

Affiliative and Sexual Bonding  
in Adult Relationships:  
A Biopsychodynamic Framework

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## Abstract

This paper is a broad theoretical treatment of the role of bonding in adult relationships. I approach this topic by interfacing constructs from three different levels of scientific discourse. After a brief introduction, I devote the first section to discussing a biological level bonding system that acts in humans to promote affiliative and sexual relationships. This system generates bonding schemas that are organized around four affects or motivations critical to bonding: affection, fear, sexual feelings, and anger. In the next section, I translate the bonding system framework into two psychological level models that represent affiliative and sexual bonding. These models are built from many of the constructs central to the work of relationship researchers. I then map these models onto the two broad relationship constructs of love and attachment. In the final section, I consider the implications for dyadic bonding of both the biological and psychological level frameworks that have been proposed. This discussion focuses on the effects of partner differences in affects and motivations and on accuracy of partner perception.

# Affiliative and Sexual Bonding in Adult Relationships: A Biopsychodynamic Framework

## Introduction

A bond is commonly considered to be a force that unites or holds things together. In the case of human social bonds, that force is located in the nervous system and mind of each individual and is fundamentally affective and motivational in nature. A dyadic bond, and the personal relationship that is manifested by it, occurs when each of two individuals is bonded to the other. This description is somewhat different from current views of the attachment bond (Ainsworth, 1991; Cassidy, 1999), which is said to be characteristic of the individual rather than the dyad and is based upon some representation of the other person within each individual. I would rather say that it is the mechanism for bonding that is based in each individual, whereas it is the reciprocal action of the two individuals' mechanism that creates a bond between them, such bond being a dyadic level phenomenon. This characterization means that there are three levels of organization that are critical for social bonding: the biological, psychological, and dyadic levels. Here I will develop a theoretical framework that includes all three of these levels, applying it in particular to close adult relationships.

The internal representation of the other to whom an individual is bonded – the internal mechanism that I will refer to here as a bonding schema – is crucial to the formation, maintenance, and dissolution of all types of dyadic relationships. In the first section of this paper, I will draw upon a biological level theoretical framework (Miller & Rodgers, 2001) that postulates the operation of a neurally based bonding system. This system generates four types of bonding schemas that operate across developmental stages. My focus will be on two types of schemas –affiliative and sexual- that function in adult relationships. I discuss the neural components that underlie their function, with an emphasis on affective and motivational systems. In the second section of the paper, I turn to the development of a psychological level framework, describing several models relevant to affiliative and sexual bonding among adults. These models are based upon the neural systems framework but are formulated in terms of psychological

constructs that are widely used by adult relationship researchers. Here again there is an emphasis on affects and motivations. In the third and final section, I extend the biological and psychological frameworks to the couple level, elaborating some implications that theoretical features of the first two levels have for dyadic interactions. The discussion will focus on how affects and motivations flow from their individual origins through the two members of the couple to affect conjoint action.

### Biological Level Framework

#### The Ontogenetic Bonding System (OBS)

Miller and Rodgers (2001) have argued that bonding is a major adaptive strategy among higher vertebrates, one that serves the interests of both members of a bonded pair of organisms. The various mechanisms that promote bonding in virtually all animals have coevolved to be reciprocal across individuals; that is to say, evolved features that are present in one individual are matched by evolved features present in another individual and together these two sets of features act to promote bonding between the two individuals. In humans the bonding mechanism may be characterized as having a diffusely distributed and hierarchically organized neural base, the primary components of which I discuss below. Although there is considerable empirical work that supports the Miller and Rodgers' bonding systems framework, it is far too extensive to cite here in any detail. My primary effort in this paper will be to summarize the essential elements of the biological framework in the first section, then elaborating its implications for both the psychological and dyadic aspects of personal relationships in subsequent sections.

A key feature of the human neurally based bonding system is that it changes during growth and development to promote the shifting adaptive needs and goals of the individual. In general, the bonding system works to promote dyadic relationships through the creation of feelings of warmth, safety, and acceptance throughout the life course. Miller and Rodgers (2001) have postulated that this overall system is composed of four developmentally organized and distinct bonding systems. Each of these systems operates to

produce a distinct stage of bonding. The first of these is the succorant stage,<sup>1</sup> which is present at birth and serves to bond the child to his or her parent(s) or primary caretaker(s). The second is the affiliative stage, which emerges during infancy and serves to promote playful relationships during childhood and then friendships and work relationships during adulthood. The third is the mating stage<sup>2</sup>, which emerges around the time of puberty and serves to promote sexual, romantic, and mating relationships. The fourth is the nurturant stage, which also emerges around puberty, is further stimulated by pregnancy and birth, and serves to bond the parent to his or her child. Although each of these four stages has unique characteristics related to their own unique tasks, they all share many characteristics that derive from a largely common neural substrate. For this reason, the group of four systems that underlie these four stages may be viewed collectively as a single overall system. Because of its developmental structure, Miller and Rodgers (2001) have called it the ontogenetic bonding system (OBS).

It is noteworthy that the succorant and nurturant bonding are reciprocal to each other in a complementary way. That is to say, the succorant and nurturant systems that underlie their respective types of bonding are each designed to provide something in their reciprocal interaction that complements what the other provides, thereby making the dyadic bond affectively and motivationally complete. For example, the succorant child seeks protection and reassurance from its parent and the nurturant adult seeks to protect and reassure its child. In contrast, the affiliative and sexual systems are both reciprocal in a symmetrical way. That is to say, each one is designed to provide something in its reciprocal interaction with a corresponding system that is similar to what the other provides. Thus in an affiliative bond, the cooperation and feelings of trust of one individual tends to be matched by similar behavior and feelings in the other individual. The same type of symmetrical reciprocity is also true of a sexual bond. Of course, there are some complementary aspects of both affiliative and sexual bonds: for example, one partner may be dominant and the other submissive in some part of their conjoint behavior as a result of sex differences, differences in personality, and/ or the assumption of different social roles.

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<sup>1</sup>Succorance is a term coined by Murray (1938) to describe a general tendency to seek the help and protection of others.

<sup>2</sup> In Miller and Rodgers (2001) this was referred to as the “sexual stage” but I now prefer the broader connotation of the term “mating stage”.

However, the fundamental nature of both affiliative and sexual bonds reflects largely the same affects and motivations in both individuals. Elsewhere, Miller, Feldman, & Pasta (2002) have examined the affective and motivational interactions of succorant and nurturant systems, using empirical data. In this paper I will examine the affiliative and sexual systems but from a theoretical perspective.

All four of the individually based bonding systems of the OBS have an organismic design, meaning that they are organized according to the fundamental design plan of the human organism's nervous system. Thus the OBS may be described in terms of a sensory input component, a set of five central processing and integration components, and an effector output component. The five central components include the traditional central nervous system (CNS) functions commonly described by neuroscientists, namely attention and arousal, affect and motivation, memory and learning, special and complex cognitive functions such as language and theory of mind, and executive functions, including integration, planning, and conation (intentionality). Together the seven OBS components allow the individual to perceive persons in the social milieu, attend to certain features of those persons, have feelings about and complex understandings of those persons, store those feelings and understandings for later recall and use, integrate those feelings and understandings with other motivations and beliefs, and finally to act in relation to those persons.

Figure 1 schematizes the processing sequence from perception to behavior. That sequence may be described more concretely as follows: sensory input affects perception of another person both directly and indirectly through arousal; both perception and arousal then affect a three-way reciprocal interaction between affects/ motivations, memory, and cognitions that are specific to the domain of bonding; these interactions feed backward to affect perceptual readiness, the tendency to perceive people in certain ways as a result of both innate (preadapted) and experience-based connections; the three-way interactions also feed forward to be integrated with perceptions of the other person, a step that affects the organism's domain-specific (i.e., within the domain of bonding) behavioral readiness; the latter is then integrated with other

perceptions and their motivational associations to produce an across-domain behavior readiness, which leads through planning and conation to behavior.

It is the seven components of the organismic model just described that together constitute a sensory-motor schema, or more accurately a perception-central processing-behavior schema. This construct is similar to one developed by Brothers (1995) and assumes a distributed neural ensemble that encodes sensory aspects of social situations, processes this information centrally, and then helps set in motion the relevant social responses. It is also convergent with Horowitz, Friedhandler, and Stinson's (1992) discussion of schemas as organizations of mental elements that shape perception and guide action, and with the internal working models of attachment theory (Bretherton & Munholland, 1999). It is implicit in the bonding schema construct that infants are born with certain preadapted connections between the seven nervous system components and that these connections both shape interactions with caretakers and are in turn modified by these experiences. Because my focus here is on affiliative and sexual schemas, I will delve into the important developmental issues of schema formation only to the extent that they are critical to an understanding of how these schemas function in adult relationships. Further, because affects and motivations are, so to speak, the engines of schema operation, I will emphasize them in the following discussion of schema components.

### Schema Components

Affects and Motivations. These are the most central components of bonding schemas because they represent the goals of the organism. Broadly, these goals are for survival and reproduction. More specifically they are to adapt to the complex social environment within which humans live in ways that ultimately serve individual survival and reproduction. No distinction will be made here between affects and motivations because both terms refer to the same central, goal-directing aspect of bonding schemas.

Miller and Rodgers (2001) describe six affects/ motivations of importance to bonding schemas: affection, sexuality, fear, anger/ aggression,

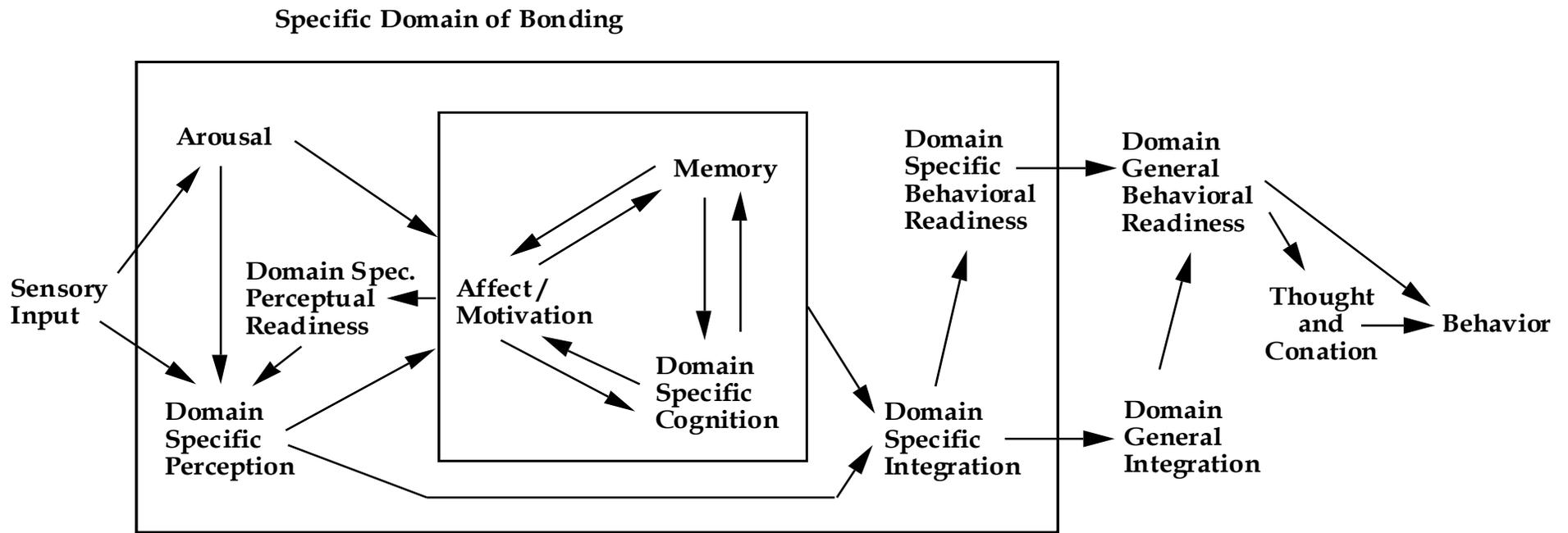


Figure 1. A schematic representation of a hypothetical CNS processing sequence, showing the flow from sensory input through the interaction of components within the specific domain of bonding to domain general processes and, ultimately, to behavior (from Miller & Rodgers, 2001).

dominance/ submission, and loneliness/ sadness. These six appear to be based on at least four phylogenetically ancient neural systems, although different observers may divide the pie somewhat differently, depending upon how far back in time they look and how they conceptualize the evolution of bonding behavior. My discussion here will focus on the first four affects/ motivations and their neural system bases, with only brief reference to the remaining two.

Affection is the “signature” affect/ motivation of bonding and is responsible for the positive, warm feelings that inspire a desire for physical and emotional closeness with another person and that make being with that person highly valued. Evidence suggests that both expressing and receiving affection confers survival and reproductive advantages on the individual (Floyd, 2002). The neural system that supports affection is in some respects the least well understood of the four I will discuss. In spite of this limitation, my position is that affection is central to bonding in all four of its developmental manifestations: succorance, affiliation, sexuality, and nurturance. Panksepp, Nelson, and Bekkedal (1997) argue that the evolutionary antecedents of the neural systems that promote social comfort lie in those systems that originally promoted the development of place preference. The idea here being that parents, siblings, and social consociates in general are a part of the place for which the organism develops a preference. Supporting their idea is the fact that both social comfort and place preference draw upon opioid and related neurotransmitters to deliver their reward function.

Bell (2001) has argued that an important step in the evolutionary development of nurturant bonding involved the creation of an emotional dyadic preference bond with offspring, which he argues results from the action of the neuropeptide oxytocin. This step was one of a series of changes that prevented typical reptilian stranger rejection (and therefore infanticide), allowing the development of the complex caregiving characteristic of mammals. Presumably, the evolution of this type of parental preference bond, together with a reciprocal development in the brains of infants, could have begun to create the neural machinery upon which all types of affectional processes were built. Whatever the phylogeny of affectional systems, it is clear that in all group-living mammals they are a central force in the creation and maintenance of dyadic bonds throughout the life course.

Sexuality is a second key affect/ motivation for bonding. Because of the intense pleasure that is characteristic of all types of sexual consummation, the effect of sexuality operating in a relationship is to make the latter highly desirable and potentially extremely rewarding. The localization of that reward on certain skin and mucous membrane surfaces – lips, nipples, anus, and genitalia – seems designed to strengthen the pursuit of and reward the execution of certain behaviors critical for survival and reproduction – nursing, elimination, copulation. However, apart from the importance and the pleasure of the final consummatory acts, it is the appetitive anticipation of them that tends to infuse mating relationships with positive feelings. The neural system underlying sexuality is phylogenetically older than that underlying affection. According to MacLean (1990), the part of the human brain responsible for primitive emotions and sexuality is of ancient reptilian origin, whereas the part responsible for social emotions is of more recent old-mammalian origin. Interestingly, current evidence (Panksepp, 1998) indicates that the same chemical agents – opioids and related neurotransmitters – that are important in affectional reward are also central to sexual reward, although acting at different CNS sites.

In addition to their similar neurochemistries, the affectional and sexual systems are so closely located neuroanatomically as to suggest considerable functional interaction. This, together with the tendency at the experiential level for sexual feelings to infuse affection, makes it important to distinguish between the psychological manifestations of these two systems. Consider the complex phenomenon of falling in love. It may appear to be linked mainly with the sexual system and the mating stage of bonding. After all, romantic passions typically feel like a blending of affectional and sexual feelings. However, falling in love is probably an affectional phenomenon primarily, one that occurs in all types of relationships – babies with their mothers, older children and early adolescents with their same-sex best friends, parents with their babies, etc. – with or without the benefit of a sexual boost. In fact it appears that this phenomenon is part of any new, high intensity bond formation or the ramp up of an old bond to a new level of intimacy. The terms “crushes” and “smashes” (Sahli, 1979), that are sometimes used to designate these kinds of feelings convey the intensity with which they occur. Although such intensity, and the preoccupation that it engenders, can not last, together they do the job of establishing a level of

intimacy that itself helps to firmly establish the bond. Thus falling in love represents a stage in the bonding process rather than a particular type of bonding. Sexual feelings may enable its occurrence, enhance its experience, or only occur after the fact, but they are distinct and separable from the affectional feelings that are so critical to its occurrence.

An important implication of the relationships between affectional and sexual feelings just discussed is that affiliative bonding commonly provides the scaffolding for sexual bonding. In other words, the general affiliative schema that an individual develops as a result of experience within affiliative relationships forms the base upon which specific sexual relationships, and ultimately a general schema suitable for mating, are built. This transformation is, of course, highly conditional upon gender identity as shaped by a number of genetic, prenatal, and early experiential factors (Money, 1968/ 1994; Money & Ehrhardt, 1972). It is also greatly influenced by adolescent changes in the levels of circulating sex hormones, such as testosterone and estrogen, and the centrally acting neurotransmitters affected by these hormones, such as oxytocin and vasopressin. In characterizing affiliative bonding as providing a base for sexual bonding, it is important to emphasize that I am not saying that affection precedes sexual feelings. Quite the opposite may be true. It is a common phenomenon that affectional feelings lead to sexual desires; but it is also common for sexual desires and experience to lead to affectional feelings.

Diamond (2003) has developed a biobehavioral framework that distinguishes romantic love from sexual desire. She provides an extensive literature review that documents the three major premises of her framework. One premise is that the evolved processes that underlie affectional bonding and sexual desire are functionally independent. Another premise is that the biobehavioral links between affection and sexual desires are bi-directional. These two premises correspond to the main points sketched out in the previous two paragraphs. A third premise is that the processes underlying affectional bonding are not intrinsically gender oriented the way that sexual processes are. A problem with this proposition is that recent evidence suggests the sexual system is not gendered in women the way that it is in men (Chivers, Rieger, Latty, and Bailey, in press), raising important and complex questions about how and to what degree the sexual system becomes gendered.

However, there is a more serious problem that underlies Diamond's biobehavioral model. In support of her premise that sexual desire and romantic love are functionally independent, she cites Hazan and Shaver (1987) and argues that whereas sexual desire is governed by the sexual mating system with the goal of reproduction, romantic love is governed by the attachment system with the goal of relationship maintenance. Additionally, in support of her third premise that affectional bonding is not gender oriented, she argues that this is because affectional processes in adult pair bonds draw upon the same neurobiological substrate and manifest many of the same psychological states as infant-caregiver attachment, which is itself not gender oriented. Her overall argument, then, is that adult pair bonding is an exaptation of the system that serves infant-caregiver attachment. From the perspective of the OBS framework, this conceptualization confounds neural based affectional/ motivational systems, such as affection and sexuality, with stages of bonding, such as the affiliative and mating systems. Stages of bonding depend upon an integrated set of neural components that include not only affectional/ motivational systems but other systems related to cognition, memory, and executive functions, which we elaborate below. A key idea of the OBS is that bonding across the four stages shares many features, including especially affectional and to a lesser extent sexual processes. The sharing of these features came about because the survival and reproductive advantages of offspring attachment to parents (succorant bonding), affiliation between individuals living in small, kinship-based groups (affiliative bonding), bonding between mated pairs (sexual bonding), and parental care-taking of offspring (nurturant bonding) all converged on the shaping of a common neural substrate through co-evolutionary forces.

Fear is a third important affect/ motivation in bonding, one that has a unique role. The neural system underlying fear is an ancient one that, like sexuality, was prominent in the primitive reptilian brain but may also have parts of more recent origin. Miller and Rodgers (2001) describe three types of bonding-related fear that develop sequentially in the infant. First, there is injury/ survival fear, in which the basic fear system is aroused by unexpected, potentially threatening features of the environment. This type of fear affects bonding when it is aroused by people unfamiliar to the infant/ child, but may also be aroused by a familiar caretaker who is hurtful or threatening. Developing next is succorant fear. It is conditional upon the sense of security

generated by a primary caretaker and is aroused by actual or threatened separation from or loss of that caretaker. Developing last is altruistic fear. This term refers to the fear that is aroused when the caretaker – or someone else like a sibling or friend who is important to the child – is perceived to be threatened with injury or death. It is conditional upon the ability to perceive the threat to the other person and upon caring about (affection for) that person. This type of fear is obviously of relatively minor importance during the succorant stage but it plays a large role in affiliative, sexual, and – especially – nurturant bonding.

Panksepp (1998) has argued that the second of these three types of fear, succorant fear, is based on a separate neural system, which he calls the panic system. It has been studied extensively in animal models through the examination of situational factors and central nervous system manipulations that affect “distress vocalizations,” which correspond to the crying of humans. The panic system has a central nervous system distribution that is clearly different from the fear system and in some locations is closely related to central representations of the pain system. It provides a way for newborns to communicate isolation distress and related feelings of helplessness to a caretaker. Caretaker proximity and physical contact generally function to terminate the vocalizations and presumably the distressed feelings that generated them. In my view this system may be seen as part of a larger one that helps protect the young of a species against parental separation and loss before they are mature enough to protect themselves. As such, it would certainly play a role in succorant bonding and attachment. If a parent is lost, then withdrawal of the opioid-based bond to the parent contributes a new type of affect/ motivation in the form of sadness and grief. If the parent is not sufficiently available, then feelings of distressed helplessness may lead to the development of strong dependency in the child (Miller, Feldman, & Pasta, 2002). In any case, with or without these additional features of sadness and dependency, it is certain that the dysphoric consequences of the distressed and helpless feelings caused by separation from a key caretaker will come to arouse substantial fear whenever their experience is anticipated. In other words, even if a separate panic system may arouse the individual who is confronted with separation and potential loss of a closely bonded other, the basic fear system operates in anticipation of that arousal and thereby plays a major role in maintaining the bond.

The key feature of altruistic fear is that it is felt for the other person. It occurs because the bonded other is valued to the extent that a threat to that person is perceived as a threat to the individual him or her self, thereby arousing the basic fear system. Usually, being valued in that way arises by virtue of an existing affectional bond, although it is possible to feel altruistic fear for complete strangers as well as for animals, on the basis of empathy and a capacity for imaginative identification (Miller, 2003). This type of fear strengthens bonds in two ways: first, it focuses attention on the bonded other, rewarding the fearful individual when the danger to the partner is averted and the fear extinguished; second, it provides the partner for whom the fear is experienced with feelings of being protected and cared about. Interacting with the feelings of warmth, liking, and fondness that originate in the affectional system, this type of fear helps create the intimacy and emotional closeness that characterize strong relationship bonds.

Anger/ aggression is the fourth important affect/ motivation in bonding. It derives from a neural system as ancient as the fear system and has many close connections with it. Many animals when faced with a threat experience both fear and rage. The fear system guides the animal toward freezing or fleeing, whereas the rage system guides it toward fighting. We should not be surprised to find that all three types of previously discussed fear have their anger/ aggression equivalents: injury/ survival fear is associated with aggression directed at the threat, succorant fear is associated with aggression turned toward the separating influence (including, in some instances, the partner him or her self), and altruistic fear is associated with aggression directed at the threat to partner.

Panksepp (1998) sorts through the taxonomies of animal aggression that have been proposed and settles on one that is based on the neural systems that underlie such aggression. Current evidence points to three primary systems, including rage or defensive attack, predatory aggression or quiet biting attack, and intermale aggression and dominance. Only the first and last of these are clearly related to human bonding and both of these have important interactions with the fear system. Defensive aggression in personal relationships is the counterpart to the three types of fear that occurs when those relationships are perceived as threatening or threatened. Intermale aggression in animals is related to dominance and competition for resources within the local social group.

It is also closely related to sexuality and the assertive pursuit of females for purposes of mating. Evolution has solved the problems that constant fighting for resources would create for the health and survival of strong males through the development of submissive behaviors, which in turn make possible the establishment of dominance hierarchies. Adams (1979) has suggested that submission motivation is the result of a ventromedial hypothalamic mechanism that switches social behavior from defensive to submissive. Obviously fear can occur in association with both defense and submission. Intermale aggression is sometimes referred to as social aggression because, although it may be best typified in males, it is by no means confined to them. There are many species' differences but phenomena such as competition for resources, including mates, and for status are commonly observed in females as well. For this reason, I prefer the term social aggression.

An important role of anger/ aggression in human bonding has to do with conflicts of interest. In concrete, day-to-day relationships, there are two forms that such conflicts of interest take. Framed in terms of a relationship bond, one type of conflict occurs when the goals of a particular bond conflict with non-bond goals of the individual such as those related to survival, self-care, growth and development, and exploration/ mastery. A second type of conflict occurs when the goals of one bond conflict with those of another bond. In both cases the individual must try to resolve the conflict. In the process of doing so, however, both defensive aggression and social aggression, including dominance/ submission, may contribute to stress, and ultimately unhappiness, in the relationship.

Cognition. The most important cognitive capacity for bonding schemas is the individual's theory of mind (ToM). This term refers to the ability to discern the mental states of other conspecifics, although its evolutionary origins are broader. In animals both prey and predator species derive survival benefits from an ability to infer the intentions of a hunter/ hunted animal on the basis of its behavior. Related benefits accrue to animals living in social groups when they can correctly interpret the motivations underlying their consociates' behaviors. This cognitive ability has achieved a unique level in humans (Povinelli, 1993). It is safe to say that humans typically perceive many levels of their intimate partners' affects/ motivations, including both conscious and unconscious traits,

as well as conscious states such as beliefs, desires, and intentions. A recent review by Frith and Frith (1999) describes the cerebral localizations of a brain system in humans that is dedicated to the perception of others' minds. On-going research (Preston & de Waal, 2001; Williams, Whiten, Suddendorf, & Perrett, 2001; Zimmer, 2003) suggests that the neural substrate of ToM consists of mirror neurons and a network of cortical centers that allow observers to match their own internal state with the state manifest by another's behavior. An important consequence of the human theory of mind capacity is that we carry around an organized perception of our intimate partners' minds. This perception maps with more or less accuracy onto what our partners are actually thinking and feeling in the current situation and, perhaps of even greater importance, what they would think and feel in hypothetical situations or, in other words, what their affective and motivational dispositions are. It is this complex ToM capacity that allows us to empathize with others. In terms of this capacity, empathy means apprehending at a feeling level what affects and motivations are driving the behavior of others and responding in kind at that same level.

Memory. There are separate memory systems in the brain that serve different purposes (Squire & Knowlton, 1995). A particularly useful distinction for the understanding of human bonding schemas is that between declarative and non-declarative memory (often referred to as explicit and implicit memory). One type of declarative memory is memory for events, usually referred to as episodic memory. Non-declarative memory, which includes the acquisition of skills and habits and simple associative learning, involves the learning of procedures for action, what has been called procedural memory. Both episodic and procedural memory make important contributions to bonding schemas. Episodic memory gives us a largely conscious, autobiographical record of our experience within each relationship. Procedural memory interacts with the preadapted component of bonding schemas to provide a largely unconscious way of responding within any relationship. Together they both shape and record our on-going bonding experiences. I have called the combined activity of this dual track memory system the affective/ motivational substrate for bonding behavior (Miller, 2002; Miller & Rodgers, 2001; Miller & Pasta, 2002).

Executive Function. This component of the OBS has an important integrative, planning, and connative role. These functions are closely associated

with the frontal cortex, especially its prefrontal division (Miller & Rodgers, 2001). Bonding schema integration takes several forms. One of these involves the integration of various schema components – affects and motivations, cognitions, memories, etc. – into a concrete schema that governs interaction with a specific individual. One important manifestation of such schema integration is happiness in or satisfaction with the relationship. Constructs like happiness or satisfaction represent a summary of the individual's accumulated positive and negative feelings about a relationship. Using an evolutionary psychology perspective, Shackelford and Buss (1997) argue that these types of constructs may be viewed as psychological states that track the on-going benefits and costs of having a specific relationship. Although this characterization may be accurate with regard to the evolutionary origin of this phenomenon, the OBS perspective of the proximate mechanism underlying relationship happiness or satisfaction is that it occurs through the accumulated schema-based episodic memories of positive and negative experiences with a partner, which memories are imbued with the affects and motivations discussed above.

A second form of schema integration occurs both within the behavioral domain of bonding and between that domain and other behavioral domains. Within the domain of bonding, the executive function of the brain must handle the conflicting and converging demands of two or more personal relationships. Across domains, it must handle similar demands between a relationship and the demands of non-relationship domains, such as those dealing with survival, self-care, growth and development, and exploration-mastery (Miller & Rodgers, 2001). In the modern world, examples of these latter domains include the sets of behaviors related to illness and wellness, education, and occupation.

A third level of integration involves the organization of bonding behavior across situations and time. At this level, the planning and connative functions of the prefrontal cortex are also important. In this regard, I have developed (Miller, 1994; Miller & Pasta, 2002) a Traits-Desires-Intentions-Behavior (TDIB) framework for understanding how childbearing motivations, which are based on nurturant schemas, are translated into reproductive behavior through intermediary consciousness-based constructs. In the course of the TDIB sequence, motivational traits, which represent preconscious dispositions of the affective/ motivational substrate, are activated in the form of desires, which are

conscious states in the form of wishes or wants that the individual holds with respect to specific goals. Desires are in turn translated into intentions, which are conscious states in the form of specific plans for action. The difference between desires and intentions may be thought of as the difference between what one would like to do given no reality constraints and what one actually plans to do within the boundary of those constraints. Finally, intentions are implemented in the form of instrumental behavior, i.e., behavior that is designed to achieve the planned goal. This sequence describes a funneling of the broad goal-setting function of affects and motivations through conscious states to a narrow set of goal-specific behaviors. Although originally conceived to characterize the expression of nurturant schemas in reproductive behavior, by changing the subdomain (from nurturant to affiliative and sexual) and including other kinds of conscious states, the TDIB framework can be useful in the modeling of adult relationships, as I will show in the next section.

### Psychological Level Framework

In this section I take the ideas about neural systems elaborated in the previous section and apply them to the construction of psychological level models that include many concepts used by contemporary adult relationship researchers. Because of space considerations, these models will be formulated only in terms of relationship maintenance as opposed to relationship formation or dissolution. However, it would be possible to elaborate similar models for these other two areas as well. In keeping with the premise of the theoretical framework that affiliative and sexual bonding occur in distinct stages, each of which requires a somewhat different mix of the core OBS components, I will develop two models in this section, encompassing both affiliative and sexual bonds. I will also interface these two models in order to represent the theoretical proposition that these two systems have bidirectional interactions. When these two models are shown interacting through their interfaces, the resulting combined model may be considered applicable to those relationships that are among the most complex and enduring that occur among humans, namely mating relationships.

The pre-adapted bonding schema inherited by an individual and shaped by experiences in previous relationships during childhood and early adult life results in the development of a general bonding schema. General schemas interact with any new partner to produce a dynamic set of perceptions, feelings, memories, and evaluations that represent a bonding schema specific to that partner. A similar process occurs in the partner and the two specific schemas then interact to produce bond-related behaviors that are characteristic of the relationship between these two partners. The effect of a specific bonding schema on its relevant relationship may be formulated in terms of the TDIB framework as follows: motivational traits – i.e., individual dispositions that affect how the individual bonds within the relationship – affect the motivational states that are associated with that specific bond. These states are represented by the individuals' desires and intentions to maintain the bond or not. These desires and intentions in turn affect bond maintenance behaviors, which are then instrumental in strengthening or weakening the bond. These behaviors include such things as listening empathically to, sharing feelings with, giving support to, and accepting differences with the partner. As I will discuss below, this entire motivational-behavioral sequence manifests itself somewhat differently depending upon whether the bond is primarily affiliative or is significantly sexual in nature.

In order to capitalize on the separate advantages of verbal and visual presentation, the discussion that follows will be centered on the schematic representations of the affiliative and sexual models. Although data analysis will not be discussed in any detail, it is implicit in these models that they lend themselves to linear structural equation analysis.

### Affiliative Model

Figure 2 expands on the general ideas presented above, using specific trait, state, and behavior variables to represent an individual level bonding model of the predictors of stability in an affiliative relationship. The general traits hypothesized to affect affiliative bonding are represented by five personality traits, including warmth, harmavoidance, agreeableness, aggression, and dominance. The names of these traits have been chosen from two widely used personality inventories: the NEO Personality Inventory (Costa & McCrae, 1992)

and the Personality Research Form (Jackson, 1984). However, many inventories have similarly named and closely related scales that could also have been used. Warmth and harmavoidance represent two general bonding traits that are derived from the affectional and fear systems, respectively. These two general traits are shown in the figure as predictors of the general state that I call feelings of emotional closeness with the partner. Such feelings, which are produced by a convergence of interests between partners, consist of the affection, connectedness, and closeness experienced by two people in a loving relationship and represent what Barnes and Sternberg (1997) call the intimacy component of love. The fundamental idea, then, is that the two traits of warmth and harmavoidance tend to generate feelings of affection and safety within a relationship and thereby to enhance closeness, trust, and intimacy.

Aggression and dominance represent two affiliative bonding traits that are derived from the neural system for anger and aggression. They are shown in Figure 2 as predictors of the general state that I call experience of conflict with the partner. This experience, which is produced by a conflict of interests between partners, has been argued to be the most important proximal factor affecting the course of intimate relationships (Christensen & Walczynski, 1997). The fundamental idea in this case is that the two traits of aggression and dominance tend to aggravate conflicts of interest and thereby the experience of conflict.

Agreeableness is an affiliative trait that reflects cooperativeness, generosity, and altruism. Individual differences along this dimension constitute a kind of personal set point with respect to the disposition to share common feelings and resolve conflicts with a partner in a selfish or unselfish way. It is shown in Figure 2 as a predictor of the general state that I call feelings of acceptance/ rejection. These feelings reflect the degree to which a partner's motivations and emotions and the behaviors that flow from them are accepted or rejected. Feelings of acceptance are increased by feelings of closeness and, in turn, reduce the experience of conflict. In contrast, feelings of rejection are increased by the experience of conflict and, in turn reduce feelings of closeness.

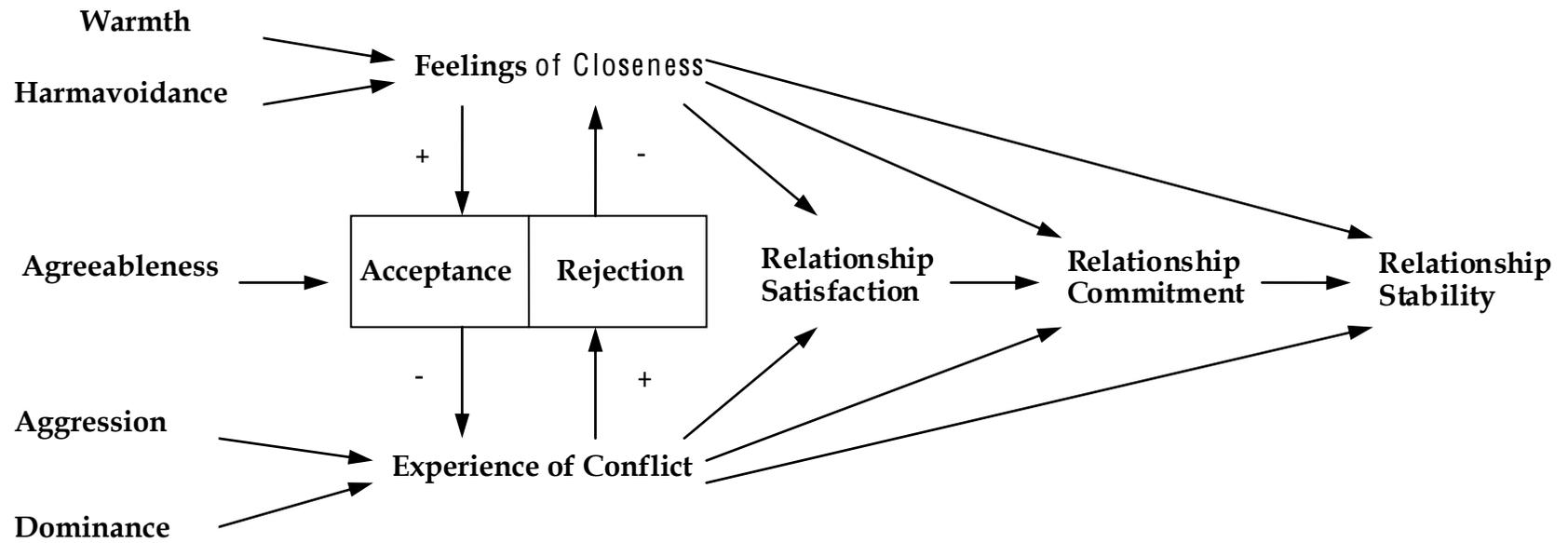


Figure 2. A schematic representation of the psychological level bonding model of the predictors of stability in an affiliative relationship.

The next step in the sequence represented by Figure 2 is the general state relationship satisfaction. This usually refers to the accumulated net of positive and negative experiences in a specific relationship. For this reason it is especially contingent on bond-specific episodic memory. A number of observers have concluded that there are orthogonal positive and negative dimensions of relationship satisfaction and that each contributes separately to net satisfaction (Fincham, Beach, & Kemp-Fincham, 1997; Ellis & Malamuth, 2000; Miller, 2002). As well as representing the net positive and negative tone of a relationship schema, satisfaction usually contains an implicit reference to some standard or expectation, either an internal one, such as an ideal level of net satisfaction - related to Thibaut and Kelley's (1959) comparison level, or an external one, such as what level of satisfaction the individual perceives to be attainable in the environment -related to Thibaut & Kelley's (1959) comparison level for alternatives. Satisfaction serves as a major motivator relative to relationship maintenance. As shown in Figure 2, I postulate that in affiliative relationships this effect acts directly on commitment, as did Rusbult (1983) in her investment model of heterosexual relationships. Figure 2 also shows that closeness and conflict have both a direct effect and an indirect effect through satisfaction on commitment.

Commitment is another construct widely used in relationship stability research. Cate, Levin, and Richmond (2002) reviewed a number of studies of the effects of general commitment on relationship stability among unmarried couples and found consistent positive effects, even when a number of other interpersonal variables such as relationship length, intimacy, satisfaction, and alternatives were controlled. They also discussed the effects of more specific aspects of commitment on stability, using as a guide Johnson's (1991) threefold conceptualization of commitment into personal, structural, and moral components. Nesse (2001) has discussed the psychology of commitment from the perspective of evolution and natural selection, arguing that commitment is a strategy in which an individual gives up short-term options in order to achieve a long-term goal. As such it reflects the strength of someone's determination to pursue that goal. Similarly, Bercheid (Bercheid & Reis, 1998; Bercheid & Lopez, 1997) has argued that commitment in a relationship represents an individual's desire or intention to continue that relationship. I concur and consider commitment to be a state construct that is best characterized as representing both

conscious desires and intentions to maintain a bond. In the affiliative model shown in Figure 2, it is a major predictor of relationship stability, along with feelings of closeness and the experience of conflict.

### Sexual Model

Figure 3 shows a model of the determinants of sexual satisfaction and sexual exclusivity (monogamy). It is organized around a TDB (Traits-Desires-Behavior) formulation of frequency of intercourse that is shown across the top of the figure. There it is shown that the trait of sexual drive predicts the desired frequency of sexual intercourse, which in turn predicts the actual frequency of sexual intercourse. It should be noted that other sexual behaviors could be used in this model in place of or in addition to sexual frequency. Intentions are omitted because they are primarily relevant to specific sexual acts rather than to a pattern of behavior over time as with sexual frequency. Both sexual drive and actual frequency are shown to affect affect sexual satisfaction, as is the absolute difference between desired and actual frequency. Sexual satisfaction feeds back to affect desired frequency and, along with actual frequency, affects sexual exclusivity.

There are, of course, other ways to conceptualize these relationships. For example, Waite and Joyner (2001) have studied the effects of three factors on both emotional satisfaction and sexual pleasure in a relationship, separately in men and women. They found that the time horizon expected for the relationship (which may be viewed as a proxy for commitment), sexual and orgasmic frequency, and sexual exclusivity all affected the two outcome measures of emotional satisfaction and sexual pleasure in both sexes. The theoretical framework proposed here includes all of the same variables but organizes their relationship according to the flow of motivation from trait to state to behavior in keeping with the underlying construct of a bonding schema. In this approach, sexual exclusivity becomes the principle behavioral outcome variable and is directly predicted by all four of Waite and Joyner's other variables: an antecedent sexual behavior, actual sexual frequency, and three state variables that span the sexual and affiliative bonding models, namely sexual satisfaction, relationship satisfaction, and relationship commitment. As hypothesized in this approach,

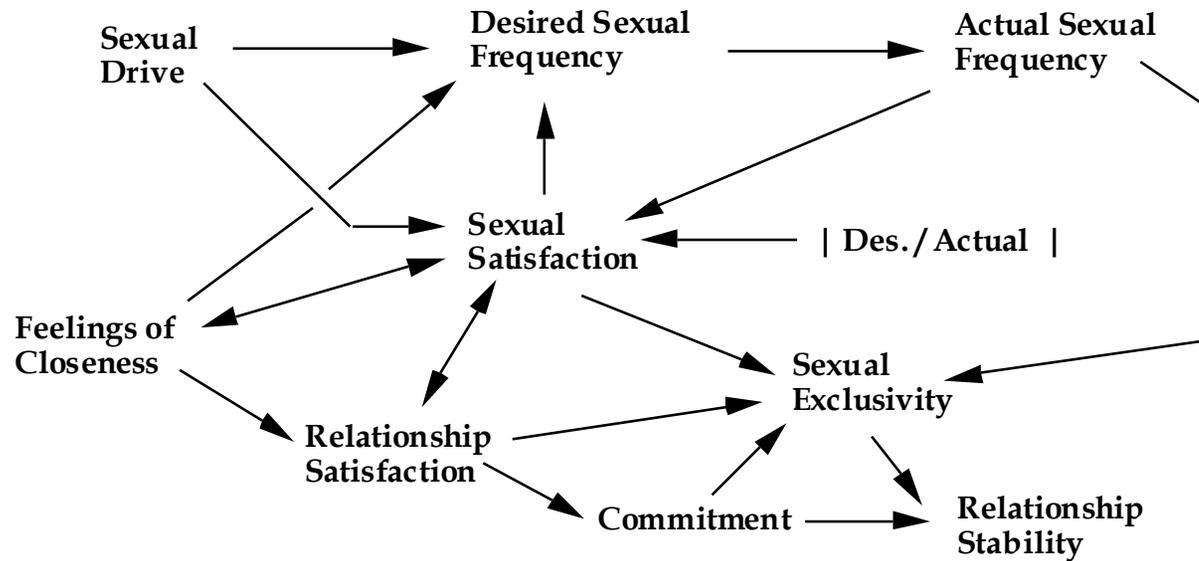


Figure 3. A schematization of the psychological level model of the determinants of sexual exclusivity (above and to the right), also showing how this model interfaces with key variables in the affiliative bonding model (below and to the left).  
 |Des. / Actual | = absolute difference between desired and actual frequency.

affiliative and sexual traits have only an indirect effect on the principle outcome variable.

The main interface points between this model and the affiliative bonding model are shown across the bottom of the figure, with the two bi-directional arrows indicating where effects are hypothesized to move in both directions. If Figures 3 and 4 are joined at this interface, the combined model would show the paths along which sexual feelings can infuse and strengthen the affiliative system and the feelings of affection and safety that are implicit in emotional closeness can act to promote sexual desire and satisfaction. The combined model would also show how downstream from these affective and motivational interactions there are positive effects on individual behavior – sexual exclusivity – and couple behavior – relationship stability.

### Models of Love and Attachment

I turn now to a consideration of two constructs that arguably represent two of the most universal, complex, and important manifestations of adult dyadic bonding, namely love and attachment. The following discussion will develop a unifying framework for understanding these two constructs based upon the just-described affiliative and sexual models. Because so much has been written about both love and attachment, I will focus my attention on two widely cited theoretical approaches to these two topics.

The Triangular Theory of Love. Sternberg's tripartite theory of love (1986) remains one of the most comprehensive, highly regarded theories of love and its dynamics ever proposed. The primary tenet of this theory is that the love one feels for a person can be largely understood in terms of three components: intimacy, passion, and commitment. Intimacy refers to "feelings of closeness, connectedness, and bondedness" in a relationship. Passion refers to "drives that lead to romance, physical attraction, sexual consummation" in a relationship. Commitment is more cognitively based than the feelings and drives of the previous two and includes decisional qualities. In the short term, commitment refers to the "decision that one loves someone" and in the long term, it refers to the "commitment to maintain that love." The magnitude of each of these three components of love varies across different types of relationships. Feelings of

intimacy occur in many types of loving relationships, such as that with a parent, sibling, friend, or lover, and therefore seems to form a common core in loving relationships. Passionate drives tend to occur only in certain types of relationships, such as those characterized by romance. Commitment to a relationship, on the other hand, tends to be highly variable; for example, it tends to be high in relationships with children but may be low with friends. All three components interact in major ways: feelings of intimacy may arise from passion and passion may promote feelings of closeness as a result of sexual intimacy; similarly, intimacy and passion may lead to commitment but commitment itself may -as in an arranged marriage- lead to intimacy and, ultimately, passion. Finally, it should be noted that Sternberg maps out the ways that each of the three components vary uniquely across time within a specific relationship.

It should be apparent how closely Sternberg's tripartite theory of love maps onto the model of affiliative and sexual bonding presented above. The intimacy component corresponds well to feelings of closeness (see Figure 2), which I have argued are derived from the affectional and fear systems. The passion component corresponds well to elements in the model of sexual satisfaction and exclusivity (see Figure 3) that are derived from the sexual system. And the commitment component corresponds well to relationship commitment (as shown in Figures 2 and 3). In fact, Sternberg's commitment component has a strong decisional basis, which fits well with the idea presented here that relationship commitment corresponds to the desires/ intentions part of the TDIB framework and draws upon the higher cortical centers' integrative functions.

This mapping of the tripartite theory of love onto the models of affiliative and sexual bonding highlights two areas that are not explicitly present in Sternberg's theory. One area is relationship satisfaction. Although Sternberg considers satisfaction both in the original formulation of the triangular theory of love (Sternberg, 1986) and in subsequent empirical research (Barnes & Sternberg, 1997), his primary focus is on how the three love components in various forms affect satisfaction with the relationship rather than on how satisfaction might itself be a component of love. The other area not explicitly present in Sternberg's theory is the experience of conflict, although it is implicit in his discussion of what he calls the match between two partners' love triangles, i.e., the degree to

which the strength of one partner's three components of love match with the strength of the other partner's corresponding components. Here again I would suggest that the experience of conflict should be viewed as an integral part of the overall love experience that includes feelings of closeness, sexual feelings, and commitment to the relationship.

Sternberg (1986) uses the three components of his theory to construct an eight-category taxonomy of love. Familiar categories include *liking*, which occurs when only the intimacy component is strong, *infatuated love*, which occurs when only the passion component is strong, *romantic love*, which occurs when both the intimacy and passion components are strong, *companionate love*, which occurs when both the intimacy and commitment components are strong, and *consummate love*, which occurs when all three components are strong. Although Sternberg would almost certainly agree that these categories have a large heuristic value, they do fit well with types of love that are commonly – and perhaps stereotypically – perceived in modern life. An advantage of the models of affiliative and sexual bonding shown in Figures 2 and 3 is that they suggest the pathways by which one of these categories of love can be transformed into another category over time. For example, infatuated love can become romantic love and then consummate love with time, first through the action of sexual satisfaction on closeness and relationship satisfaction and second through the action of closeness and relationship satisfaction on commitment.

Attachment Theory. Bowlby (1969/ 1982) developed attachment theory, using principles of ethology and control theory, in order to explain the nature of the infant/ child's bond to its mother or principal caretaker. He proposed an attachment behavioral system that functioned to attain and maintain proximity of the infant/ child to a preferred individual who was perceived as stronger and/ or wiser. He believed that this system originally served the purpose of protection, primarily from predators. He described the emotions related to the formation of the attachment bond as falling in love, those related to the maintenance of the bond as loving someone, and those related to the loss of the partner as grieving over the loss of someone (Bowlby, 1977). These and other phenomena encompassed by attachment theory correspond in many respects to what Miller and Rodgers (2001) have called the succorant stage of bonding. What is clearly important to the relatively powerless and vulnerable infant/ child

during this stage is that the primary caretaker's attention, help, and protection be consistently available and that the caretaker be sensitive to the infant/ child's specific situation and needs. Attachment theory research conducted during the last three to four decades has supported the notion that variation in the primary caretaker's availability and sensitivity has important effects on the infant/ child's perception of the security of its attachment relationship. The cumulative impact of such perceptions results in a pattern of attachment. Different types of attachment patterns have been described, varying across age groups (Goldberg, 1991). These include secure attachment and several categories of insecure attachment, such as avoidant (also called dismissing), ambivalent/ resistant (also called preoccupied), and disorganized.

Attachment theorists have also applied the attachment framework to relationships that occur later during the life course (Ainsworth, 1991; Hazan & Zeifman, 1999), which is to say during the affiliative, sexual, and nurturant stages of bonding. Hazan and Shaver were among the first to suggest that attachment theory provided a substantial understanding of romantic love (1987) and adult relationships in general (1994). They hypothesize a three-group model of patterns of adult attachment, two groups of which appear to have been affected by high levels of what I described above as succorant fear. The secure attachment group is characterized by felt security in response to the love of others, which is perceived as consistently responsive. The anxious/ ambivalent attachment group is characterized by insecurity about and preoccupation with the love of others, which is perceived as inconsistently responsive. Finally, the avoidant attachment group is characterized by a fear of intimacy and an avoidance of intimate relationships in response to the love of others, which is perceived as consistently unresponsive.

Around the same time, Bartholomew (1990) developed a four-group model of adult attachment, which reflected Bowlby's suggestion that patterns of attachment were based on internal working models -similar to the OBS's bonding schemas, but with an emphasis on cognitive factors- of the self and others. Bartholomew's four groups are based on whether the self-model is positive or negative and whether the other-model is positive or negative. The self-model is based on an internalized sense of self-worth and the other-model is based on expectations of others supportiveness. Secure individuals are positive

on both models. Preoccupied individuals (Hazan and Shaver's anxious/ ambivalent category) are positive on other-models but negative on self-models. As a result, they tend to be dependent on others' approval. Dismissing individuals (a category included in child attachment theory but not by Hazan and Shaver) are positive on self-models but negative on other-models. As a result, they tend to distance themselves from others and be self-reliant. Finally, fearful individuals (Hazan and Shaver's avoidant category) are negative on both models. As a result, they tend to be fearful of rejection and so avoid closeness. Bartholomew (1997) emphasizes that the models of self and other are "more or less consciously held" but that underlying the positive self-model of dismissing individuals is an unconscious negative self-model and underlying the positive other-model of preoccupied individuals is an unconscious negative other-model. In other words, three of her four categories develop ontogenetically from insecure attachment during infancy/ childhood.

Feeling Love and Perceiving Love. Bartholomew's four-group model has received good empirical validation and has been increasingly adopted by researchers (Feeney, 1999). By emphasizing certain parts of her terminology, it is possible to map that approach to adult attachment quite well onto the OBS framework. That emphasis involves thinking not about positive/ negative models of self and other but about the lovability of self and other. To facilitate understanding the implications of this conceptual adjustment, it is useful to recall two features of the OBS: first, experiences with others affect the procedural memories that regulate the affects and motivations attendant upon dyadic relationships; and second, dyadic relationships are influenced both by the individual's schema of the bonded other and, through the ToM capacity, by the individual's perception of the bonded other's schema of the individual and, in particular, of the bonded other's love for the individual.

Given these two features of the OBS, let us consider the following developmental scenario. During infancy/ childhood there are two especially important affective/ motivational processes going on for the individual in relation to his/ her primary caretaker (for simplicity sake, I will assume only one caretaker). One process involves perception of the quantity and quality of the caretaker's love. This depends in part upon caretaker behaviors (for example, availability, sensitivity, and consistency), which, in turn, depend upon the

caretaker's nurturant schema and to some degree upon the infant/ child's own behavior. This perception of love is internalized over time and affects procedural memories in such a way that the individual develops a trait-like sense of the other as loving and of the self as lovable. The latter results in what Bartholomew would call a positive model of self. The perception of being loved and the consequent feelings of being lovable then contribute to security of attachment, the sense that the caretaker is there when needed. A second and separate process involves the feelings of love for the caretaker. This depends upon the caretaker's behavior, as well as upon the infant/ child's own succorant schema. Over time, these feelings affect procedural memories such that the infant/ child develops a trait-like sense of loving the caretaker and of the caretaker as being lovable or, as Bartholomew would say, a positive model of other. Because infant/ child attachment theorists have tended to think about attachment security largely in terms of how secure the infant/ child feels about the caretaker's love, it is not clear how loving the caretaker and the perception of the caretaker as lovable affects attachment security but they surely must be important. What is equally important, however, is that the two processes just described are separable. Clearly both are influenced by some of the same things – caretaker availability, sensitivity, and consistency, for example – but just as clearly both are influenced by different things – the caretaker's nurturant schema in the case of feeling loved and lovable and the infant/ child's succorant schema in the case loving the caretaker and feeling that he or she is lovable.

The scenario just outlined gives a bonding-systems perspective on how positive/ negative models of the self and the other develop during the succorant stage. It does not, however, indicate how an individual comes out of childhood as preoccupied, dismissing, or fearful rather than secure. Bartholomew (1997) has suggested that inconsistent parenting may contribute to being preoccupied and that rejecting and unresponsive parenting may contribute to being in the other two insecure categories. Almost certainly characteristics of the child also play a role in the development of these patterns. In any case, by the time the individual becomes an adult, many new relationships have come and gone, further shaping the internal models of self and others as lovable. In any current relationship, it is the generalized procedural memories of these models, together with the cumulative episodic memory of the ongoing relationship, that play a critical role in determining the relationship's course and outcome.

## Dyadic Level Framework

### Dyadic Interaction

The two frameworks presented to this point have focused on the biological and psychological bonding system levels, that is to say, on those neural components and psychological factors within the individual that regulate the formation, maintenance, and dissolution of bonded relationships. However, as indicated in the introduction, bonds are dyadic level phenomena. It is, therefore, important to examine how two individual bonding systems interact within the context of a specific relationship. Figure 4 schematizes some of the important features of such interaction. It shows the perceptual input components (P-1 and P-2), the central processing and integration components (CP-1 and CP-2), and behavioral (B-1 and B-2) and non-behavioral trait (T-1 and T-2) output components of two interacting OBS schemas. The suffixes 1 and 2 designate two individuals of a bonded couple. I have added non-behavioral traits to the figure in order to account for the fact that certain kinds of individual characteristics, such as secondary sexual characteristics, facial symmetry, and pheromones, have important effects on bonding through the partner's perceptual input component.

Two additional features of the figure are noteworthy. First, the figure indicates that both conscious and unconscious factors affect behavioral output and are, in turn, affected by perceptual input. Second, the figure shows that an image of the partner is produced in both the conscious and unconscious mind of individual 1 and, further, that this image includes both conscious and unconscious features of the partner. A corresponding image, which is not depicted, is also produced in the mind of individual 2. These features mean that both conscious (or explicit) and unconscious (or implicit) affects and motivations, which draw largely upon episodic and procedural memory systems respectively, contribute to the interaction with and perception of an intimate partner.

Overall, Figure 4 represents the reciprocal, interactive dynamic that occurs at the dyadic level between two individuals, creating and maintaining a social

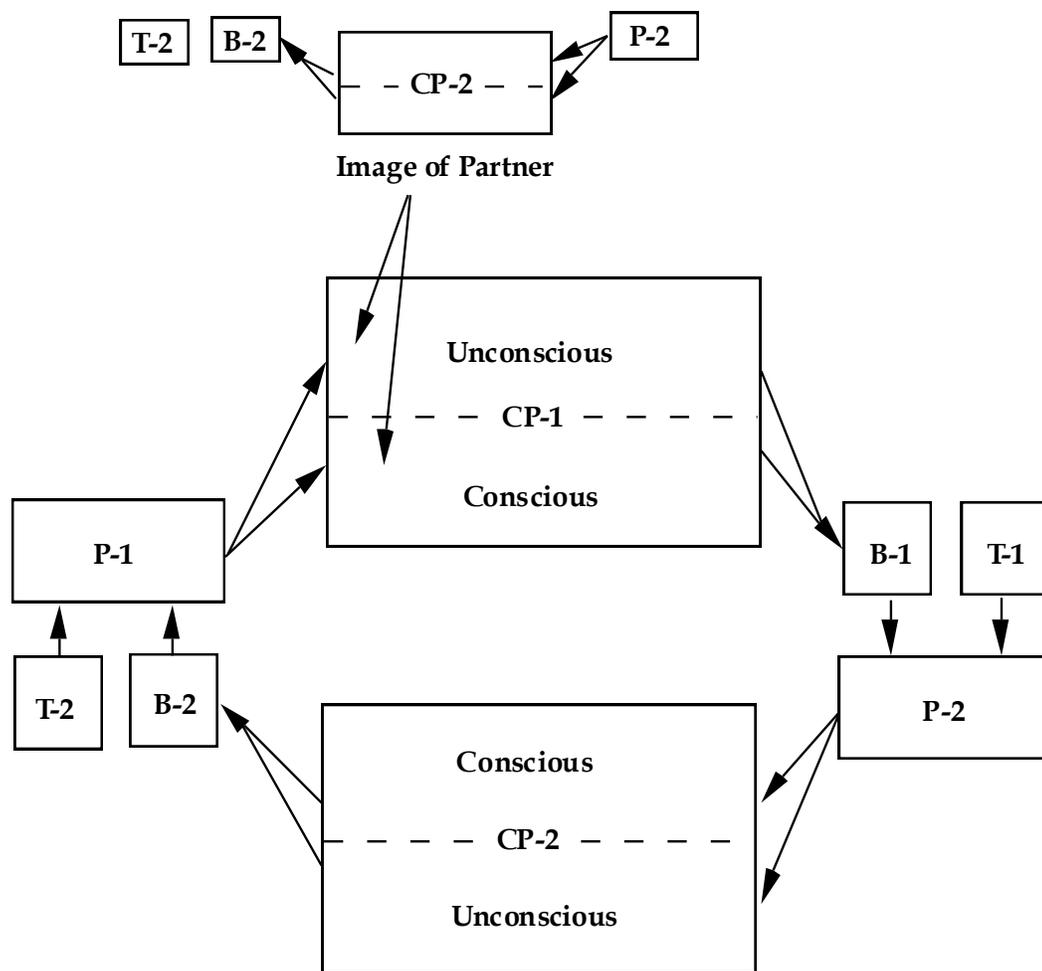


Figure 4. A schematic representation of the dyadic interaction of two bonded individuals as represented by the perceptual input (P), central processing (CP), and both behavioral (B) and non-behavioral trait (T) output components of their respective OBS schemas (adapted from Miller and Rodgers, 2001.)

bond. During that interaction, two important processes occur. One process involves the way that each individual's affects and motivations are combined, or integrated, with those of the partner. These combinational effects depend upon two considerations: how each individual's affects and motivations are perceived by his or her partner; and the degree to which the two partners' affects and motivations differ between them. The other process involves the degree to which each individual's affects and motivations are accurately perceived. Miller, Severy, & Pasta (2004) have discussed in detail the combinational and perceived partner effects that result from these processes. Below I will consider how their analysis extends the affiliative and sexual bonding framework developed in this paper from the biological and psychological levels to the dyadic level.

### Combinational Effects

Although the social bond that results from the interaction schematized in Figure 4 holds two individuals together, the uniting force resides in each of the partners separately. As a result, the strength of a dyadic bond depends upon the strength of the bonding force in each partner. However, overall bond strength is considerably more complex than a simple sum of the two individuals' bonding force. I will illustrate this point by focusing on different sections of the affiliative model already elaborated. One aspect of bond strength has to do with combinational effects, that is to say, with how the bonding forces in each individual are integrated. There are at least three important combinational effects, which Miller, Severy, and Pasta (2004) describe as the sum of the two individuals' bonding forces, the signed difference between them, and the absolute difference between them. These may be discussed with reference to Figure 5a, which shows a simple model of two individuals' commitment to each other predicting their relationship stability. Let us suppose that commitment is measured on a 20-point scale in which 1 represents no commitment and 20 represents total commitment. It is easy to see that when both individuals have a commitment that measures around 2 or 3, the model will predict low stability. Similarly, when both individuals have a commitment measuring around 18 or 19, the model will predict high stability. However, what happens when the two individuals' commitment is not the same or almost the same? In this case we are likely to observe not just a sum effect but also one or both kinds of difference effects.

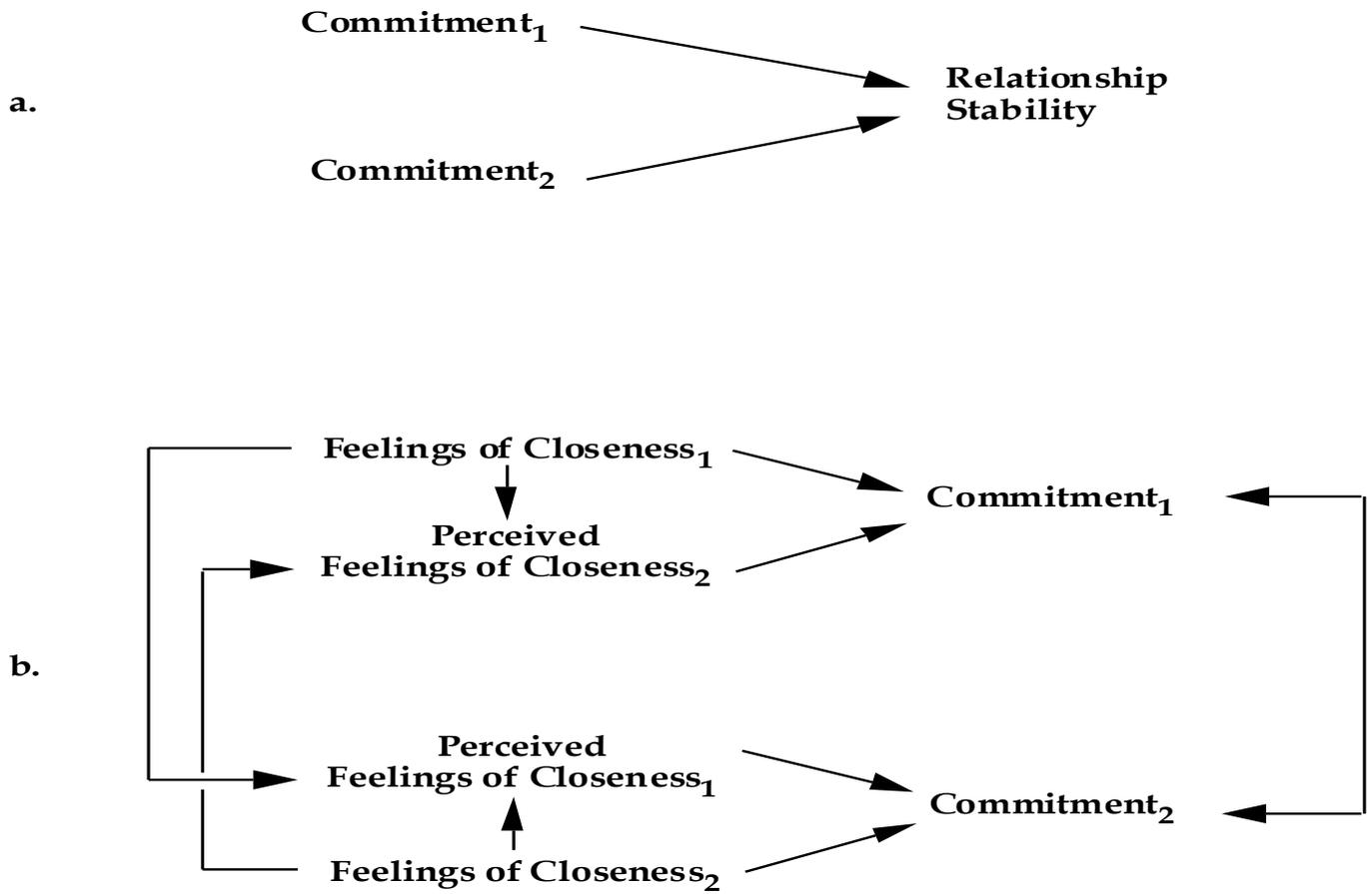


Figure 5. Dyadic level schematization of two sections of the psychological level affiliative bonding model.

In order to illustrate this point, let us do a thought experiment comparing a bonded couple in which both members' commitments measures 14 with a similar couple in which one member's commitment measures 10 and the other's measures 18. Both couples have the same summed commitment but for the second couple the difference between their commitments is likely to predict the stability of their relationship above and beyond that predicted by the sum. Further, this difference has two separate aspects. First, there is a signed difference effect. Let us say that in calculating the signed difference variable, the female's commitment score is subtracted from the male's score. If this variable contributes to the prediction of relationship stability, it suggests that which member of the couple is higher or lower in commitment makes a difference for couple stability above and beyond their summed commitment. (Whether it is higher male commitment or higher female commitment that increases stability depends upon which sex's score is subtracted from the other's in calculating the signed difference variable and on the sign of the empirically obtained prediction coefficient.). Second, there is an absolute difference effect. In this case the magnitude of the calculated absolute difference variable depends solely on the difference in commitment between partners regardless of which one of them (i.e., which sex) is higher or lower in commitment. If this variable contributes to the prediction of relationship stability, it suggests that it is the difference per se, i.e., the degree of disagreement, that makes a difference for couple stability above and beyond their summed commitment. In some cases, all three combinational effects may be operating. The important point here is that all three of these effects need to be taken into account when individual level models of affect and motivation are combined at the dyadic level in the prediction of some conjoint behavioral outcome.

### Perceived Partner Effects

A second aspect of bond strength has to do with partner perception. Dyadic relationships are fundamentally partnerships. They thrive because of convergent interests and in spite of conflicting interests. For these reasons and because the affects and motivations we have for our intimate partners are so closely connected to our perception of the affects and motivations they have for us, it is essential that those perceptions be built into our models. A useful way of doing this is based on two empirical findings from my previous research on the

motivational antecedents to childbearing in married couples (Miller, 1994). The first finding was that the two primary predictors of an individual's childbearing intentions were his or her childbearing desires – as would be expected according to the TDIB framework – and the perceived childbearing desires of his or her spouse. Perceived desires is a ToM-based construct that reflects, among other things, the perceiver's capacity to discern his or her partner's desires. The second finding was that the two primary predictors of the perceived childbearing desires of the spouse were the spouse's actual childbearing desires and the individual's own childbearing desires. When the latter effect is measured in the presence of the spouse's actual desires, it represents biased attribution (or projection) on the part of the observing partner. What is important is that in some cases this type of attribution can have a marked distorting effect on partner perception.

As shown in Figure 2, feelings of closeness in a relationship predict commitment to the relationship. This occurs in very much the same way that desires predict intentions. If we make that assumption and then draw upon the two empirical findings discussed in the previous paragraph, we arrive at a dyadic model like the one shown in Figure 5b. This model shows two sets of predictions. First, it shows that each individual's commitment is predicted both by their own feelings of closeness and by their perceptions of their partner's feelings of closeness. Second, it shows that each individual's perceptions of their partner's feelings are predicted both by their partner's actual feelings and by their own feelings. For the sake of simplicity, rather than expand the model with the additional variables shown in Figure 2, other predictors are dropped and the two partners' commitments are just shown as correlated. What Figure 5b makes clear is that each partner's commitment depends not just on the combinational effects of feelings and perceived partner feelings but also on the accuracy with which the partner is perceived and the amount of bias in perception that own feelings introduce. For example, let us assume a case where an individual's feelings of closeness and his or her perceptions of the partner's feelings of closeness are about equally weighted in determining commitment. If that individual's perception of the partner's feelings are dominated by his or her own feelings, then to the extent that there are partner differences, the net effect of own feelings on commitment is much larger than if the individual's perception of the partner's feelings are dominated by the partner's true feelings. Needless to say,

this type of dyadic modeling can be applied to many sections of the core individual-level model.

### Love and Perceived Love in the Dyad

Combinational and perceived partner effects are also both important with respect to the broad constructs of love and attachment. I have argued that Sternberg's triangular theory is primarily concerned with the components of loving another person. Witness his focus on a typology of individual love. I have further argued that attachment theory is primarily concerned with variations in the perception of being loved by another person. Witness that one of its central constructs, security of attachment, is about the infant/ child's confidence that a caring, protective adult's love is available. These generalizations are not completely true, of course, because Sternberg (1986) does consider how the perceived love triangle of a partner interacts with the individual's own love triangle and Bowlby (1977) does talk about attachment in terms of falling in love and loving. Nevertheless, there is an important emphasis on love in the triangular theory and on perceived love in attachment theory. A strength of the OBS framework is that it has the capacity to highlight and integrate both loving and being loved. Figure 6 captures the essence of this idea. It condenses the affiliative and sexual predictors of relationship stability shown in Figures 2 and 3 into the single construct "love". It also includes the ToM-based construct "perceived love". Finally, it creates a dyadic model along the lines of shown in Figure 5b.

Combining these features into the dyadic model shown in Figure 6 indicates the double effect of each individual's love for the partner and perception of partner's love on the relationship outcome, in this case stability. It also indicates the two main effects of own love and partners' love on the perception of partner's love. Other effects, such as that of the partner's perceived love on own love, are also revealed. Although these dynamics are complex, they can be readily distinguished and analyzed separately (Miller, Severy, & Pasta, 2004). Overall, this simple model represents a broad synthesis at the dyadic level of the effect of love of the partner and perception of the partner's love on a relationship. Of course, such a broad treatment misses many of the details of

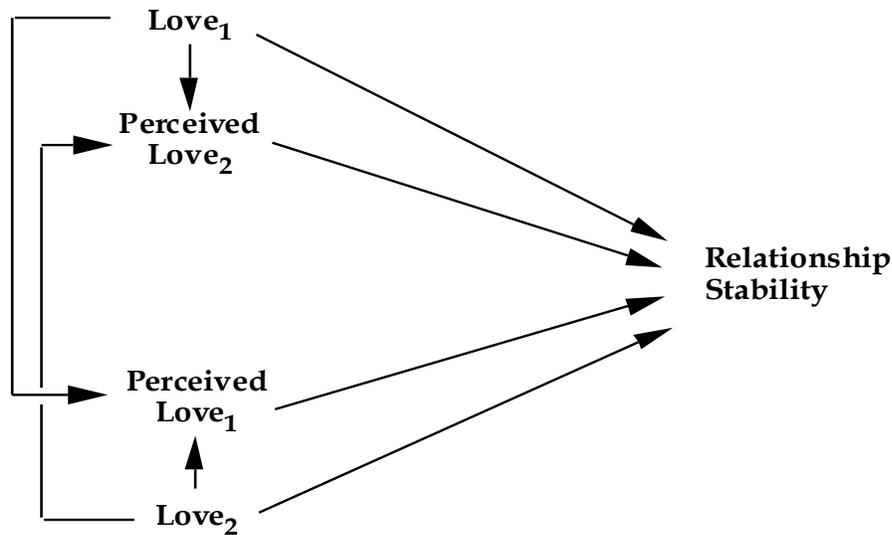


Figure 6. A dyadic level schematization of the effects of love and perceived love on stability of the relationship.

dyadic interactions, but for those, one has only to apply the dyadic framework developed here to the more specific models represented in Figures 2 and 3.

### Summary

I have argued that bonding is a major adaptive strategy for higher vertebrates. In humans the domain of bonding is characterized by four major developmental stages, of which the affiliative and sexual stages have special relevance to adult relationships. At the biological level, bonding is organized around at least four ancient neural systems that generate affection, fear, sexual feelings, and anger. These four affects and motivations differentiate, interact, and combine to play an important role in many of the fundamental psychological level constructs of interest to relationship researchers, including intimacy, trust, conflict, satisfaction, passion, and commitment. Taken together, this group of constructs can be construed as different facets of the broad relationship construct of love. Drawing upon the human capacity for theory of mind, it is also possible to distinguish between one's love for a partner and the perception of that

partner's love, a step that proves useful for understanding adult attachment. To fully understand bonding effects, however, it is necessary to model the four core affects and motivations dyadically, taking into account both their combinational effects and their influence on the accuracy of partner perception. The bonding systems perspective developed in this paper facilitates an understanding of relationships at all three of these levels of discourse. In that sense, it represents a biopsychodynamic framework.

There are, of course, many theoretical issues that I have only touched on briefly and that need fleshing out. Having developed a somewhat sex- and gender-neutral perspective, perhaps the most important question is what difference sex and gender make to the form and process of adult bonding described here. More specific issues also demand attention. The phenomenon of acceptance/ rejection and its postulated set point is potentially of great theoretical importance in bonding and deserves more study. The conceptualization and measurement of happiness/ satisfaction constructs needs further empirical work (Miller, 2002). Finally, it would be of great interest to characterize how the succorant and nurturant bonding systems, with their complementary structures and their relationship to dependency and caretaking, interact with and influence the later development of symmetry in the affiliative and sexual bonding of adult relationships.

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