81. Lieberman, D. & Hatfield, E. (in press). Passionate Love: Cross-cultural and evolutionary perspectives. In Robert J. Sternberg and Karin Weis (Ed.), *The psychology of love* (2nd ed). Cambridge, MA: Yale University Press.

Passionate Love:

Cross Cultural and Evolutionary Perspectives

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I. Passionate Love

"Hubb" is love, "ishq" is love that entwines two people together, "shaghaf" is love that nests in the chambers of the heart, "hayam" is love that wanders the earth, "teeh" is love in which you lose yourself, "walah" is love that carries sorrow within it, "sababah" is love that exudes from your pores, "hawa" is love that shares its name with "air" and with "falling", "gharm" is love that is willing to pay the price.

—Ahdaf Soueif (1999)—

A. The Meaning of Love

Passionate love (sometimes termed "obsessive love," "infatuation," "lovesickness," or "being-in-love") is a powerful emotional state. Hatfield and Rapson (1993) defined it as:

A state of intense longing for union with another. Passionate love is a complex functional whole including appraisals or appreciations, subjective feelings, expressions, patterned physiological processes, action tendencies, and instrumental behaviors. Reciprocated love (union with the other) is associated with fulfillment and ecstasy. Unrequited love (separation,) with emptiness, anxiety, or despair (p. 5).

The *Passionate Love Scale* was designed to assess the cognitive, physiological, and behavioral incidents of such love (Hatfield & Sprecher, 1986.) The *PLS* has been found to be a useful measure of passionate love for young children, adolescents, and adults from a variety of cultures (see Doherty, Hatfield, Thompson, & Choo, 1994; Landis

& O'Shea, 2000) and has been found to correlate well with neurocortical and *f*MRI measures of passionate love and sexual desire (see Bartels & Zeki, 2000; Fisher, 2003; Fisher, et al, 2004). In parallel with this research, neurobiologists have begun to explore the chemical and hormonal bases of passionate love, sexual desire, and sexual motivation (Carter, 1998; Fisher, et al., 2004; Komisaruk & Whipple, 1998; Marazziti, et al, 1999; Marazziti & Canale, 2004.).

In recent years, the interest in passionate love, sexual desire, and mate selection, once considered of only minor interest, has become a topic of central concern to psychologists. Three things account for this dramatic change: (1) scientists have gained a new understanding of the critical importance of culture in shaping people's thoughts, feelings and actions; (2) technological advances, such as fMRI techniques, have made it possible for scientists to study phenomena (such as passionate love and darker emotions) once thought to be will 'o the wisps, too vague to study scientifically; and (3) recent advances in Evolutionary Psychology have made it clear that the challenges our ancestors faced may have a profound impact on the ways men and women behave today.

II. Cultural Factors Affecting Passionate Love and Sexual Desire

A. Culture and the Meaning of Love

In all societies, people find it easy to understand such emotional terms emotions as love, joy, anger, fear, and sadness (see Jankowiak, 1995). Yet, cultural values have been found to have a profound impact on the subtle shadings of meaning assigned to such constructs (see Nisbet, 2003.)

Recently, Shaver, Wu, and Schwartz (1991) interviewed young people in America, Italy, and the People's Republic of China. As expected, in all three cultures, men and

women identified the same five emotions as "basic," or prototypic, emotions. These were joy/happiness, love/attraction, fear, anger/hate, and sadness/depression.

Men and women in these cultures also agreed as to whether the various emotions should be labeled as positive experiences (such as joy) or negative ones (such as fear, anger, or sadness). They agreed, that is, with one exception—love. American and Italian subjects tended to equate passionate love with happiness; love was assumed to be an intensely positive experience. Students in Beijing, China, possessed a darker view of love. In Chinese there are few "happy-love" words; love is associated with sadness. Not surprising then that Chinese men and women associated passionate love with such ideographs (words) as infatuation, unrequited love, nostalgia, and sorrow love.

Recently, social psychologists have explored folk conceptions of love in a variety of cultures—such as the People's Republic of China and Indonesia. Researchers find that although in most cultures people possess surprisingly similar views of love and other "feelings of the heart," differences do in fact exist (see Shaver & Murdaya, 2001, and Jankowiak, 1995, for a review of this research.)

B. Anthropological Perspectives

At one time, scholars assumed that passionate love was "invented" by the troubadours in 12th century France. In fact, passionate love is as old as humankind. The Sumerian love fable of Inanna and Dumuzi, for example, was spun by tribal storytellers in 2,000 B. C.! Today, most anthropologists agree that passionate love is a cultural universal.

Jankowiak and Fischer (1992) drew a sharp distinction between "romantic passion" and "simple lust." They proposed that both passion and lust, although different,

are universal feelings. To test this notion, they selected a sampling of tribal societies from the *Standard Cross-Cultural Sample* in an effort to determine how prevalent romantic was love in those societies. They found that in almost all of these far flung societies, young lovers talked about passionate love, recounted tales of love, sang love songs, and spoke of the longings and anguish of infatuation; when passionate affections clashed with parents' or elders' wishes, young couples often eloped. On this basis, the authors concluded that romantic love *is* a pan-human characteristic. There is considerable evidence that they are right (see Buss, 2003; Hatfield & Rapson, 1993; and Jankowiak, 1995.)

Social anthropologists have explored folk conceptions of love in such diverse cultures as The People's Republic of China, Indonesia, Turkey, Nigeria, Trinidad, Morocco, and the Fulbe of North Cameroun. They have also studied the Mangrove (an aboriginal Australian community,) the Mangaia in the Cook Islands, Palau in Micronesia, and have worked among the Taita of Kenya. In all these studies, people's views of passionate love appear to be surprisingly similar. Perhaps love *is,* indeed, a cultural universal. Or perhaps the times they are 'a changing ?. One impact of globalization (and the ubiquitous MTV, Hollywood and Bollywood movies, chat rooms, and foreign travel) is to insure that when people speak of "passionate love," they are talking about much the same thing (see Jankowiak, 1995 for a review of this field research.)

In spite of the fact that passionate love is considered to be a cultural universal—an emotion thought to exist in all cultures and in all historical eras—cultural factors do seem to exert a profound impact on the commonness of such passionate feelings. They also appear to affect how intensely passion is experienced and how people attempt to deal with these tumultuous feelings.

C. Cultural Perspectives

1. Cultural Perspectives

Americans are preoccupied with love—or so cross-cultural observers have claimed.

Anthropologist Hsu (1985) once contrasted Western and Chinese values concerning passionate love and intimacy. American culture, he argued, is interested in personality. It attaches great importance to personal and emotional expression. Chinese culture is situation-centered. The Chinese are caught up in "a web of interpersonal relationships" (p. 33). Group members are required to conform to "the interpersonal standards of the society" (1971, p. 29). Chinese men and women tend to "underplay all matters of the heart" (1971, p. 12).

Hsu (1953) maintained that such cultural differences have a critical impact on the ways in which people in these two societies view romantic love. The concept of romantic love fits in well with a North American cultural perspective but *not* with a Chinese cultural orientation, where one is expected to consider not just one's own personal feelings, but to consider obligations to others, especially one's parents as well. Hsu wrote: "An American asks, 'How does my heart feel?' A Chinese asks, 'What will other people say?'" (p. 50). He claimed that the Western idea of romantic love has virtually no appeal for young adults in China. He pointed out that the Chinese generally use the term love to describe not a respectable, socially sanctioned relationship, but an *illicit* liaison between a man and a woman.

More recently, other cross-cultural researchers have noted that romantic love is less valued in traditional cultures with strong, extended family ties (Simmons, Vom Kolke, &

Shimizu, 1986).

On the basis of such testimony, early cross-cultural researchers (Goode, 1959; Rosenblatt, 1967) proposed that romantic love would be common only in modern, industrialized, countries. The emerging evidence, however, suggests that men and women in a variety of cultures—individualist and collectivist, urban and rural, rich or poverty-stricken—are every bit as romantic as Americans.

In one study, for example, Sprecher and her colleagues (1994) interviewed 1,667 men and women in the United States, Russia, and Japan. They found that in all three societies, the majority of young people were "currently in love." They had expected American men and women to be most vulnerable to love, the Japanese the least. In fact, 59% of American college students, 67% of Russians, and 53% of Japanese students said they were in love at the time of the interview. In all three cultures, men were slightly less likely than were women to be in love at the present time. There was no evidence that individualistic cultures bred young men and women who are more love-struck than do collectivist societies, however.

Surveys of Mexican-American, Chinese-American, and Euro-American students have found that in a variety of cross-national groups, young men and women show high rates of "being in love" at the present time (Aron & Rodriguez, 1992; Doherty, Hatfield, Thompson, & Choo, 1994).

2. Culture and the Intensity of Passionate Love

What impact does culture have on how *passionately* men and women love? In one study, Hatfield and Rapson (1996) asked men and women of European, Filipino, and Japanese ancestry to complete the *Passionate Love Scale.* To their surprise, they found

that men and women from the various ethnic groups seemed to love with equal passion.

Doherty and his colleagues (1994), in a survey of European-American, Chinese-Americans, Filipino-American, Japanese-American, and Pacific Islanders, secured similar results.

3. What Men and Women Desire in Romantic Partners

Since Darwin's (1871) classic treatise *The Descent of Man and Selection in Relation to Sex,* evolutionary biologists have been interested in mate preferences. Many evolutionary psychologists contend that there are cultural universals in what men and women desire in a mate.

In a landmark cross-cultural study, Buss (1989) asked over 10,000 men and women, from 37 countries, to indicate what characteristics they valued in potential mates. The survey interviewed people from a variety of geographic, cultural, political, ethnic, religious, racial, economic, and linguistic groups.

Men and women were asked to consider 18 traits and to rate how important they thought each trait was in choosing a mate. Buss and his colleagues found that, overall, the single trait that men and women in all societies valued most was "mutual attraction-love." After that, men and women cared next about finding someone who possessed a dependable character, emotional stability and maturity, and a pleasing disposition.

Buss was interested in cultural universals; nonetheless, he could not help but be struck by the powerful impact that culture had on preferences. In China, India, Indonesia, Iran, Israel (the Palestinian Arabs), and Taiwan, for example, young people were insistent that their mate should be "chaste." In Finland, France, Norway, the Netherlands, Sweden, and West Germany, on the other hand, most judged chastity to be relatively unimportant.

(A few respondents even jotted notes in the margin of the questionnaire, indicating that, for them, chastity would be a *disadvantage*.)

In an alternative analysis of Buss's (1989) data, Wallen (1989) attempted to determine which was the most important—culture or gender—in shaping people's mate preferences. He found that for some traits—such as good looks and financial prospects—gender had a great influence on preferences. (Gender accounted for 40-45% of the variance; geographical origin accounted for only 8-17% of the variance). For other traits—such as chastity, ambition, and preferred age—on the other hand, culture mattered most. (Gender accounted for only 5%-16% of the variance, whereas geographical origin accounted for 38%-59% of the variance). He concluded that, in general, the cultural perspective may well be even more powerful than one's evolutionary heritage in understanding mate selection.

Cultural researchers provide additional evidence that in different cultural, national, and ethnic groups, people often desire very different things in romantic, sexual, or marital partners.

Hatfield and Sprecher (1996) studied three powerful, modern, and industrial societies—the United States, Russia, and Japan. Men and women in Western, individualistic cultures (such as the United States and to some extent Russia) expected far more from their marriages than did couples in a collectivist culture (such as Japan). Cultural attitudes were also found to be critically important in determining *what* men and women desired in a mate.

4. Culture and the Willingness to Marry Someone You Do Not Love

In the West, romantic love is considered to be the *sine qua non* of marriage

(Kelley, et al., 1983; Sprecher, et al., 1994.)

In the mid-1960s, Kephart (1967) asked more than 1,000 college students: "If a boy (girl) had all the other qualities you desired, would you marry this person if you were not in love with him (her)?" In that era, men and women were found to possess very different ideas as to how important romantic love was in a marriage. Men considered passion to be essential (only 35% of them said they would marry someone they did not love). Women were more practical. They claimed that the absence of love would not necessarily deter them from considering marriage. (A full 76% of them admitted they would be willing to marry someone they did not love). Kephart suggested that while men might have the luxury of marrying for love, women did not. A woman's status was dependent on her husband's; thus, she had to be practical and take a potential mate's family background, professional status, and income into account.

Since the 1960s, sociologists have continued to ask young American men and women The Question. They have found that, year-by-year, young American men and women are coming to demand more and more of love.

In the most recent research, 86% of American men and a full 91% of American women answered The Question (of whether they would wed without love) with a resounding "No!" (Allgeier & Wiederman, 1991).

How do young men and women in other countries feel about this issue? Many social psychologists have pointed out that cultural values have a profound impact on how people feel about the wisdom of love matches versus arranged marriages. Throughout the world, arranged marriages are still relatively common. It seems reasonable to argue that in societies such as China, India, and Japan, where arranged marriages are fairly typical,

they ought to be viewed more positively than in the West, where they are relatively rare.

To test this notion, Sprecher and her colleagues (1994) asked American, Russian, and Japanese students: "If a person had all the other qualities you desired, would you marry him/her if you were not in love?" The authors assumed that only Americans would demand love *and* marriage; they predicted that both the Russians and the Japanese would be more practical. They were wrong! Both the Americans *and* the Japanese were romantics. Few of them would consider marrying someone they did not love. The Russians were more practical. Russian *men* were only slightly more practical than were men in other countries. It was the Russian *women* who were most likely to "settle." Desperate times . . .?

In a landmark study, Levine and his colleagues (1995) asked college students in 11 different nations if they would be willing to marry someone they did not love even if that person had all the other qualities they desired. In affluent Western nations, young people were insistent on love as a prerequisite for marriage. (In the U.S., Brazil, Australia, and England, few young people admitted they would say, "Yes" to a loveless marriage.) College students in affluent Eastern nations tended to vote for love as well. (In Japan, Hong Kong, and Mexico—the first two of which have a high standard of living—most insisted on love as a prerequisite for marriage.) Only in a very few traditional, collectivist, third world nations, were students willing to compromise. (In the Philippines, Thailand, India, and Pakistan, a fairly high percentage of college students said they would be willing to marry someone they did not love.) In these societies, of course, the extended family is still extremely important and poverty widespread.

Research suggests that today, young men and women in many countries throughout

the world consider love to be a prerequisite for courtship and marriage. It is only in a few Eastern, collectivist, and poorer countries that passionate love remains a bit of a luxury.

D. In Conclusion

The preceding studies, then, suggest that the large differences that once existed between Westernized, modern, urban, industrial societies and Eastern, modern, urban industrial societies may be fast disappearing. Those interested in cross-cultural differences may be forced to search for large differences in only the most underdeveloped, developing, and collectivist of societies—such as in Africa or Latin America, in China or the Arab countries (Egypt, Kuwait, Lebanon, Libya, Saudi-Arabia, Iraq, or the U. A. E.).

However, it may well be that, even there, the winds of Westernization, individualism, and social change are blowing. In spite of the censure of their elders, in a variety of traditional cultures, young people are increasingly adopting "Western" patterns—placing a high value on "falling in love," pressing for gender equality in love and sex, and insisting on marrying for love (as opposed to arranged marriages.) Such changes have been documented in Finland, Estonia, and Russia (Haavio-Mannila and Kontula, 2003) as well as among an Australian aboriginal peoples of Mangrove and a Copper Inuit Alaskan Indian tribe (see Jankowiak, 1995, for an extensive review of this research.)

Naturally, cultural differences still exert a profound influence on young people's attitudes, emotions, and behavior and such differences are not likely to disappear in our lifetime. In Morocco, for example, marriage was once an alliance between families (as historically it was in most of the world before the 18th century,) in which children had little or no say. Today, although parents can no longer simply dictate whom their children

will marry, parental approval remains critically important. Important though it is, however, young men and women are at least allowed to have their say (see Davis and Davis, 1995.)

Many have observed that today two powerful forces—globalization and nationalism—are contending for men's and women's souls. True, to some extent, the world's citizens may to some extent be becoming "one," but in truth the delightful and divisive cultural variations that have made our world both such an interesting, and simultaneously dangerous place, are likely to add spice to that heady brew of love and sexual practices for some time to come. The convergence of cultures around the world may be reducing the differences in the ways passionate love is experienced and expressed in our world, but tradition can be tenacious and the global future of passionate love cannot be predicted with any certainty.

III. The Development of Sexual Aversions: Kin Detection and the Emotion of Disgust

According to social psychologists, factors that influence who one will choose as a sexual partner include: degrees of familiarity, similarity, and proximity (e.g., Berscheid & Walster, 1978). Yet, who best fits this description? Family members! They're familiar – you've known them your entire life. They're similar – you share the same religion, the same culture, a strong physical resemblance, and, a greater than average chance of sharing the same genes. Lastly, they're close by and easily accessible – perhaps even under the same roof and down the hall. Nevertheless, nuclear family members are, typically, the last group of individuals considered as appropriate sexual partners.

Why is this? Intuitively, the answer to this question is that sex with family is disgusting and repugnant. But why do most people across diverse cultures feel this way

rather than perceiving sexual behavior with a close family member as exciting and erotic? One answer to this question can be obtained by considering our species' evolutionary history. In particular, throughout our evolutionary past, various recurring selection pressures (e.g., pathogens and deleterious recessive genes) existed that led to the evolution and maintenance of psychological mechanisms promoting the avoidance of sexual relations with close genetic relatives. Such an inbreeding avoidance system requires at least two main components: (i) systems designed to estimate of the probability each individual in the surrounding social environment is a close genetic relative (i.e., systems for detecting kin), and (ii) systems that take these computed estimates of kinship as input and regulate motivations to seek or avoid an individual as a sexual partner accordingly.

The nature of the information humans use to detect kin remains largely unknown. In addition, the emotive systems entrained to regulate sexual avoidance have not been fully explored. In this section, the psychological mechanisms governing the development of a sexual aversion toward close genetic relatives are discussed. First, theoretical considerations regarding the selection pressures that led to the evolution of inbreeding avoidance mechanisms are reviewed. Then evidence from inbred human and non-human animals is presented to show that sexual relations with close genetic relatives are in fact deleterious. This is followed by a discussion of the cognitive systems mediating kin detection. In particular, the cues governing the detection of a specific class of kin, siblings, is discussed along with ethnographic studies exploring whether these cues mediate the development of a sexual aversion between genetically *unrelated* individuals reared as siblings. Last, the emotion of disgust is proposed as the cognitive program entrained by kin detection systems to motivate sexual avoidance. At the opposite end of

the spectrum from lust, sexual disgust is an important, though often neglected, aspect of human mating psychology.

IV. Selection Pressures and the Evolution of Inbreeding Avoidance Systems

There are sound biological reasons why psychological mechanisms designed to avoid mating with a close genetic relative are expected to exist. Throughout our species' evolutionary history, the selection pressures posed by deleterious recessive mutations (e.g., Bittle & Neel, 1994) and short-generation pathogens (e.g., Tooby, 1982) would have severely negatively impacted the health and viability of offspring of individuals who were close genetic relatives. As a result, individuals who avoided mating with close genetic relatives and instead mated with someone who did not share an immediate common ancestor would have enjoyed greater reproductive success. Consequently, the presence of these two selection pressures would have led to the evolution and maintenance of systems that decreased the probability of close kin matings in species where close genetic relatives regularly encountered one another over the life span.

A. The Effects of Inbreeding Depression

The negative fitness consequences associated with inbreeding have been acknowledged in a number of different non-human species (Charlesworth & Charlesworth, 1999; Husband & Schemske, 1996; Keller, et al, 1994; Crnokrak & Roff, 1999). In general, parents who are close genetic relatives, such as siblings, tend to produce fewer and less viable offspring. These decrements in fitness can be manifest in a number of ways such as an increased susceptibility to disease-causing organisms, and hence increased rates of mortality (e.g., Jimenez, et al, 1994; Acevedo-Whitehouse, et al, 2003), impaired cognitive functions (e.g., Deckard, Wilson, & Sclesinger, 1989), and inability to

attract a mate(Hoglund, et al, 2002) .

Studies from human populations have documented the negative fitness consequences associated with mating with a close genetic relative (Neel & Schull, 1965; Adams & Neel, 1967; Carter, 1967; Seemanova, 1971; Bittles & Neel, 1994). Inbreeding leads to an increased probability of the expression of recessive deleterious genes leading to a greater incidence of major congenital malformations and postnatal mortality (Bittles, et al, 1991). Many studies in humans have focused on offspring of first cousins since this form of marriage is quite common in many cultures around the world (Bittles, *unpublished manuscript*). Though the effects of inbreeding depression in offspring of 1st cousins are expected to be much less severe than in offspring of individuals related at an r=0.5 (parents, offspring, and siblings) there have, nevertheless, been reports of various deformities and deficiencies across a variety of populations (Stoltenberg, et al, 1997; Demirel, et al, 1997; Jaber, et al, 1992; Zlotogora, 2002).

In addition to increased probabilities of mortality and congenital malformations and diseases, children of 1st cousins have been shown to have cognitive impairments. In two early studies, Cohen, et al (1963) and Schull & Neel (1965) both found offspring of 1st cousin marriages to have lower IQs than offspring of non-relatives. However, these studies did not take into account important variables such as the socio-economic status of the parents (Bashi, 1977). Controlling for this variable and other demographic factors, Bashi (1977), focusing on an Arab population, found that children of non-relatives performed better on intelligence (e.g., Raven's Progressive Matrices [Raven, 1960]) and achievement tests (e.g., subject tests in science, mathematics, and language) than children of 1st cousins.

Studies focusing on the effects of inbreeding between siblings have found substantially increased risks when compared with 1st cousin matings. Compared to inbreeding depression rates of 2-6% in offspring of 1st cousins (compared to population baseline), it has been estimated that sibling matings lead to an inbreeding depression of 45% (Seemanova, 1971; Ralls, Ballou, & Templeton, 1988; Aoki & Feldman, 1997). Moreover, since spontaneous abortions may go undetected, the effects of consanguineous marriages may be significantly underestimated (Bittles, et al, 1991). There have been a handful of studies documenting the fitness consequences of offspring born of two siblings. In all studies, there was an increased risk of mortality, mental deficiencies, congenital malformations, and disease (Neel & Schull, 1965; Adams & Neel, 1967; Carter, 1967; Seemanova, 1971).

V. Components of Incest Avoidance Mechanisms

Given these negative fitness consequences of inbreeding, natural selection would have favored those individuals who preferred to not mate with close genetic relatives. However, to solve the adaptive problem of inbreeding avoidance, two distinct systems are required: 1) systems for identifying those individuals who have a high probability of being a close genetic relative (e.g., a sibling, parent, or offspring), in short, kin detection, and 2) systems that regulate sexual attraction/avoidance in accordance with the computation of the likelihood an individual is a close genetic relative. These two components are discussed in turn with specific consideration of the cues our mind uses to detect a particular class of close relative: siblings.

A. Systems for Detecting Kin

Specifically, what is the origin and nature of the information used to categorize an

individual as a close genetic relative? There are a number of possible cues kin detection systems may have been designed to take as input. One potential source of information regarding kinship is linguistic and cultural input (e.g., during development you are told who counts as a close genetic relative and how to feel about them). However, this poses several problems. First, kin terms can be used across genetic boundaries and blur the distinction between types of close genetic relatives and between kin and non-kin. For example, in the U.S., "brother" might be used to refer to a full, half, step, or adoptive sibling, and in some cultures might even encompass cousins or coalitional allies. Second, due to asymmetries in relatedness, individuals may not share common "interests" regarding whom to help and when (Trivers, 1974). For example, a child would benefit (in terms of inclusive fitness) from helping a full sibling (with whom her degree of relatedness is .5) more than a half sibling (with whom her degree of relatedness is .25), all other things equal. However, a female is equally related to all her children regardless of their paternity and might therefore urge each child to, for example, "help your sister" while not linguistically differentiating between full and half siblings. Thus, kin terms might disregard or obscure genetic distinctions making them evolutionarily *less* reliable cues to kinship (but see Jones, 2004). Last, systems for detecting kin exist in many other animal species (Hepper, 1991; Hepper & Cleland, 1999) and predate the evolution of language and culture. There is no reason to suspect that either of these recent inventions have erased or replaced such phylogenetically prior mechanisms.

So if linguistic and cultural inputs alone do not provide a stable solution, what does? Because we cannot "see" another person's genes directly, the best natural selection could do is to shape mechanisms that use cues that were *reliably correlated with genetic relatedness*

in the ancestral past to compute an internal index of relatedness. To the extent that different cues reliably correlated with an individual being a particular type of close genetic relative (e.g., mother, father, offspring, or sibling), different detection mechanisms are expected to exist. For example, because ancestrally a female always gave birth to her own offspring, she could have relied on the process of birth and/or the visual and olfactory cues derived from a newborn to reliably and accurately categorize that child as a close genetic relative (e.g., Porter, Matochik, & Makin, 1983, 1984). However, due to the fact that males of our species could not be 100% certain of their paternity, seeing one's mate give birth to an offspring would not have solved the problem of assessing degree of relatedness to that offspring. Rather, for males, assessments of paternity may rely on cues signaling the sexual fidelity of their mate. Therefore, there may not be a general kin detection mechanism that relies on the same set of information for detecting *all* types of close genetic relatives. Instead, the advantages of kin selection would accrue most strongly to individuals that possessed specialized detection systems capable of narrowing in on the small subset of states that correlated with an individual being a particular kind of kin. The following discussion focuses on the cues used by the human cognitive architecture to detect a particular class of kin, siblings.

1. Cues to Siblinghood: The Westermarck Hypothesis.

Throughout our evolutionary history, the nutritional demands of breastfeeding along with the need for protection would have meant that children of the same mother were typically reared in close proximity during early childhood. Also, when hunter-gather bands fission into smaller units (e.g., due to size or difficult times), nuclear families (including siblings) tend to stay together as a unit (Lee & DeVore, 1968; Chagnon, 1992).

This means that in ancestral environments, early childhood would have offered valuable information regarding relatedness of individuals in prolonged close association. The notion that early childhood association plays an important role in the assessment of relatedness was first proposed by Edward Westermarck (1891), a Finnish social scientist. Noting the absence of sexual attraction between siblings, Westermarck hypothesized that early childhood propinquity leads to the development of a sexual aversion later, during adulthood. This has come to be known as the Westermarck Hypothesis (WH).

A number of researchers have tested the WH (see e.g., Shepher, 1971, 1983; Wolf, 1995; Williams & Finkelhor, 1995; Bevc & Silverman, 1993, 2000; Lieberman, Tooby, & Cosmides, 2003; Fessler & Navarrete, 2004). For some, the focus of research has been testing the WH in populations where genetically *unrelated* individuals are reared together as siblings. These have become well-known studies in the inbreeding avoidance literature and are reviewed in the next section.

2. Empirically Testing the Westermarck Hypothesis: Ethnographic Measures

Two well-known anthropological studies have taken advantage of cultural institutions that inadvertently created a "natural experiment" where children who were not genetically related to one another were reared in close physical proximity throughout childhood. The first study focused on the peer-groups of Israeli kibbutzim (Spiro, 1958; Talmon, 1964; Shepher, 1971, 1983). The second far more comprehensive series of investigations was by Arthur Wolf and colleagues who examined the adoption of baby girls into the household of their future husband's in Taiwan (sim-pua marriages; Wolf, 1995). Both of these "natural experiments" provide strong support for the Westermarck hypothesis and shed light on the nature of the cues mediating the recognition of siblings.

a. Israeli Kibbutzim

Israeli kibbutzim provided a unique natural laboratory allowing for the investigation of the role co-residence plays in the development of a sexual aversion. According to Shepher (1983), children born on a kibbutz were raised in peer groups consisting of six to eight individuals who were within two years of age of one another. Since there was a very low probability that biological siblings would occupy the same peer group (due to birth intervals greater than two years), individuals brought together in these peer groups tended to be unrelated. Most daily activities, such as attending school, eating, showering, using the toilet, playing, and sleeping, were done with other peer group members. A woman, who may or may not be the biological mother of anyone within the peer group, slept in the same house with members of a peer group. This rearing environment led to the close physical association of individuals who were not genetic relatives and allowed a series of researchers to explore the effects this arrangement had on sexual attraction. The Westermarck hypothesis predicts that individuals reared in close physical association (as were the children on Israeli kibbutzim) will develop a sexual aversion toward one another during adulthood.

Three of the pioneering social scientists to explore the commonly noted lack of sexual attraction and absence of marriage between peer group members were Spiro (1958), Talmon (1964), and Shepher (1971, 1983). In his survey of marriages within one kibbutz, Spiro (1958) found that no members within a peer group married one another or engaged in sexual behaviors during adulthood. Talmon (1964) found a similar pattern in her study evaluating 125 married couples across three kibbutzim. She discovered that no marriages and no reported sexual behavior occurred between individuals within the same peer group

who had been reared together from early childhood.

Perhaps the most comprehensive survey was completed by Shepher (1971, 1983). Shepher investigated the sexual behavior and patterns of marriage in all of the second-generation adults living in one kibbutz (N=65) and then surveyed all of the marriages occurring between second-generation Kibbutz members in all 211 Israeli kibbutzim. In the former he found the complete absence of sexual behavior and marriage between individuals reared in the same peer group from early childhood. In the latter study, of the 2769 marriages that occurred across all 211 Israeli kibbutzim surveyed, only 14 were between people reported to have been reared in the same peer group. Upon closer inspection, Shepher found that *none* of these 14 couples had been reared together continuously throughout the first six years of life. Shepher reasoned that continuous exposure throughout childhood and especially the *first six years of life* were critical for the development of a sexual aversion that became manifest at the age of 14 or 15 (Shepher, 1983). All of this occurred despite the lack of prohibitions or taboos against such relations. In fact, most parents were hopeful their children would marry within their respective peer group (Shepher, 1971).

b. Taiwanese Minor Marriages

A second natural experiment that allowed for the testing of the Westermarck hypothesis was the cultural institution of Taiwanese minor marriages. When the Japanese colonial government took control of Taiwan in the late 1800s, they compiled meticulous demographic records, including birth rates, death rates, marriages, divorces, and adoptions. Another record they kept was the form of marriage that took place. In Taiwan during this time period, there existed three different forms of marriage: patrilocal (major),

uxorilocal, and minor. In the major form of marriage, the bride went to live with the husband's family whereas in the uxorilocal form, the bridegroom went to live with the wife's family. In both cases, the parents of the children arranged the marriage and the husband and wife did not meet until the day of their marriage. In the minor form of marriage, a *sim-pua* (little bride), usually between a few months to three years of age, was adopted into a family for the purpose of marrying one of the sons later in life.

The anthropologist Arthur Wolf and colleagues spent the last 40 years collecting and analyzing data to determine whether marriages in which the wife had resided with her husband throughout early childhood differed from those in which the wife first met and started to live with her husband at the time of marriage (see Wolf, 1995). Wolf reasoned that if co-residence duration influences sexual attraction, as the Westermarck hypothesis predicts, then in those marriages where husband and wife co-resided from very early childhood, there should be a reduced sexual attraction as measured by rates of fertility, divorce and extramarital affairs. Moreover, Wolf hypothesized that the earlier a sim-pua was adopted into her husband's family, the more pronounced the effects would be.

Wolf surveyed more than 20,000 marriages and found that women in the minor form of marriage had twice as many extramarital affairs as women married in the major or uxorilocal form. In addition, minor marriages had 3 times the rate of divorce, and fertility rates 40% *lower* than that of women married in the major or uxorilocal pattern (i.e., where husband and wife met on the day of marriage). When Wolf looked at the age at which the daughter was adopted into her husband's family, he found an increased frequency of divorce and extramarital affairs and a lower fertility rate if the girl was adopted into a family with a son designated to be her future husband *before her third birthday*. If the girl

was adopted after her third birthday, the rates of fertility, divorce, and extramarital affairs were similar to those found between individuals married in the major fashion. These data led Wolf to conclude that, for an aversion to develop, individuals must be exposed to one another *before the age of three.*

These cross-cultural studies have provided evidence in support of the Westermarck hypothesis showing that genetically unrelated individuals who are reared together from early childhood develop a sexual aversion toward one another. As informative as these studies are, many questions remain: Does co-residence duration mediate the development of sexual aversions between individuals who are in fact genetic relatives? Is there a specific time frame of co-residence necessary for the activation of a sexual aversion? Is co-residence duration the only cue used by the cognitive architecture to identify siblings or are other cues used (e.g., facial similarity and cues derived from the catabolism of proteins associated with the MHC)? Does co-residence duration serve as a cue for identifying both older and younger siblings? After all, older siblings would have been exposed to a potent cue signaling relatedness, namely, seeing one's own biological mother pregnant and caring for (e.g., breast-feeding) a newborn (see Lieberman et al, 2003, Lieberman, under review). Last, does co-residence, or other cues mediating sibling detection, predict psychological measures assessing sexual aversions with siblings as implied by the sociological measures used by Shepher and Wolf? This last question relies on the existence of cognitive programs regulating sexual aversions, the topic of the next section.

B. Cognitive Programs Guiding Sexual Aversion: The Emotion of Disgust

In addition to systems designed to take in cues from the social environment and compute an estimate of kinship (i.e., kin detection), systems for regulating sexual

attraction and avoidance are required to achieve inbreeding avoidance. The amplitude of a sexual avoidance mechanism should be a function of the computed estimate of kinship (Lieberman et al, 2003). For example, when the kinship estimate is high (i.e., when cues signaling that an individual is likely to be a close genetic relative are present), then systems motivating sexual attraction will be down regulated and systems motivating sexual avoidance up-regulated. The greater the kinship estimate, the greater the activation of the program mediating sexual avoidance. The question remains, however, what program governs sexual aversions?

There are a variety of programs that could, in principle, solve this problem. One possibility is a system that causes an individual to withdraw from situations in which there is a high probability that sexual relations with a close relative might occur. A response that renders an individual merely disinterested in such a situation, for example, would, however, not be as effective at avoiding sexual relations with close relatives as a response that enabled an individual to actively monitor others' desires and withdraw from potentially incestuous (and hence, reproductively costly) situations. This is particularly important given the possibility of inbreeding conflict, where males may actively seek sexual relations with female relatives (Tooby, 1977; Haig, 1999).

Under ancestral conditions, close kin regularly encountered one another throughout the course of their lifetime. In the absence of any sexual aversion, there would have been a substantial chance that two close genetic relatives would engage in sexual relations. The presence of this statistically recurrent situation (close genetic relatives mating with one another) would have selected for psychological programs that brought about an appropriate response when cues indicating a close relative's desire to mate were present.

A cognitive system already in place that could have caused an individual to withdraw from a potential inbreeding situation is the emotion of disgust (Lieberman, 2003). From an evolutionary perspective, an emotion is a coordinated response of a suite of specific cognitive and physiological mechanisms to an evolutionary recurring situation (Tooby & Cosmides, 1990, 2000; Rosenberg & Ekman, 1994). As a repeated situation, the statistical possibility of sexual relations occurring between close family members would make an emotion, such as disgust, a good solution to this adaptive problem.

It has been widely hypothesized that the original function of disgust is to avoid the oral incorporation of various harmful substances (see, for example, Rozin & Fallon, 1987; Ekman & Davidson, 1994; Izard, 1993). More specifically, the emotion of disgust evolved to inhibit the ingestion of toxic materials and contact with disease-causing agents (e.g., feces, dead organisms, and spoiled food, Curtis & Biran, 2001). Disgust, which causes one to avoid or withdraw from harmful substances, such as pathogens, could have been co-opted during human evolution to motivate the withdrawal from sexual relations with a close genetic relative. The fact that this emotion causes repulsion (whereas mere lack of interest, does not), means that it can be mobilized to deter an unsolicited advance by a close family member. It can also act as a failsafe device, to counteract any sexual desire that may arise as a consequence of the fact that a family member such as a sibling may, in every other way, be an attractive individual of the opposite sex with all of the features (including accessibility) that feed into sexual attraction systems.

There are several reasons why the emotion of disgust may have been a felicitous system to co-opt for this new function. First, unlike – say – fear of predation, disgust evolved to make decisions about many situations in which appropriate and attractive

stimuli are similar in appearance to inappropriate and harmful stimuli: Feeding involves sorting among potential foods some of which may appear appealing but, if ingested, would be toxic or parasite-laden. For this reason, the system needs to be able to inhibit attraction based purely on perceptual properties. This same abstract structure is present in incest avoidance: someone's sexually inappropriate mother is someone else's sexually desirable spouse. Physical appearance cannot be used to make this discrimination since appearance is identical in both cases.

Secondly, disgust is capable of producing responses of varying intensity and assigning them to a large number of arbitrary stimuli. As the strength and/or number of cues indicating relatedness varies between different individuals, the increment or decrement in either attraction or the willingness to resist sexual contact should vary as well. For example, inbreeding depression should make cousins slightly less appealing than identically appearing non-cousins, but this factor may not be so strong as to overwhelm all other factors.

A final reason why disgust is a candidate system to co-opt for the purpose of inbreeding avoidance is because disgust is mobilized by exposure to other individuals and their bodily fluids – a system that must be suppressed for sexual contact to take place (Angyal, 1941). So, the sexual system already has to be linked in some fashion to the disgust system, making further engineering refinements an easy path for evolutionary modification.

C. In Conclusion

The model of a human inbreeding avoidance system proposed herein provides an empirical framework within which information hypothesized to serve as cues to

relatedness can be tested. The magnitude of the sexual aversion (or attraction) associated with a particular individual should be a function of the cues present in the social environment that were correlated with relatedness in our ancestral past. It is therefore possible to reverse engineer the kinds of cues used to detect each type of close genetic relative by quantitatively matching individual variation in opposition to incest to individual variation in parameters that may have served as cues to relatedness. Recently a handful of researchers have employed this method to investigate the nature of the cues our mind uses to identify siblings (e.g., DeBruine, 2002; Lieberman, 2003; Lieberman, et al, 2003; Fessler & Navarrete, 2004).

Understanding how sexual aversions develop in addition to how sexual attraction operates will provide a more comprehensive picture of mate selection in humans. Evolutionary considerations of the kinds of systems likely to exist that govern mating psychology in tandem with cross-cultural analyses of mating preferences and behavior will assist in the mapping of the cognitive architecture of human mating psychology.

IV. References

Acevedo-Whitehouse, K., Gulland, F., Greig, D., and Amos, W. (2003). Disease susceptibility in California sea lions. *Nature, 422,* 35.

Adams, M.S. and Neel, J.V. (1967). Children of incest. *Pediactrics, 40,* 55.

Allgeier, E. R., & Wiederman, M. W. (1991). Love and mate selection in the 1990s. *Free Inquiry, 11,* 25-27.

Angyal, A. (1941). Disgust and related aversions. *Journal of Abnormal and Social Psychology, 36,* 393-412.

Aoki, K. and Feldman, M.W. (1997). A gene-culture coevolutionary model for

brother-sister mating. *Proceedings of the National Academy of Science, 94,* 13046-13050.

Aron, A., & Rodriguez, G. (1992, July 25). Scenarios of falling in love among Mexican-, Chinese-, and Anglo-Americans. Sixth International Conference on Personal Relationships. Orono, ME.

Bartels, A. & Zeki, S. (2000). The neural basis of romantic love. *Neuroreport, 11* (17,) 3829-3834.

Bashi, J. (1977). Effects of inbreeding on cognitive performance. *Nature, 266,* 440-442.

Berscheid, E. and Walster, E. (1978). *Interpersonal Attraction*, 2nd ed., Reading, MA: Addison-Wesley.

Bevc, I. and Silverman, I. (1993). Early proximity and intimacy between siblings and incestuous behavior: A test of the Westermarck theory. *Ethology and Sociobiology, 14,* 171-181.

Bevc, I. and Silverman, I. (2000). Early separation and sibling incest: A test of the revised Westermarck theory. *Evolution and Human Behavior, 21,* 151-161.

Bittles, A.H. & Neel, J.V. (1994). The costs of human inbreeding and their implications for variation at the DNA level. *Nature Genetics, 8,* 117-121.

Bittles, A.H. Genetic aspects of inbreeding and incest. Unpublished manuscript.

Bittles, A.H., Mason, W.M., Greene, J., and Rao, A. (1991). Reproductive behavior and health in consanguineous marriages. *Science, 252,* 789-794.

Buss, D.M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses testes in 37 cultures. *Behavioral and Brain Sciences, 12,* 1-49.

Buss, D.M. (2003). *The Evolution of Desire,* revised edition. New York: Basic Books.

Carter, C.O. (1967). Risk of offspring of incest. *Lancet, 1,* 436.

Carter, C. S. (1998) Neuroendocrine perspectives on social attachment and love. *Psychoneuroendrocrinology, 23,* 779-818.

Chagnon, N.A. (1992). *Yanomamo: The last days of Eden.* San Diego: Harcourt Brace & Company.

Charlesworh, B. & Charlesworth, D. (1999). The genetic basis of inbreeding depression. *Genetical Research, 74,* 329-340.

Cohen, T., Block, N., Flum, Y., Kadar, M., and Goldschmist, E. (1963). School attainments in an immigrant village. In E. Goldschmist (Ed.) *The genetics of migrant and isolated populations.* New York: Williams and Wilkins.

Crnokrak, P. & Roff, D.A. (1999). Inbreeding depression in the wild. *Heredity, 83,* 260-270.

Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease: Is hygiene in our genes? *Perspectives in Biology and Medicine, 44,* 17-31.

Darwin, C. (1871/2004). *The Descent of Man and Selection in Relation to Sex.* New Ed. Penguin Books.

Davis, D. A. & Davis, S. S. (1995). Possessed by love: gender and romance in Morocco. In: William Jankowiak, (Ed.) (1995). *Romantic passion: A universal experience?* New York: Columbia University Press (p. 219-238.)

DeBruine, L. M. (2002). Facial resemblance enhances trust. *Proceedings: Biological Sciences, 269,* 1307-1312.

Deckard, B.S., Wilson, J.R., & Schlesinger, K. (1989). Behavioral and reproductive differences in mice as a function of inbreeding. *Behavior Genetics, 19,* 433-445.

Demirel, S., Katlanoglu, N., Acar, A., Bodur, S., and Paydak, F. (1997). The frequency of consanguinity in Konya, Turkey and its medical effects. *Genetic Counseling, 8,* 295-301.

Doherty, R. W., Hatfield, E., Thompson, K., & Choo, P. (1994). Cultural and ethnic influences on love and attachment. *Personal Relationships, 1*, 391-398.

Ekman, P. and Davidson, R.J. (1994). *The nature of emotion: Fundamental questions*. New York: Oxford University Press.

Fessler, D. M. T. & Navarrete, C. D. (2004). Third-party attitudes toward sibling incest: Evidence for Westermarck's hypotheses. *Evolution & Human Behavior, 25*, 277-294.

Fisher, H. (July 16, 2003) The brain chemistry of romantic attraction and its positive effect on sexual motivation. Paper presented at: International Academy of Sex Research. Twenty-Ninth Annual Meeting. Bloomington, IN.

Fisher, H., Aron, A., Mashek, D., Strong, G., Li, H., & Brown, L. L. (2004). Early stage intense romantic love activates cortical-basal-ganglia reward/motivation, emotion and attention systems: An fMRI study of a dynamic network that varies with relationship length, passion intensity and gender. Presented at Society for Neuroscience 33rd Annual Meeting, November

Goode, W. J. (1959). The theoretical importance of love. *American Sociological Review, 24,* 38-47.

Haavio-Mannila, E. & Kontula, O. (2003). Single and double sexual standards in Finland, Estonia, and St. Petersburg. *The Journal of Sex Research, 40,* 36-49.

Haig, D. (1999). Asymmetric relations: Internal conflicts and the horror of incest. *Evolution and Human Behavior, 20*, 83-98.

Hatfield, E. & Rapson, R. L. (1993). *Love, sex, and intimacy: Their psychology, biology, and history*. New York: Harper Collins.

Hatfield, E. & Rapson, R. L. (1996). *Love and sex: Cross-cultural perspectives.* Boston, MA: Allyn & Bacon (p. 71).

Hatfield, E. & Sprecher, S. (l986). Measuring passionate love in intimate relations. *Journal of Adolescence, 9,* 383-4l0.

Hatfield, E., & Sprecher, S. (1996). Men's and women's mate preferences in the United States, Russia, and Japan. *Journal of Cross-Cultural Psychology. 26,* 728-750.

Hepper, P.G. (1991). *Kin Recogntion.* Cambridge: Cambridge University Press.

Hepper, P.G. and Cleland, J. (1999). Developmental aspects of kin recognition. *Genetica, 104,* 199-205.

Hoglund, J., Piertney, S.B., Alatalo, R.V., Lindell, J., Lundberg, A., and Rintamaki, P.T. (2002). Inbreeding depression and male fitness in black grouse. *Proceedings of the Royal Society of London, Series B: Biological Sciences, 269 (1492),* 711-715.

Hsu, F. L. K. (1953). *Americans & Chinese: Passage to difference* (3rd ed.). Honolulu: University Press of Hawaii.

Hsu, F. L. K. (1985). The self in cross-cultural perspective. In A. J. Marsella, G. DeVos, & F. L. K. Hsu (Eds.), *Culture and self: Asian and Western perspectives* (pp. 24-55). London, England: Tavistock.

Husband, B.C. and Schemske, D.W. (1996). Evolution of the magnitude and timing of inbreeding depression in plants. *Evolution, 50,* 54-70.

Izard, C.E. (1993). Organizational and motivational functions of discrete emotions.

In M. Lewis and J.M. Haviland (Eds.), *Handbook of Emotions* (pp. 631-665). New York: Guilford Press.

Jaber, L., Merlob, P., Bu, X., Rotter, J.I., and Shohat, M. (1992). Marked parental consanguinity as a cause for increased major malformations in an Israeli Arab community. *American Journal of Medical Genetics, 44,* 1-6.

Jankowiak, W. (Ed.) (1995). *Romantic passion: A universal experience?* New York: Columbia University Press.

Jankowiak, W. R., & Fischer, E. F. (1992). A cross-cultural perspective on romantic love. *Ethology, 31,* 149-155.

Jimenez, J.A., Hughes, K.A., Alaks, G., Graham, L., & Lact, R.C. (1994). An experimental study of inbreeding depression in a natural habitat. *Science, 266,* 271-273.

Jones, D. (2004). The universal psychology of kinship: Evidence from language. *Trends in Cognitive Sciences, 8,* 211-215.

Keller, L.F., Arcese, P.S., James N.M., Hochachka, W.M. (1994). Selection against inbred song sparrows during a natural population bottleneck. *Nature, 372,* 356-357.

Kelley, H. H. (1983). Love and commitment. In H. H. Kelley, E. Berscheid, A. Christensen, J. H. Harvey, T. L. Huston, G. Levinger, E. McClintock, L. A. Peplau & D. R. Peterson (Eds.). *Close relationships* (pp. 265-314). New York: W. H. Freeman.

Kephart, W. M. (1967). Some correlates of romantic love. *Journal of Marriage and the Family, 29,* 470-479.

Komisaruk, B.R. & Whipple, B. (1998). Love as sensory stimulation: Physiological consequences of its deprivation and expression. *Psychoneuro-endocrinology, 8,* 927-944.

Landis, D. & O'Shea, W. A. O. III, (2000). Cross-cultural aspects of passionate love; An individual difference analysis. *Journal of Cross-Cultural Psychology,* 31, 754-779.

Lee, R. B. & DeVore, I. (1968) *Man the hunter.* New York: Aldine de Gruyter.

Levine, R., Sato, S., Hashimoto, T., & Verma, J. (1995). Love and marriage in eleven cultures. *Journal of Cross-Cultural Psychology, 26,* 554-571.

Lieberman, D. (2003). *Mapping the cognitive architecture of systems for kin detection and inbreeding avoidance: The Westermarck hypothesis and the development of sexual aversions between siblings.* UMI Digital Dissertation, AAT 3103441.

Lieberman, D., Tooby, J., & Cosmides, L. (2003). Does morality have a biological basis? An empirical test of the factors governing moral sentiments relating to incest. *Proceedings of the Royal Society: Biological Sciences, 270,* 819-826.

Marazziti, D., Akiskal, H. S., Rossi, A., & Cassano, G. B. (1999). Alteration of the platelet serotonin transporter in romantic love. *Psychological Medicine,* 29 (3), 741-745.

Marazziti, D. & Canale, D. (2004). Hormonal changes when falling in love. *Psychoneuroendrocrinology, 29* (7), 931-936.

Neel, J.V. & Schull, W.J. (1965) *American Journal of Human Genetics, 48,* 573.

Nisbett, R. (2003.) *The geography of thought: how Asians and Westerners think differently . . . and why.* Chicago, IL: The Free Press.

Porter, R.H., Matochik, J.A., & Makin, J.W. (1983). Evidence for phenotype matching in spiny mice (*Acomys cahirinus). Animal Behavior, 31,* 978-984.

Porter, R.H., Matochik, J.A., & Makin, J.W. (1984). The role of familiarity in the development of social preferences in spiny mice. *Behavioral Proceedings, 9,* 241-254.

Ralls, K., Ballou, J.D., & Templeton, A. (1988). Estimates of lethal equivalents and the cost of inbreeding in mammals. *Conservation Biology, 2,* 185-193.

Raven, J.C. (1960). *Guide to the standard progressive matrices.* London: Lewis.

Rosenberg, E. L. & Ekman, P. (1994). Coherence between expressive and experiential systems in emotion. *Cognition and Emotion, 8,* 201-229.

Rosenblatt, P. C. (1967). Marital residence and the function of romantic love. *Ethnology, 6,* 471-480.

Rozin, P., & Fallon, A.E. (1987). A perspective on disgust. *Psychological Review, 94,* 23-41.

Schull, W.J. and Neel, J.V. (1965). *The effects of inbreeding on Japanese children*. Harper and Row, New York.

Seemanova, E. (1971). A study of children of incestuous matings. *Human Heredity, 21,* 108-128.

Shaver, P. R. & Murdaya, U. (2001). Structure of the Indonesian emotion lexicon. *Asian Journal of Social Psychology, 4,* 201-224.

Shaver, P. R., Wu, S., & Schwartz, J. C. (1991). Cross-cultural similarities and differences in emotion and its representation: A prototype approach. In M. S. Clark (Ed.), *Review of Personality and Social Psychology, Vol.13* (pp.175-212). Newbury Park, CA: Sage

Shepher, J. (1971). Mate selection among second-generation kibbutz adolescents: Incest avoidance and negative imprinting. *Archives of Sexual Behavior, 1(1),* 293-307.

Shepher, J. (1983). *Incest: A biosocial view*. New York: Academic Press.

Simmons, C. H., Vom Kolke, A., & Shimizu, H. (1986). Attitudes toward romantic love among American, German, & Japanese students. *Journal of Social Psychology, 126,* 327-337.

Soueif, A. (1999), *The Map of Love*. London, England: Bloomsbury Publishing.

Spiro, M. E. (1958). *Children of the Kibbutz*. Cambridge, Massachusetts. Harvard Press.

Sprecher, S., Aron, A., Hatfield, E., Cortese, A., Potapova, E., & Levitskaya, A. (1994). Love: American style, Russian style, and Japanese style. *Personal Relationships, 1,* 349-369.

Stoltenberg, C., Magnus, P., Lie, R.T., Daltveit, A.K., and Irgens, L.M. (1997). Birth defects and parental consanguinity in Norway. *American Journal of Epidemiology, 145,* 439-448.

Talmon, G.Y. (1964). Mate selection in collective settlements. *American Sociological Review, 29,* 408-491.

Tooby, J. (1977). Factors governing optimal inbreeding. *Proceedings of the Institute for Evolutionary Studies, 77*(1), 1 – 54.

Tooby, J. (1982). Pathogens, polymorphism, and the evolution of sex. *Journal of Theoretical Biology, 97,* 557-576.

Tooby, J. and Cosmides, L. (1990). The past explains the present: Emotional adaptations and the structure of ancestral environment. *Ethology and Sociobiology, 11,* 375-424.

Tooby, J. and Cosmides, L. (2000). Evolutionary psychology and the emotions. In M. Lewis & J. M. Haviland-Jones, (Eds.), *Handbook of Emotions, 2nd Edition*. New York: Guilford.

Trivers, R. L. (1974). Parent-offspring conflict. *American Zoology, 14,* 249-264.

Wallen, K. (1989). Mate selection: Economics and affection. *Behavioral and Brain*

Sciences, 12, 37-38.

Westermarck, E.A. (1891/1921). *The History of Human Marriage*. London: Macmillan

Williams, L. M. & Finkelhor, D. (1995). Paternal caregiving and incest: Test of a biosocial model. *American Journal of Orthopsychiatry, 65*, 101-113.

Wolf, A.P. (1995) *Sexual Attraction and Childhood Association: a Chinese brief for Edward Westermarck*. Stanford, CA: Stanford University Press.

Zlotogora, J. (2002). What is the birth defect risk associated with consanguineous marriages? *American Journal of Medical Genetics, 109*, 70-71.