Behaving Like Animals: Human Mate Selection

Despite our sentimental notions concerning love, romance, and relationships, there seems to be an underlying biological explanation for human sexual behavior. The concrete demands of reproduction may influence these emotional categories more than we might expect or like to believe. Theories of sexual selection offer us a different perspective on the mechanics of human attraction and human mate choice. In recent history, a literature of scientific studies has developed that examines the biological basis for human sexual behavior. Scientists have uncovered data that demonstrate what genetic factors may help drive sexual selection in humans. Multiple studies suggest that the major histocompatibility complex plays a significant role in women's mate choice.

The major histocompatibility complex (MHC) is a combination of linked genes that contributes to immune system function in two ways (Penn 1999). Class I antigens regulate the immune system's ability to distinguish between self and external elements, while Class II antigens activate T-lymphocytes (Hoth 2007). The MHC, which is also referred to as human leukocyte antigens (HLA) in humans, happens to be one of the most polymorphous complexes in our genetic code (Roberts 2005). This polymorphism provides a great diversity in MHC among potential human mates. Although an individual whose MHC is too diverse may encounter autoimmune problems, many scientists believe that a heterozygous MHC provides an individual with a better immune response than a homozygous MHC would, because it can recognize a greater number of pathogens. (Penn 1999).

Various studies, comprising both laboratory experiments and survey data, have found a correlation between MHC genotype diversity and sexual behavior. Namely,

MHC disassortative mating preferences have been found in many animals (Roberts 2008). Experimental data has shown that mice attempt mating more often with other mice that have MHC genotypes that differ from their own (Penn 1999). The ability to discriminate between MHC-similar and MHC-dissimilar potential mates and the preference for MHC-dissimilar mates has been hypothesized to have developed as a way to control inbreeding by kin recognition. Mice can detect the MHC genotype of other mice through the odor of their urine. Similarly, studies show that humans can identify the MHC differences in mice and vice versa (Wedekind 1995). Therefore, MHC-genotypes can be identifiable through odor.

Although humans do not "smell" directly the MHC composition of another individual, recent scientific studies that odor, insofar as it may reveal MHC genotype, influences attraction and human mate choice. In an experiment performed by Claus Wedekind in 1995, "MHC-dependent mate preferences in humans" (often referred to as the "T-shirt experiment"), Wedekind asked the men participating in the study to wear a T-shirt for two days in a row and to avoid the presence of other odors during that time. The women were then asked to evaluate the odors of six T-shirts, worn by three men with a dissimilar MHC composition and three men with a similar MHC composition, which were presented to them in a random order. The results of study established that women are more attracted to the odor of men with a dissimilar MHC genotype—especially during their most fertile menstrual phase. Furthermore, the odor of men with a dissimilar MHC genotype tended to remind women more often of their current or former partners than the odor of MHC-similar men by a two to one ratio. Finally, Wedekind discovered

that these results were still consistent, but reversed, in women who are taking hormonal contraceptives.

In addition to predicting the likelihood of attraction between two individuals, MHC-genotype dissimilarity seems to indicate sexual response in established couples. In her study, "Major Histocompatibility Complex and Sexual Responsivity" (2006), Christine Garver-Apgar surveyed MHC-genotyped couples. Her surveys revealed that the more MHC alleles a couple shared the less sexual responsive to her partner the women reported herself to be. The average number of extra-pair copulations during the relationship was also higher in couples with similar MHC compositions. This study discovered that, over the course of the woman's menstrual cycle, women are more attracted to MHC-dissimilar men during ovulation, when they are most likely to conceive. Furthermore, women in MHC-similar couples experienced fewer orgasms with their partners during their fertile period. These results provide evidence for the strong influence that MHC genotype compatibility influences human sexual behavior as well as attraction. This consistency of attraction leads to the conclusion that, when they are fertile, women are more attracted to men with diverse (and differing) MHC composition.

Just as a higher level of MHC allele sharing corresponds to unfaithfulness and lack of sexual responsivity in couples during a woman's fertile phase, MHC similarity predicts reduced reproductive success. Wedekind (1995) discusses specific trends in fitness (or "maternal selection") of MHC-similar and MHC-dissimilar couples. Couples with greater difficulty with *in vitro* fertilization and tubal embryo transfer tended to share more MHC alleles than control couples. In addition, in a studied Hutterite population that does not allow birth control, couples with similar MHC genotypes get pregnant less

often and less frequently. Finally, there is a higher instance of spontaneous abortion or miscarriage in offspring of homologous MHC couples. Although these instances do not appear with great frequency, the diversity of this data further supports evidence that MHC compatibility influences human sexual selection. These observations indicate a trend to favor MHC-heterozygous individuals as potential sexual partners, because MHC-homozygous infants display less fitness.

Having established that human sexual selection favors MHC disassortitive mating, we are left to explain why it beneficial for an individual to mate with someone who has a different MHC composition from her. According to the "good genes" theory, women should be attracted to men who will provide the best genes for their offspring. Because MHC-heterozygosity allows for a healthy immune response, MHC-heterozygous men are more resistant to parasites and pathogens. Women would seek mates who can contribute their gene variability to their offspring, and therefore increase their fitness. Likewise, women would seek to maintain this variability by mating with MHC-dissimilar men. The "good genes" theory could explain the increase of extra-pair copulations and augmented attraction to MHC-dissimilar men during a woman's high-fertility phase. MHC-dissimilar mates provide better genes, although the MHC-similar partners may be providing other resources.

Instead of selecting for arbitrarily "good" genes, the search for heterozygosity could simply be the result of dodging the attack of parasites. Milinski (2006) suggests that choosing to reproduce with MHC-dissimilar mates can be seen as "a best-of-bad-job rule." MHC-dissimilar mates do not guarantee increased fitness of the offspring, but increases the probability that the offspring will inherit the appropriate gene that will

combat the next generation of parasites. This argument suggests that Milinski is a proponent of another theory of selection that may account for the preference for MHC-dissimilar mates. According to the "Red Queen" hypothesis, producing a heterozygous offspring would be beneficial—not necessarily because this variation automatically provides a better immune response, but because the variation shifts the common genotype from one that parasites may have already adapted to and produces offspring with different immune systems that can resist these parasites. This need for constant recombination would maintain polymorphism on the MHC and explain why females choose MHC-dissimilar mates.

Although individuals are attracted to MHC-dissimilar potential mates through their odor preference, additional factors contribute to determining the attraction between individuals. Consistent with the odor data, Roberts discovers in his study, "MHC-heterozygosity and human facial attractiveness" (2005), that women found MHC-heterozygous men more attractive than MHC-homozygous men; furthermore, women perceived the skin of MHC-heterozygous men to appear healthier. Certain studies evaluating facial attractiveness, however, found a contradictory preference: women were more attracted to MHC-similar individuals (Roberts 2008). Roberts (2008) suggests that this apparent contradiction between MHC disassortative mating preference based on odor and MHC assortative mating preference based on facial attractiveness could be explained by establishing a balance of optimal out-breeding. The competition between these two preferences could mediate between the selection of a mate with extreme genetic similarity or difference.

The expression of symmetry may be the key trait that connects MHC-dissimilarity and facial attractiveness, "good genes" and the "Red Queen" theories. In 1999, Thornhill expounded on the Wedekind experiment by testing for the attractiveness of men with symmetrical features perceived by their odor in "The Scent of Symmetry: A Human Sex Pheromone that Signals Fitness." In this experiment Thornhill modified the T-shirt procedure that Wedekind used to search for the correlation between facial attractiveness, attractiveness determined by odor, and symmetrical features. He found that, during their fertile period, women were more attracted to the odors of men who were facially attractive and had a low rate of fluctuating asymmetry. These results supplement the findings of Wedekind because they also indicate that olfactory senses play a significant role in women's mate choice.

Although Thornhill does not specifically test for MHC-compatibility data, he suggests that MHC-dissimilarity coincides with symmetry. He suggests that symmetric men may have a rare MHC composition and, for this reason, women consistently find them to be desirable mates. Thornhill puts forth the "good genes" theory while connecting these two factors in determining attraction. Asymmetrical features indicate a defective immune system; the degree of fluctuating asymmetry (FA) negatively correlates with male attractiveness to women (Barber 1995; Thornhill 1999). Symmetrical features give out an "honest signal" of the quality of the males genes, because symmetry advertises a robust immune response—such as, parasite resistance developed by a diverse MHC genotype (Barber 1995). Therefore, sexual selection would incline women to be attracted to men with low fluctuating asymmetry as well as men with a dissimilar MHC-

genotype. Additional experiments should be performed to establish the correlation between symmetrical features and MHC-heterozygosity.

Further examples of how features that suggest genetic information may drive human sexual selection can be found by examining general preferences. Certain basic features, many of which tend to be sexual dimorphic, are considered to be attractive; sexual selection acts upon these features. Women are attracted to larger males with prominent features that display dominance. Women are less attracted to over-developed male features. Features associated with exceptionally high testosterone levels recall associations of unattractive and unsuitable mate behavior, such as aggressiveness (Grammer 2002). Given the suppressive effect that testosterone has on the immune system, females would want to avoid males with a lowered immune efficiency, since these high levels of testosterone increase the likelihood of the man being infected or passing on poor genes.

The fact that larger men tend to be more symmetric than smaller men connects these general preferences back to the possible influence of MHC-genotype influence in human sexual selection (Grammer 2002). Similarly, judging by studies that use computer modifications to original images, average features are considered to be most attractive. This pattern may be derived from the fact that average traits often represent heterozygosity, which generally implies a greater immune system than homozygosity (Barber 1995). There is, however, a consistent preference for individuals with rare features to be considered even more beautiful. This preference may exist because these individuals may offer "rare genes" that the parasites have not evolved to attack.

In this paper, I have discussed the various ways in which MHC-genotype dissimilarity directly influence women's mate preference, mate choice, and sexual behavior. Most studies have found that women are attracted to MHC-diverse and MHC-dissimilar potential mates. We can explain this attraction by referring to either the "good genes" or the "Red Queen" theories of sexual selection; although these theories are not mutually exclusive in this scenario. According to the "good genes" hypothesis, women are attracted to MHC-heterozygous men because these men are more likely to be healthy and to transmit better genes. The "Red Queen" hypothesis attributes the benefit of a polymorphic MHC to producing MHC-heterozygous offspring to out-evolve parasites. These connections are further suggested by the correlation of symmetry and average features—both of which provide information about a functional immune system. In addition, I explored other patterns of attraction based on features that also reveal genetic information relating to MHC-genotype hypotheses. Because biology most often considers females to be the "choosy sex," I have restricted my discussion to women's sexual selection. A more in-depth approach to the subject of sexual selection in human society, however, should take into male choice as well.

Literature cited

Barber, N. The Evolutionary Psychology of Physical Attractiveness: Sexual Selection and Human Morphology. *Ethology and Soiobiology* 16: 395-424, 1995.

Bereczkei, T., Gyuris, P., Koves, P., & Bernath, L. Homogamy, genetic similarity, and imprinting: parental influence on mate choice preferences. *Personality and Individual Differences* 33: 677-690, 2002.

Feingold, A. Gender Difference in Mate Selection Preferences: A Test of the Parental Investment Model. *Psychological Bulletin* 112.1: 125-139, 1992.

Garver-Apgar, C. et. al. Major Histocompatibility Complex Alleles, Sexual Responsivity, and Unfaithfulness in Romantic Couples. *Psychological Science* 17.10: 830-835, 2006.

Grammer, K., et. al. Darwinian aesthetics: sexual selection and the biology of beauty. *Biology Review* 78: 385-407, 2003.

Hoth, L. Sensory genes and mate choice: Evidence that duplications, mutations, and adaptive evolution alter variation in mating cue genes and their receptors. *Genomics* 90: 159-175, 2007.

Milinski, M. The Major Histocompatibility Complex, Sexual Selection, and Mate Choice. *The Annual Review of Ecology, Evolution, and Systematics* 37: 159-86, 2006.

Penn, D., & Potts, W. The Evolution of Mating Preferences and Major Histocompatibility Complex Genes. *The American Naturalist* 153.2: 145-164, 1999.

Roberts, S., & Little, A. Good genes, complementary genes, and human mate preferences. *Genetica* 132: 309-321, 2008.

Roberts, S. C. et al. MHC-heterozygosity and human facial attractiveness. *Evolution and Human Behavior* 26: 213-226, 2005.

Thornhill, R., & Gangestad, S. W. The Scent of Symmetry: A Human Sex Pheromone that Signals Fitness? *Evolution and Human Behavior* 20*:* 175-201, 1999.

Wedekind, C. et. al. MHC-dependent mate preferences in humans. *Proceedings of the Royal Society of London* 260: 245-249, 1995.