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Evolutionary Perspectives on Sibling Relationships

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Published as:

Michalski, R., & Euler, H. A. (2007). Sibling relationships. In C. A. Salmon & T. K. Shackelford (Eds.), *Family relationships: an evolutionary perspective* (pp.185-204). New York, NY: Oxford University Press.

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“The sibships into which we are born are crucial social environments, with associated opportunities, costs and ‘niches,’ and it would be remarkable if our evolved social psyches did not contain features adapted to the peculiarities of sibling relationship.”

-Martin Daly, Catherine Salmon, & Margo Wilson (1997, p. 276)

### *Overview*

The quote above highlights crisply the focus of this chapter. Sibling relationships are unique. They are the longest lasting human social relationship exceeding, on average, the length of relationships with parents, mates, and children. Reports of sibling relationships and in particular their potential for strife and fratricide between siblings are features of mythology (e.g., Dardanus) and of Biblical accounts (e.g., Cain and Abel). These tales suggest that sibling relationships have been the fodder of disputes and gossip throughout written history and probably throughout human evolutionary history. Sibling relationships galvanize our interests when used to explain why our personalities have been shaped as they are. Many humans delight in the disclosure of the sibling status of potential mates and friends who seem to then “know” them better based on features of the sibling relationship such as the sex composition of sibships and their birth order. The powerful underlying evolved psychological mechanisms activated in the contexts of sibling relationships are revealed in the attempts often made by parents to foster closeness between their children. Parents often attempt to groom young children for the arrival of a younger sibling. Consumer evidence of these manipulative parental mechanisms is revealed in the books available to parents to educate them on aiding their oldest child’s adjustment to the arrival of a younger sibling. There are also children’s books available that can be used to suit the fitness interests of parents by enticing children into the role of helpful, older siblings who are not jealous over the investment demands of newborns (Sears, Sears, & Kelly, 2001). Put simply, these books would have no market if it were not for the evolved psychological mechanisms triggered in the minds of children that attempt to counteract the diversion of parental resources to siblings. As we will discuss in this chapter, the most powerful guidance available to unmask this psychology is offered by evolutionary theories including inclusive fitness theory (Hamilton, 1964), parental investment theory (Trivers, 1972), and parent-offspring conflict theory (Trivers, 1974).

Sibling relationships differ according to types of siblings, namely full siblings, half-siblings, stepsiblings, adoptive siblings, fictive siblings, or siblings-in-law. Full siblings are two individuals who

share the same two biological parents. Half-siblings are two individuals who share only one biological parent. Stepsiblings share no biological parent but are linked as a result of the marriage of the biological parent of one child to the biological parent of their other child. Adoptive siblings are two individuals where both or one of the children is legally adopted by two parents. Fictive siblings are two individuals who are genetically unrelated but who are given the status of siblings. Siblings-in-law are labels for relationships between individuals who, by virtue of the establishment of long-term pair bonds to one of the categories of siblings listed above, are considered siblings. Siblings-in-law have different distinctions across cultures but these categories, broadly defined, can be the spouse of one's sibling, the sibling of one's spouse, or the spouse of one's spouse's sibling.

The literature on sibling relationships is fairly disjointed with little emphasis placed on integrating these separate areas of research. Typical areas of study on sibling relationships include sibling relationships in childhood, sibling relationships in adulthood, studies on differences between siblings, sibling violence and abuse, and altruism toward siblings, to name just a few. Few researchers operate within an overarching framework from which to understand the nature of different sibling relationships and how these relationships change across the lifespan. We propose that more earnest attempts need to be made to incorporate explicit evolutionary, adaptationist accounts of sibling relationships to propel future research in the area of sibling relationships in an integrated way. Research that does purport to utilize an integrated, overarching framework (e.g., family systems theory), we believe, falls short in its attempts to understand *why* unique features of the sibling relationship exist. Relatively recent writings on sibling relationships often fail to mention evolution or to highlight any of the research done by evolutionary psychologists on the topic of sibling relationships (See, for example, Cicirelli, 1995). In short, the most revealing research on the nature of sibling relationships has yet to be done because the most powerful tool available to social scientists has not been fully brought to bear on the topic—Darwin's theory of evolution by natural selection.

*A Brief Primer on Evolutionary Psychology*

Researchers guided by an evolutionary perspective are unified in their belief that the psychological mechanisms have evolved via processes of natural selection and sexual selection (Darwin, 1859; 1871). Selection produces evolved psychological mechanisms that function to take in relatively narrow slices of environmental input and generate output correlated with reproductive and survival success in ancestral environments. The behavioral expression of modern humans represents the interaction of modern environmental input with evolved psychological mechanisms. This interaction between environments and evolved psychological mechanisms has spurred researchers working from an evolutionary perspective to examine the impact of siblings on various psychological outputs.

Siblings, having been recurrent features of ancestral social environments, may have posed adaptive problems that led to the development of psychological mechanisms that counteract the adaptive problems posed by siblings. We propose that sibling relationships (1) may contribute to the development of certain classes of psychological mechanisms including, for example, personality and sexual strategies, (2) may have forged specific evolved psychological mechanisms triggered only by the presence of siblings, and (3) that the activation of these evolved psychological mechanisms are unique to specific adaptive problems confronted at certain points throughout development. There were several influential theories that equipped evolutionary scientists with the tools necessary to begin to tackle the study of sibling relationships.

Hamilton's (1964) inclusive fitness theory is one of these influential theories. Inclusive fitness theory states that natural selection favored not only those traits that promoted individual survival or reproductive success, but also those traits that increased the chances that other related family members, who share copies of genes, would reach reproductive age and produce children. Not all ancestral humans, however, shared the same assurance of relatedness to other family members. Ancestral women could place their long-term partner at risk of investing resources in a rival's offspring by cuckolding their long-term partner. Inclusive fitness theory also sheds light on the interconnectedness of parental psychology and sibling psychology. Siblings also benefited from greater paternity certainty by virtue of fitness advantages accrued through investments in siblings with whom more certain genetic relatedness were

shared. We find that as the study of parental psychology progresses that these insights illuminate features of sibling relationships that were darkened prior to this research.

Parental investment theory was another influential theory that led to a deeper appreciation of parental investment as limited and partitionable (Trivers, 1972). For nearly a century after the original publication of Darwin's theory of sexual selection, the focus was placed on biological sex as the driving force behind sexual selection. Parental investment theory forced evolutionary biologists and, later, evolutionary psychologists to reformulate the impact of biological sex on sexual selection. Trivers' theory proposes that it is not biological sex that drives sexual selection but differences in the *minimum* obligatory parental investment. Parental investment is defined as any investment that a parent makes in its offspring that increases that offspring's chances of survival at the expense of the parent's ability to invest in additional or future offspring. Parental investment in one sibling therefore forecloses investment in other siblings.

Among humans, females make the larger investment in their offspring compared to males (see Hrdy, this volume). Female sex cells are larger and metabolically more costly than male sex cells to produce. Additionally, fertilization occurs internally within females. As a result, female humans bear the costs of gestating an offspring for a minimum of nine months, going through the process and historical risks of childbirth, and nursing an offspring for several years. A male's minimum obligatory investment can end with the act of sexual intercourse. Because the costs associated with parental investment are not isomorphic between the sexes, a suite of psychological characteristics are proposed to exist in females that are not expected to exist in males. Following impregnation, a female's reproductive opportunities are more constrained by the investment that must be made during pregnancy. A male's reproductive opportunities are not constrained in similar fashion, making a male's reproductive potential considerably larger than the female's reproductive potential.

Cross-culturally, men invest substantially less than women in their offspring (See Geary, this volume). Even in cultures with relatively high paternal investment, maternal investment dwarfs the investments made by fathers. This asymmetry between the sexes sets the stage for a host of potential

evolved psychological mechanisms that exist to deal with social dilemmas posed by other family members—including siblings.

In sexually reproducing species, parents and their offspring are genetically related, on average, by 50 percent. Offspring, in contrast, are 100 percent related to themselves. This difference resulted in selection pressures on offspring and on parents in ancestral environments over the allocation of parental resources. This insight was developed in parent-offspring conflict theory (Trivers, 1974; see Salmon, this volume). Parent-offspring conflict theory predicts that offspring covet more resources from parents than parents are willing to give. A key prediction of this theory is that parents will encourage offspring to value their siblings more than siblings will be inclined to value each other. Siblings are primary competitors over parental resources and mechanisms have been selected in offspring that increase investment in themselves relative to their siblings. This leads to clear implications for the literature on birth order (see Sullo way, this volume). Birth order, a proxy for age, size, and status differences between siblings, may be predictably related to advantages that siblings have in securing resources from parents. Firstborns, being older and larger than their laterborn siblings early in life may have been in a better position in competition over access to resources. This is the theoretical engine behind much of the evolutionarily informed research on differences between siblings based on birth order.

### *Competitiveness*

Siblings are each other's main competitors over parental resources. The ways in which siblings compete with each other over those resources are beginning to be unveiled. One method by which children attempt to distort parental perceptions of need was identified by Dunn and Kenrick (1982) who report that older siblings often "regress" to earlier developmental stages upon the birth of a younger sibling. This tactic of regressing may have functioned in ancestral environments as a way in which children, who have a more impoverished arsenal of competitive tactics, signal to parents their need for a greater proportion of parental resources. Children also may "compete" with siblings who have not yet been conceived as a means of staving off the introduction of a competitor over parental resources. For

example, future research may reveal psychological tactics in children that result in reduced maternal or paternal sexual interests.

Siblings are competitors over parental resources throughout their lives and upon the death of one or both parents. Although speculative, younger siblings may stand to gain more parental resources when an older, perhaps parentally favored, sibling dies. This may be particularly true for males. Because males' reproductive variance is greater than females', selection has created in men psychological adaptations that create more intense competitions with others over access to resources that men can translate into reproductive opportunities. The inclination of males to enter into competition, especially with other males, is evident in childhood and so pervasive that it also appear early in life as competition with siblings.

Siblings may contain psychological adaptations that function to channel investment in them at the expense of their siblings. Siblings also may have psychological adaptations that function to channel parental resources toward their children at the expense of their sibling's children (See Euler & Michalski, this volume). Parents may attempt to cultivate grandparent-grandchild relationships for their children in a way that they do not for their nieces and nephews. Within the parental psychological arsenal of tactics of resource extraction may be attempts to present their parents with pictures of grandchildren, attempts made by parents for grandchildren to spend more time with their grandparents, and attempts to "talk up" the accomplishments of their children. Although this hypothesis has, to our knowledge, never been tested, mothers *and* fathers may be more likely to attempt to get their children to spend time with the most investing grandparents (the maternal grandmother). To date, there exists no study that has examined the ways in which parents attempt to distort the attitudes of their parents and their children in ways that foster grandparental investment. It is possible as well that grief intensity over the death of a grandparent acts as a gauge of relational closeness and as a manifestation of sibling competition. If grief is more intense among closer individuals, then grief may signal to others (siblings) of the deservingness of grandparental resources after their death. In this way, future researchers may examine grief over the loss of a loved one

as one strategy for extracting a larger portion of the deceased resources. We eagerly await these future studies.

*Sibling Conflicts: Full siblings, Stepsiblings, and Half-siblings*

Research on how sibling relationships vary as a function of the genetic relatedness has not been central. We expect mechanisms to exist in the minds of humans that easily distinguish categories of siblings like those listed in the beginning of the chapter. Additionally, we expect mechanisms to exist that subtly distinguish full siblings based on signals of genetic relatedness between them. Full siblings are *putative* full siblings and psychological mechanisms may ignite conflict with siblings under certain circumstances when triggered by cues of less certain genetic relationships between them. Female infidelity may have placed children at risk of investing in half-siblings instead of full siblings. We expect selection to have crafted in the minds of humans, psychological mechanisms that help identify kin based on characteristics that may signal a genetic relationship. In siblings, these psychological adaptations may become activated based on actual or perceived psychological similarity, actual or perceived physical similarity, parental attempts to manipulate perceptions of psychological or physical similarity, presence of same putative father, and/or features of maternal behavior that siblings may be sensitive to (e.g., favoritism).

A particularly powerful study on the ability of human sibling psychology to trump cultural attempts to obliterate siblings preferences was made by Jankowiak and Diderich (2000). These researchers examined sibling solidarity among full and half-siblings in a Mormon fundamentalist polygamous community in the western United States. Based on the ideology of this religious group, siblings are not differentiated along full sibling and half-sibling lines and are consequently instructed to not differentiate between these two types of siblings. The logic of inclusive fitness theory predicts that sibling solidarity will be strongly crafted by the genetic relationship between two individuals with full siblings expressing more solidarity to each other than will be expressed between half-siblings. But despite ideological claims to the contrary, more solidarity was expressed with full siblings than with half-siblings



as shown in monetary gifts, requests to babysit, feelings of closeness, favoritism, and attendance at birthday and wedding celebrations.

Using a sample of several hundred young adults, we examined whether the conflict reported between full siblings, half-siblings, and stepsiblings changes over time. We collected reports from several hundred young adults on conflict they experienced with their sibling while they were growing up and the current conflict they experience with their siblings ( $N = 680$ ). Results from these analyses reveal a main effect of sibling type with siblings reporting the most conflict with their full siblings with whom they are in the most direct competition with over parental resources. We also found a significant interaction between sibling type and time (See Figure 1). For both full siblings and half siblings, reports of conflict are greater while they were growing up relative to current conflict experienced with the sibling. In contrast, reports of conflict with stepsiblings did not decrease from childhood to young adulthood. These findings highlight future directions for research on sibling conflicts throughout the lifespan. An additional area of future work may be on elucidating the types of sibling conflicts that change over the lifespan.

[Insert Figure 1 here]

There seems to exist no inventory to assess the types of conflict that siblings experienced while they were growing up. Although it was possible in the above study to identify overall trends in conflict, the kinds of conflicts that riddle siblings could not be identified. To follow up on this study, we collected act nomination data from college students by asking them to list aggressive acts that their siblings had done to them while growing up. This study resulted in the development of an inventory (Michalski & Shackelford, 2006). Aggressive tactics ranged from verbal insults and destruction of property to threats of death and actual physical violence. The kind of sibling aggression differed between girls and boys, with siblings being more likely to insult sisters on features of physical attractiveness (e.g., calling a sibling fat) and siblings being more likely to insult a brother's intelligence (e.g., calling a sibling stupid)—features linked to sex-specific, reproductively relevant characteristics. Participants indicated that they were insulted by claims they were unrelated to the family (e.g., telling a sibling he or she was adopted). Apparently, a popular tactic includes derogating a sibling by saying he or she has no genetic relationship

with others “in the family”. This tactic only would emerge if siblings were sensitive to the extent to which they are related to others in the family because of the consequences of *not* being related to kin in ancestral environments. Another tactic that emerged was to claim that a sibling did not look like a father (Daly & Wilson, 1982). Not one participant mentioned the tactic of claiming that a sibling did not look like the mother. The prospect of a more detailed picture of the impact of an evolutionary history of sibling relationships on competitiveness and the conflict that emerges from this competitiveness seems bright. Although childhood conflict often is reflected in pleasant memories shared by adult siblings, for others, these conflicts can become lethal.

### *Siblicide*

Siblicide—the killing of one sibling by another—is rare relative to other types of homicide. Underwood and Patch (1999) report that, of 65,390 total homicides coded in the Supplementary Homicide Reports (SHRs) of the Federal Bureau of Investigation (FBI) for the years 1993 through 1995, only 572 (0.9%) were cases in which offender and victim were siblings. But despite this rarity, violence between siblings is the most frequent form of intrafamilial non-lethal violence (Wiehe, 1997). The study of siblicide, we believe, can provide insight into sibling relationships and non-lethal sibling conflict.

An evolutionary perspective has been applied to the study of homicide (Daly & Wilson, 1988), and to siblicide, in particular (Russell, Michalski, Shackelford, & Weekes-Shackelford, 2006; Daly, Wilson, Salmon, Hiraiwa-Hasegawa, & Hasegawa, 2001; Sulloway, 1996). Daly et al. found that older siblings are more likely to kill younger siblings earlier in life and that younger siblings are more likely to kill older siblings later in life. Previous research on siblicide from an evolutionary perspective failed to differentiate siblicides perpetrated against siblings of varying genetic relationships. Genetic relatedness may be an important moderator of conflict and homicide among family members, including siblings (Russell et al., 2006; Daly et al., 2001, Daly & Wilson, 1988).

Russell et al. (2006) conducted the first investigation of siblicide as a function of the genetic relatedness between the victim and offender. Using the Chicago Homicide Database (CHD) for the years 1965 through 1994, the researchers found that a greater proportion of siblicides of full siblings were

single-victim siblicides, relative to the proportion of siblicides of half-siblings and stepsiblings. Russell et al. also found that a greater proportion of siblicides of half-siblings and stepsiblings were perpetrated through beatings, relative to the proportion of siblicides of full siblings. The patterns of results were as predicted, but did not reach statistical significance owing, perhaps, to small sample sizes.

As an extension of Russell et al. (2006), Michalski, Russell, Shackelford, and Weekes-Shackelford (2006) examined siblicides perpetrated by siblings-in-law to yield data distinguishing full, genetic siblings from unrelated siblings in a historical homicide database from Chicago spanning the years 1870 to 1930. Siblings may be less likely to kill a full sibling, for example, because the evolutionary “fitness” costs associated with the death of a full sibling, with whom the perpetrator shares 50% of his or her genes, are higher than the fitness costs associated with the death of a sibling-in-law, with whom the perpetrator shares 0% of his or her genes. Siblicides between siblings-in-law may be more likely than those between full siblings to include more than one victim because siblings-in-law may be more likely to commit siblicide during a moment of intense bitterness and resentment—emotions that may co-occur with greater behavioral disorganization and spontaneity (Weekes-Shackelford & Shackelford, 2004). Full siblings, on the other hand, may single out one particular sibling—perhaps that sibling perceived by the offender to be the recipient of a greater share of parental investment.

Parental investment in siblings-in-law may be viewed by a sibling as “wasted” investment. Such a “misdirected” investment may lead to feelings of jealousy and indignation toward siblings-in-law that are not present to the same degree toward full siblings. Michalski, Russell, et al. (2006) tested whether a greater proportion of siblicides of siblings-in-law will be perpetrated via beatings, relative to the proportion of siblicides of full siblings and found that the results were in the predicted direction but were not statistically significant.

Because a greater evolutionary “fitness” cost is associated with the death of a full sibling, relative to the death of a sibling-in-law, deliberate and intentional siblicides may be more frequent among siblings-in-law than among full siblings. Michalski, Russell, et al. (2006) found that accidental siblicides were more common between full siblings than between siblings-in-law, who may be more inclined

towards purposeful and contemplated siblicides. Future breakthroughs on siblicide research await but must rely on larger, national databases that code for the genetic relatedness of victim and offender. Such databases are, unfortunately, currently lacking.

### *Parental favoritism*

Parents are not expected to invest in offspring equally because the genetic interests of parents and their children are not identical (Daly & Wilson, 1987; Hertwig, Davis, & Sulloway, 2002; Trivers, 1974). Parental genetic interests translate into “strategies” that reflect evolved psychological mechanisms designed to increase fitness by channeling investment to children who were likely to yield the greatest reproductive returns in ancestral environments (Hamilton, 1964). Recent work suggests that perceived parental favoritism may be contingent on the birth order of children (Hertwig, et al. 2002; Rohde et al. 2003; Salmon, 2003; Sulloway, 2001).

Michalski, Shackelford, and Salmon (2006) tested several predictions about perceptions of parental favoritism. Previous research reveals a bias of paternal investment in daughters and a bias of maternal investment in sons (Salmon, 2003). This pattern of investment may be understood by appreciating the role of relational uncertainty. Relational uncertainty refers to the probability that a genetic relationship between two kin could have been severed by cuckoldry (Euler & Weitzel, 1996; Hartung, 1985; Michalski & Shackelford, 2005). Grandfathers faced the adaptive problem of relational uncertainty at higher rates than did grandmothers because paternal and maternal grandfathers averaged more potential links of cuckoldry between themselves and their grandchildren than maternal and paternal grandmothers. Grandfathers would have benefited by investing more heavily in daughters than in sons because they could have been more certain that each unit of investment in a daughter would go towards aiding her children. The predicted pattern of greater investment in daughters than in sons may not be exclusive to periods when grandchildren through daughters are present. An ontogenetic history of increased investment in daughters relative to sons may result in prolonged investment biases throughout a daughter’s life. Grandmothers’ investments are not expected to favor one particular sex over the other, all else equal. Grandmothers may channel more investment in daughters because of greater certainty that the

investment will be directed toward grandchildren who have a higher probability of being genetically related. On the other hand, grandmothers may channel more investment in sons because that investment, relative to an equal investment in daughters, may be more directly related to additional mating opportunities for their sons, relative to such opportunities for daughters, especially when resources are abundant (Trivers & Willard, 1973). Paternity uncertainty coupled with relational uncertainty suggests a paternal bias towards investing in daughters than investing in sons—a finding documented by Michalski et al. (2006).

The investment costs incurred by parents in ancestral environments are likely to have been higher for mothers than for fathers (Hrdy, 1999). Psychological mechanisms in women motivating investment in children, therefore, were likely to have been a special target of selective processes. One stable feature of ancestral environments that may have prompted increased investment was the presence of a mate who is unrelated to her children. Daughters react more negatively than sons in mother-stepfather families because of a disruption of the tie established between mother and daughter by stepfathers (Bray, 1999). Mothers may appear to favor daughters in this context because of this disruption, to compensate for this loss of emotional closeness. An alternative explanation of mother's favoritism towards daughters centers on the unique risks that daughters in blended families incur. Female sexual abuse perpetrated by a stepfather is higher than abuse by a biological father (Russell, 1984; Wilson & Daly, 1987). As a result of this risk, mothers may invest more heavily in daughters than in sons in the presence of a stepfather. Such a conditional strategy may be an attempt by mothers to reduce the risk of sexual abuse that female children suffer in such a condition. A similar pattern is not expected to emerge for fathers because their current partners do not pose an equivalent risk that mothers' partners pose to stepdaughters. Previous favoritism by a mother in sons may shift to favoritism towards daughters when a stepfather or mother's partner is present. Michalski et al. (2006) found that daughters are perceived as favored by mothers in blended families. This finding, to our knowledge, represents the first hint of a strategy of thwarting the sexual interests of stepfathers in stepdaughters.

Theoretical models and evidence collected to test those models reveal a preference for both mothers and fathers to invest disproportionately in genetically-related children compared to genetically-unrelated children (e.g., Daly & Wilson, 1987; Anderson, Kaplan, & Lancaster, 1999). Among blended families, it is likely that both mothers and fathers will be perceived as favoring genetically related children than stepchildren. Michalski et al. (2006) found that adult children perceive parents as favoring genetic children over stepchildren.

Parental psychological mechanisms may be sensitive to the reproductive “value” that children offer (Daly & Wilson, 1987). This value may be assessed by parents through three broad classes of child characteristics: the probability that a child will survive to reproductive maturity and reproduce, the value of investment in one child relative to others, and the parent’s probability of future reproduction. Firstborn children, on average, are highest in reproductive value because they have survived for a greater period of time and are closer to reproductive maturity than their younger siblings (Salmon, 2005). One unit of investment is, on average, more valuable to lastborns because they are more vulnerable than older siblings. This reasoning has led researchers to predict a pattern of parental investment that favors firstborns and lastborns over middleborns, with associated psychological and behavioral ramifications on expressions of family solidarity (Salmon & Daly, 1998; Salmon, 1999), personality (Michalski & Shackelford, 2002a; Sulloway, 1996), and sexual strategies (Michalski & Shackelford, 2002b; Salmon, 2003). Previous research has shown that children nominate birth order as a determinate of parental favoritism (Zervas & Sherman, 1994). Using data collected from several countries, for example, Rohde et al. (2003) found that (1) parents are reported as favoring lastborn children more often than firstborn children and that (2) lastborns are more likely to indicate that they are favorites relative to parallel reports by firstborns and middleborns. Michalski et al. (2006) investigated separately whether reports of maternal and paternal favoritism by firstborns, middleborns, and lastborns corroborate these findings. The results revealed a pattern of perceiving both mothers and fathers as favoring firstborn and lastborn siblings at the expense of middleborn siblings.

*Sexual and Emotional Jealousy*

Research documents a sex difference in the psychological weighting of aspects of a partner's infidelity: Men report greater upset than do women in response to a partner's sexual infidelity, and women report greater upset than do men in response to a partner's emotional infidelity (For review, see Buss, 2003). An opportunity to unpack two competing predictions of how this sex difference in jealousy is generated is offered by the opportunity to examine jealousy over an in-law's infidelities. Men and women report greater upset over a daughter-in-law's sexual infidelity and over a son-in-law's emotional infidelity (Fenigstein and Peltz, 2002; Shackelford, Michalski, & Schmitt, 2004). These researchers argued that when the adaptive problem is a child's partner's infidelities, it is the sex of the child that determines whether a sexual infidelity or emotional infidelity is likely to lead to greater reproductive costs. By virtue of shared genes, in turn, greater reproductive costs for a child translate to greater reproductive costs for the parents. Michalski, Shackelford, and Salmon (in press) extended these findings to sibling relationships finding that men and women are more upset over a sister's partner's emotional infidelity and are more upset over a brother's partner's sexual infidelity. Highlighting the importance of appreciating the need for relevant triggers for psychological adaptations, the researchers found this effect only among older participants. Among older participants who are more likely to actually have nieces and nephews, the costs of a sister's partner's emotional infidelity, as a cue to his diversion of resources away from a sister, are more damaging because of this greater probability of the presence of nieces and nephews.

In a follow-up study and methodological extension of this study, Michalski (2006) examined upset over a sibling's infidelity rather than upset over a sibling's partner's infidelity ( $N = 769$ ). Participants were asked to report distress over a brother's and a sister's imagined infidelities when both had occurred. Preliminary analyses of the reports provided suggest different patterns of results than was revealed by Michalski et al. (in press). Michalski (2006) found that men and women are more upset over a sister's sexual infidelity than her emotional infidelity and that this effect is more dramatic for brothers than for sisters. A similar finding emerged in response to a brother's infidelity. A sex difference emerged only in response to a brother's infidelities--female participants reporting greater upset over a brother's

infidelities than male participants. When comparing upset over a sister's infidelities and a brother's infidelities, participants were more upset over a sister's sexual infidelity than a brother's sexual infidelity and were more upset over a sister's emotional infidelity than a brother's emotional infidelity.

#### *Relationships with Siblings-in-laws*

Very little research exists to understand features of the relationships between siblings-in-law with no known research that differentiates the three types of siblings-in-law mentioned in the beginning of this chapter. As such, we know little about the nature of conflicts or the satisfaction between siblings-in-law. Conflict with siblings-in-law appears to become particularly salient during times when desire for shares of inheritance from deceased parents arise (Horsley, 1996). Siblings-in-law may play a role in provoking mates to negotiate for larger shares of parental resources. The conditions under which siblings-in-law may become more vocal in their desire for a greater share have not yet been studied. It is possible that (1) the mates of female siblings may be more vocal than the mates of male siblings in securing parental resources and (2) the mates of younger siblings, relative to older siblings, may be more vocal in the need to secure a larger share of parental resources. The mates of younger siblings may attempt to undo parental favoring of older siblings on the younger sibling's behalf. The mates of female siblings may be more vocal because of their greater competitiveness over resources relative to the competitiveness of the mates of male siblings.

The relationship between siblings-in-law may be sex-specific and focused on the reproductively relevant resources offered by siblings-in-law to a sibling. We predict that men and women will report their relationships with brothers-in-law as closer and less contentious when the brother-in-law exhibits characteristics linked with the mate preferences of the sister (e.g., access to resources, emotional fidelity). Conversely, we predict that men and women will report their relationships with sisters-in-law closer and less contentious when the sister-in-law exhibits characteristics linked with the mate preferences of the brother (e.g., youthfulness, sexual fidelity).

Among heterosexual, same-sex siblings, there is a potential for sexual attraction to develop between siblings-in-law. We are not aware of any data that indicate how prevalent attraction between



siblings-in-law is but we speculate that same-sex siblings may nevertheless reveal features of the potential for such sexual relationships to emerge including increased mate retention. Future research in this area may follow from an appreciation of the underlying mating psychologies of men and women. For example, men and women might report interactions between their spouses and opposite-sex siblings-in-law as more distressing than interactions with same-sex siblings-in-law.

Research documents that men, more than women, place greater emphasis on youthfulness in evaluating a prospective mate (Buss, 2003). This sex difference in mate preferences leads to the prediction that among siblings, older brothers may be more likely to view as attractive (and consequently attempt to poach) the mates of younger brothers because younger brothers will be mated to younger women than older brothers. Women may then be more upset over interactions between their spouse and a younger brother's spouse than an older brother's spouse. Men may be more upset over interactions between their spouse and an older sister's spouse than a younger sister's spouse. Support for such predictions awaits future empirical scrutiny but we expect such effects to emerge consistent with the nature of sibling relationships and of sex-differentiated mating psychology. With respect to "lover's triangle" homicides, we expect older males to kill younger siblings-in-law more often than older siblings-in-law because of their greater interest, on average, in slightly younger partners. We expect younger females to kill older siblings-in-law more often than younger siblings-in-law because of their greater interest in slightly older partners. In short, research in the area of relationships with siblings-in-law is wide open with a multitude of opportunities to study the nature of sibling-in-law relationships.

#### *Birth Order and Personality: Future Directions with Dynamical systems*

There is a long history of research on the relationships between birth order and personality, scattered across the social and behavioral sciences (see Sulloway, 1996, for a review). Sulloway organized this literature and conducted a meta-analysis of these relationships. Following current and historical work in the field of personality, personality characteristics were organized into five major dimensions: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience (Norman, 1963).

Parents generally invest more in firstborn children than in laterborn children (see Sulloway, 1996, for a review). According to Sulloway, differential parental investment motivates differences in the strategies that children in the same family use to solicit parental investment. To solicit parental investment, firstborns display beliefs, attitudes, and personality characteristics that mirror parental beliefs, attitudes, and personality characteristics—Sulloway refers to this mirroring as “upholding the parental status quo.” Laterborns use a strategy of investment solicitation that differs from that used by firstborns. According to Sulloway, laterborns develop beliefs, attitudes, and personality characteristics that differ from firstborns and from parents. Sulloway hypothesized and found that firstborn status correlates positively with Extraversion, Conscientiousness, and Neuroticism. Sulloway also hypothesized and found that firstborn status correlates negatively with Agreeableness and Openness to Experience.

Several recent and reputable studies have failed to replicate Sulloway’s findings (Michalski & Shackelford, 2002a; Beer & Horn, 2000; Freese, Powell, & Steelman, 1999; Jefferson, Herbst, & McCrae, 1998). The inconsistent history of findings between the relationships between birth order and personality present a challenge to evolutionary accounts of sibling differences based on birth order. Harris (1998) has commented on the mercurial nature of birth order effects in personality. Her argument is that siblings have no evolutionary relevant reason to maintain a suite of personality characteristics forged from differing family patterns in the home to relationships outside of it. The evolutionary logic behind this argument suggests that siblings who moderated personality characteristics relative to each other and continued to carry those characteristics with them throughout their life would have been out-reproduced by ancestral siblings who moderated personality characteristics to the environments that they may find themselves in the future. This argument suggests that personality is domain-specific in nature and has the possibility of change over time.

Researchers have typically examined mean differences among firstborns and laterborns. It is possible that the mean levels of personality dimensions mask revealing features of the dynamics of personality systems that can change over time through interactions with others (Mischel & Shoda, 1995). The possibility that birth order does not predict mean differences in personality but rather predicts

*changes* in how the cognitive structures of personality systems react to various environmental cues remains unexplored. To assess the potential for change in personality characteristics over time it may become necessary to invoke theoretical and methodological tools developed in dynamical social psychology (for a more complete discussion of dynamical social psychology, see Nowak & Vallacher, 1998).

Nowak and Vallacher (1998) stated that to understand a complex system it is necessary to examine the how that system changes over time. Nowak, Vallacher, and Zochowski (2002) describe two types of synchronization: positive, whereby behaviors of one person induce similar behaviors in another and, negative, where one person's feelings or behaviors result in the opposite feelings or behaviors in another. Synchronization refers to the temporal similarity in thoughts, actions, or behaviors between two people. Nowak, Vallacher, and Zochowski (2002) assume that individuals set their internal (personality) states through synchronization with others as a result of ontogenetic social interactions. These interactions result in stable attractor states corresponding to specific psychology dimensions. The sibling environment may be one such set of ontogenetic social interactions that results in different personality "landscapes" for firstborns and laterborns. We expect firstborns and laterborns to have similar depths of attractor states (personality trait). This similar depth in the personality landscapes of firstborns and laterborns may result in the findings revealed in the literature of few mean personality differences between siblings based on birth order. A difference, however, may exist in the shape of the landscape. Laterborns may have a shallower basin of attraction than firstborns. This shallower basin of attraction may correspond to a lower level of environmental input required to oust the person from that attractor state to another.

Laterborns, having had greater needs to seek out investment in ways different than firstborns, may have been favored to be "chameleon"-like in their personality. Interactions of seeking investments through other sources may foster the development of personality characteristics that aid in pursuit of these alternative investments (e.g., higher scores on Openness to Experience). Such personality traits may then calibrate internal dynamics resulting in less environmental input necessary to move them towards the attractor states of other individuals in their social environment. Synchronization is therefore predicted to

vary as a function of birth order with laterborns synchronizing more quickly than firstborns (perhaps revealed by the greater willingness of laterborns to accept revolutionary scientific ideas; See Sulloway, 1996). The tools developed within dynamical social psychology, we believe, will inform future research on family relationships including the impact of birth order on personality.

### *Conclusions*

In this chapter, we highlighted a few areas of sibling relationships. There are additional areas of inquiry that were not discussed here but that are equally demanding of research (e.g., incest avoidance; See Lieberman, this volume). We argue that many important components and studies of sibling relationships have been missed by a failure to incorporate the theoretical power of evolutionary theories and that an evolutionary perspective offers us a means to generate new, untested hypotheses. We believe that much research has yet to be done on topics such as relationships with siblings-in-law, siblicide, sibling conflict, relationships between siblings of varying degrees of relatedness, jealousy, favoritism, examinations of personality differences between siblings as a function of dynamical systems theory tools, and an exploration of possible mechanisms that function in the minds of siblings to identify putative full siblings from half-siblings. Although many of the predictions reported in this chapter have not been tested, we expect answers to such research questions to emerge in the decades to come. We also expect that a clearer and more comprehensive picture of sibling relationships will emerge with the increased use of evolutionary theories to understand the nature of sibling relationships.

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Figure 1. Conflict reported between full siblings, half-siblings, and stepsiblings while they were growing up and currently.

