wynnewood, 1970.
15. Allee, W.C., *The Social Life of Animals*, Bacon Hill Press, Boston, 1938.
16. Williams, G., *Sex and Evolution*, Princeton University Press, New Jersey, 1977.
17. Bagemihl, B., *Biological Exuberance: Animal Homosexuality and Natural Diversity*, St. Martins Press, New York, 1999.
18. Smith, J.M., *The Evolution of Sex*, Cambridge University Press, Cambridge, 1978.
19. Williams, G., *Adaptation and Natural Selection*, Princeton University Press, New Jersey, p. 184–185, 1974
20. Jones, S., *The Language of Genes*, Bantam Doubleday, New York, p. 92, 1993.
21. Fisher, E., *Woman's Creation; Sexual Evolution and the Shaping of Society*, Anchor Press/Doubleday, New York, 1979.
22. Pendell, E., *Why Civilizations Self-Destruct*, Howard Allen, Cape Canaveral, 1977.
23. Rice, E.L., *Darwin and Bryan—a study in method*, Science 61:243–250, 1925; p. 245.
24. Bagemihl, ref. 17, p. 203.
25. Chasteen, S., *Gender scientists explore a revolution in evolution*, Stanford Report 19 February, pp. 1–2, 2003; p. 1.
26. Roughgarden, J., *Evolution's Rainbow—Diversity, Gender and Sexuality*, University of California Press, 2003.
27. McCarthy, S., 'Must Dog Eat Dog?' in: Gleick, J. (Guest Ed.), Cohen, J. (Series Ed.), *The Best American Science Writing*, The ECCO Press/an imprint of HarperCollins Publishers, pp. 207–212, 2000; p. 166.
28. Shine, R., Ecological causes for the evolution of sexual dimorphism: a review of the evidence, *The Quarterly Review of Biology* **64**(4):419–461, 1989.
29. Fisher, H.E., *The Sex Contract; The Evolution of Human Behavior*, William Morrow and Company, New York, p. 97, 1982.
30. Fisher, ref. 29, p. 96.
31. Montagu, A., *The Natural Superiority of Women*, Altamira, New York, 1999.
32. Tavris, C., *The Mismeasure of Women; Why Women are not the Better Sex, the Inferior Sex, or the Opposite Sex*, Simon and Schuster, New York, 1992.
33. McLennan, D. and Brooks, D.R., Parasites and sexual selection: a macroevolutionary perspective, *Quarterly Review of Biology* 66(3):255, 1991.
34. Jones, ref. 20, p. 88.
35. Bergman, J., The problem of extinction and natural selection, *CRSQ* **30**: 93–106, 1993.
36. Ambrose, E.J., *The Nature and Origin of the Biological World*, Wiley, Halsted, New York, 1982.
37. Harris, C.L., *Concepts in Zoology*, Harper Collins, New York, p. 383, 1992.
38. Concar, D., Sex and the symmetrical body, *New Scientist* **146**:40–44, 1995.
39. Concar, ref. 38, p. 41.
40. Jones, ref. 20, p. 95.
41. Goodhart, C., Man shed fur coat in days before last Ice Age; in: Penman, D. (Ed.), *The Independent of London* **48**(3):4, 1993.
42. Reynolds, R., *Beards: Their Social Standing, Religious Involvements and Value in Offense and Defense Through the Ages*, Harcourt Brace Jovanovich, New York, 1949.
43. Gibbons, A., The brain as 'sexual organ', *Science* **253**:957–958, 1991.
44. Wright, R., Our cheating hearts, *Time* **144** (7):44–52; 1994, p. 45.
45. Birkhead, T., *Promiscuity*, Harvard University Press, Cambridge, 2000.
46. Barash, D.P. and Lipton, J.E., *The Myth of Monogamy: Fidelity and Infidelity in Animals and People*, W.H. Freeman, New York, 2001.
47. Greenstein, B., *The Fragile Male; The Decline of a Redundant Species*, Birch Lane Press Book, New York, 1993.
48. Greenstein, ref. 47, p. 9.
49. Greenstein, ref. 47, pp. 128–129.
50. Bane, M.J., *Here to Stay: American Families in the Twentieth Century*, Basic Books, New York, 1976.
51. Cameron, P. and Cameron, K., *Homosexual parents: a comparative forensic study of character and harms to children*, Psychological Reports 82:1155–1191, 1998.
52. Kevles, B., *Females of the Species; Sex and Survival in the Animal Kingdom*, Harvard University Press, Cambridge, 1986.
53. Hubbard, R., Have only men evolved? in: Hubbard, R., Henifin M. and Fried B. (Eds.), *Women Look at Biology Looking at Women*, G.K. Hall Co., Boston, pp. 7–35, Introduction, p. XV, 1979.
54. Morgan, E., *The Descent of Woman*, Stein and Day, New York, 1972.
55. Borgese, E.M., *Ascent of Women*, Braziller, New York, 1963.
56. Jones, ref. 20, p. 91.
57. Witham, L., *Where Darwin Meets the Bible*, Oxford University Press, New York, p. 249, 2002.
58. Diamond, ref. 7, p. 77.
59. Pollan, M., T*he Botany of Desire; A Plant's-Eye View of the World*, Random House, New York, p. 74, 2001.
60. Jones, ref. 20, p. 84.
61. Ford, B.J., *Patterns of Sex; The Mating Urge and our Sexual Future*, St. Martin's Press, New York, 1980.
62. Hapgood, F., *Why Males Exist*, William Morrow and Co. Inc., New York, 1979.
63. Diamond, ref. 7, p. 78.

Jerry Bergman is working on his ninth academic degree. His major areas of study for his past college work were in biology, chemistry, psychology, and evaluation and research. He graduated from Wayne State University in Detroit, Medical College of Ohio in Toledo, and Bowling Green State University among others. A prolific writer, Dr Bergman teaches biology, chemistry and biochemistry at Northwest State in Archbold, Ohio.