

Warmth as a Developmental Construct: An Evolutionary Analysis

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Abstract

This paper provides an evolutionary account of the human affectional system as indexed by the construct of warmth. It is argued that although warmth and security of attachment are often closely intertwined in actual relationships, warmth must be distinguished from security of attachment. Warmth is conceptualized as a reward system which evolved to facilitate cohesive family relationships and paternal investment in children. Individual differences in this system underlie the dimension of warmth in parent-child research as well as a similar dimension revealed in factor analytic studies of personality traits. Warmth plays an important motivational role in children by facilitating compliance and the acceptance of adult values, and is viewed as one of several discrete evolved systems underlying personality development. Although securely attached children typically have affectionate relationships with caregivers in many societies, it is hypothesized that warmth is complexly related to attachment classification. Consistent with a discrete systems perspective, research is reviewed indicating that relationships based on warmth and affection are often highly compartmentalized and can co-exist with relationships based on exploitation and aggression.

Warmth as a Developmental Construct: An Evolutionary Analysis

The purpose of this paper is to develop an evolutionary perspective on warmth and affection as a developmental construct. Scientific interest in this topic is quite old, dating back at least to the factor-analytic studies of Baldwin (1955) and Schaefer (1959). Recently, however, research and theory related to the human affectional system has been dominated by the attachment paradigm. The present paper will provide reasons for distinguishing between warmth and attachment, develop an evolutionary theory of the human affectional system, review data on the role of the affectional systems in development, and link this perspective with attachment theory, particularly Bowlby's ethological theory of attachment. It will be argued that while the function of the attachment system is to provide security in the face of threat, the human affectional system functions to facilitate cohesive, psychologically rewarding family relationships and paternal investment in children. A major point will be that the human affectional system is one of several discrete human motivational systems, with the result that human relationships are often compartmentalized. Compartmentalization implies that people can have intimate, affectionate relationships with some individuals (typically family members), and radically different relationships with others, because different biological systems are involved.

An Overview of Developmental Research on Warmth

It is a commonplace observation that humans often engage in relationships characterized by affection and intimacy. The paradigm for such relationships is that of close family relationships, as between spouses or lovers, and between parents and children. There is now an extensive social psychological literature on the intimate relationships of adults (e. g., Berscheid, 1986). Within the developmental literature the emphasis has been on parent-child relationships (e. g., Maccoby & Martin, 1983) and, to a lesser extent, on relationships of friendship among peers (e. g., Berndt & Ladd, 1989).

It is an important finding that the dimension of parent-child warmth has emerged independently in several factor analytic studies of parenting performed over the last 35 years. This dimension did not emerge as the result of any theoretical perspective, but rather as the result of descriptive studies of the characteristics of parent-child relationships. Schaefer (1959) found a dimension of warmth-hostility, ranging from high affection, positive reinforcement, and sensitivity to the child's needs and desires on one end to rejection and hostility on the other. Similarly Becker (1964) and Baldwin (1955) found evidence for a warmth-coldness dimension. More recently, Baumrind (1971) has noted that authoritative parents are generally warm and accepting, while authoritarian parents tend to be cold, hostile and aloof. Reflecting these findings, Maccoby and Martin (1983) interpret the data as indicating a dimension ranging from acceptance, responsiveness, and child-centeredness to its opposite.

The dimension of warmth-hostility is also present cross-culturally. Warm parent-child relationships are characteristic of a wide range of human societies at very different levels of economic development and social organization. Significantly, parent-child (and husband-wife) affection as well as paternal involvement in child rearing (rather than sibling rearing) are characteristic of societies in which the nuclear family is the norm (Blain & Barkow, 1988; Draper & Harpending, 1988; Katz & Konner, 1976; Weisner, 1984). Nuclear family social structure occurs among many economically advanced human societies (e. g., industrialized Western and Westernized societies) as well as among many economically primitive foraging societies (e. g., the !Kung of Africa) viewed by many anthropologists (e. g., Lee, 1979) as exhibiting the prototypical human social organization.

The warmth-coldness dimension is thus a pan-human phenomenon (see, e. g., Eibl-Eibesfeldt, 1989), and there is the suggestion that warmth is characteristic of societies which form the prototype of human evolution. However, the patterning of warmth varies widely, not only within cultures, but also between cultures. This cross-cultural and within-cultural variation in warmth has been shown to be associated with a consistent set of correlates related to adaptive functioning, including attraction to intimacy, psychopathology, acceptance of adult values, and prosocial behavior (see review below).

Warmth and affection are therefore of signal importance for understanding human development. In recent years, however, developmental research on affectional relationships and intimacy has been dominated by the attachment paradigm. The point of the following section is to provide reasons for distinguishing attachment security from the construct of warmth.

The Necessity of Distinguishing Between Warmth and Attachment

The enormously influential view of infantile attachment as a fundamental human behavioral system with long range influences on later behavior stems from the writings of John Bowlby (1969; 1973). Bowlby argued that the function of the attachment system was to maintain contact with the mother and its primary emotions are fear and anxiety. When Bowlby discusses the role of biological predispositions in attachment, the emphasis is on fear: "attachment behaviour appears as one component among the heterogeneous forms of behaviour commonly grouped together as fear behaviour" (1973; p. 90). The function of attachment is to remove the child from a threatening situation and thereby remove the negative emotion of fear. Although attachment is also activated when the child is ill or fatigued, it is viewed essentially as a category "under the general rubric of fear behavior" (1973; p. 90). We are thus left without an analysis of the positive emotions involved in intimate relationships.

An important point in the following is to show that the powerful associations observed between warmth and security of attachment (see below) are culturally specific and that the systems underlying warmth and intimacy

in human relationships must be distinguished from the systems underlying the propensity for fear in the absence of an attachment object. There are several reasons for making this distinction.

1. Positive feelings of affection and warmth appear to result from a different biological system than do negative emotions such as fear, distress, and anxiety which are so central to attachment research based on the Strange Situation. The view that independent systems of positive and negative affect underlie human emotions is reflected in current perspectives which may be described as discrete emotions theories (e. g., Bates, 1989; Belsky & Pensky, 1988; Belsky, Fish, & Isabella, 1991; Darwin, 1872; Ekman, 1982; Fox, 1991; Fox & Davidson, 1987; Goldsmith & Campos, 1990; Gray, 1982; Izard, 1971; MacDonald, 1988, 1991; Malatesta, Culver, Tesman & Shepard, 1989; Panksepp, 1980, 1989; Plutchik, 1980; Rothbart, 1989; Thayer, 1989; Tompkins, 1962; 1963; Tucker & Williamson, 1984; Watson & Tellegen, 1985). Although there is disagreement on the number of independent biological systems underlying human emotions (see Footnote 1 on p. xxx), these theories agree in proposing at least two independent biological systems underlying positive affect and negative affect respectively.

Of particular relevance here is Fox and Davidson's (1987) finding that the joy elicited by mother approaching and reaching for her infant was associated with left frontal EEG activation, while separation protest was associated with right frontal activation. Similarly, Goldsmith and Campos (1990) and Belsky, Fish, and Isabella (1991) found that positive emotionality and negative emotionality were independent during infancy, and Belsky et al found that these traits were differentially related to attachment classification and parental behavior. Differences in attachment security were more strongly associated with changes in positive emotionality than negative emotionality.

Consistent with this body of research and theory, the perspective developed here proposes a theory of the relationship between warmth and attachment based on independent biological systems with different evolutionary origins and functions.

2. Attachment is commonly found among a wide range of primates and other mammals and a similar system occurs in birds. The function of the system, as Bowlby maintained, is to keep the animal close to the mother, especially in threatening situations. However, for the great majority of these species there is no reason to suppose that there has been evolution of intimate relationships, pair bonding, or affection. A system which evolved for the purpose of protecting the young need not also function to produce bonding and intimacy.

Attachment is ubiquitous among the primates, occurring among primitive as well as more advanced species. However, pair bonding, as indicated by monogamy, is relatively rare among primates, occurring in only 17% of the species (Hrdy, 1981). Among the great majority of primate species mating is promiscuous or males have harems. For example, the rhesus monkey, which has served as the primary animal model of attachment, is highly promiscuous in its mating habits and shows no paternal care (Hrdy, 1981; Parke & Suomi, 1981). Chimpanzees, our

nearest primate relative, also tend toward promiscuity (Hrdy, 1981), or they develop consortships which are based on force rather than on affection (Pusey, 1990).

The implication is that the conceptualization of the biology of the human affectional system must go beyond merely viewing attachment as a means of protecting offspring in the face of threat toward a positive conceptualization of the nature and evolutionary function of positive affective interchanges and pair bonding.

3. A third reason for distinguishing between attachment and warmth is that attachment appears to be compatible with lack of warmth and even maltreatment. Rajecki, Lamb and Obsmacher (1978) review data from several species indicating that attachment occurs even in the face of punitive and abusive behavior by the caregiver. Despite rather extreme treatment at the hands of the "motherless monkeys", infants persisted in their attempts to cling to the mother (Seay, Alexander, & Harlow, 1964). The primitive function of attachment is indeed protection, and the animal appears to seek out the attachment object even under the most negative conditions.

This gap between attachment and warmth is well illustrated by Ainsworth's (1967) Uganda study. Of interest is the finding that mothers did not show warm, affectionate behaviors toward their children and did not receive these behaviors from their infants. "The Ganda babies very rarely manifest any behavior pattern even closely resembling European affection, and indeed their mothers did not try to elicit hugging or kissing in the baby, although they occasionally nuzzled the baby while holding him" (p. 344). This lack of affectionate behavior occurred despite the finding that the babies showed attachment behaviors at levels which were higher than found in American samples (see Ainsworth, 1977), and the majority of the babies studied were considered securely attached. Indeed, Ainsworth (1977) reported that the Ganda mothers exhibited more sensitivity and responsivity than American mothers: "(My) impression is that more of them than of the Baltimore mothers were sensitive to infant signals and communications, and fewer of them insensitive, rejecting, inaccessible or interfering" (p. 126).

Similarly, LeVine and LeVine (1966; see also Draper, 1989) found that marital relationships and parent-child relationships (including early mother-infant relationships) were aloof and lacking in affection among the Gusii of Kenya. "It is rare to see a mother kissing, cuddling, hugging, or cooing at her child" (p. 126). Mothers nursed their infants "mechanically, without looking at the child or fondling him" (p. 122). Despite this clear lack of affectionate interaction, the mothers were perceived as very highly sensitive and responsive to infant needs (see LeVine & LeVine, 1988).

These results suggest that despite the powerful association between attachment security and warmth found in Western and Westernized societies (see review below), the association between warmth and attachment security is culturally specific. This point will be central to the discussion below.

4. A fourth reason to distinguish between security of attachment and warmth is the issue of sex differences. Girls tend to be more strongly attracted to intimate relationships than boys, and this is a very pervasive feature of sex differences in social relationships throughout life (see review below). However, there are no sex differences in security of attachment. It is thus not likely that knowledge of security of attachment will prove to be a powerful predictor of seeking intimacy in relationships except within sex, and then only if in fact warm, affectionate relationships are characteristic of secure attachment.

5. A further reason for distinguishing security in the presence of threat from warmth is that security is a salient issue in infancy but is relatively unimportant for understanding the content of peer relations of intimate friendship and the romantic relationships of adults, although interactions between attachment security and affection are an important possibility (see below). Reciprocated positive social interaction defines the content of these later relationships.

The Evolutionary Function of the Human Affectional System

These considerations suggest the need to develop a conceptualization of warmth which is independent of security of attachment and to explore the relationships between these two phenomena. Here the argument is developed that the capacity for warmth and intimacy is a basic human biological adaptation. Warmth is viewed as an important proximal mechanism which underlies the capacity for high investment parenting as a biological adaptation (see also MacDonald, 1984; 1988).

Lovejoy (1981) has developed the idea that a fundamental aspect of human adaptation involves obtaining increased levels of investment from hominid males in the environment of evolutionary adaptedness. The basic idea is that evolution in the direction of prolonged dependency of human children occurred. The benefit of this prolonged pre-adult phase was that it provided a time of relatively high plasticity which could be utilized by an increasingly large-brained, altricial, and neotenus species. The cost, however, was that such a prolonged period of helplessness and dependency required enormous parental investment.

This high investment style of parenting is an aspect of what ecologists term K-selection. K-selection occurs when there is pressure to produce highly competitive offspring which require high levels of resources from their environment. K-selected species tend to concentrate their resources in a few, high quality offspring rather than dilute their resources among many offspring. High levels of parental investment, including paternal investment, are a common result of K-selection (e. g., Clutton-Brock & Godfray, 1991), since the economic investment of males is available to the offspring.

Hominid males who cooperated with females by provisioning their offspring and in return receiving the confidence of paternity were able to father more highly competitive, highly adapted offspring than were males who

attempted to mate with many females and provided no resources to their offspring. Females who chose high investment males as partners were able to have more highly competitive offspring than females who mated with males who would not provide investment in their offspring.

Although any proposed scenario for human evolution is at present somewhat speculative, there are several reasons for accepting Lovejoy's theory or something close to it. (For example, Lancaster and Lancaster (1987) also emphasize the importance of K-selection, monogamy, low fertility, and paternal investment in human evolution and in contemporary foraging societies. Flinn and Low (1986), Irons (1983), and Katz and Konner (1981) emphasize the role of paternal investment in children in foraging societies.) First, this proposal has the advantage of being compatible with the expected parenting correlates of highly dependent, altricial human offspring and with the importance of human developmental plasticity as a biological adaptation (MacDonald, In press). The pre-reproductive period of children's dependency on adults is extremely long, and it is difficult to suppose that mothers would be able to rear their children without help from others in the primitive foraging economy in which humans evolved. Pair bonding and a tendency toward monogamy are common responses in a wide range of birds and mammals to ecological pressures for high investment parenting (e. g., Barash, 1977; Clutton-Brock & Godfray, 1991; Davis, 1991; Kleiman, 1981). Moreover, Belsky, Steinberg, and Draper (1991) have shown that the affectional systems are strongly implicated in variation in a number of life history variables within contemporary societies related to high investment parenting.

Secondly, mechanisms for ensuring paternal investment have been a common feature of other evolutionary theories of human origins (e. g., Alexander and Noonan, 1979; Lancaster & Lancaster, 1987), and Buss (1989) has shown in a large cross-cultural sample that male control of resources is an important criterion of female mate choice. This suggests that paternal investment in offspring has been an important evolutionary pressure in humans. A functional explanation in terms of female discrimination of males who will invest in children is also highly compatible with the existence of important sex differences in attraction to affection and intimacy (See below).

Finally, Lovejoy's scenario is compatible with the existence of the human affectional system. As indicated above, while attachment as a mechanism for protection from danger is virtually a pan-mammalian system, close, intimate relationships characterized by warmth and affection are not. The only plausible explanation for the existence of the human affectional system is that it evolved as a mechanism for underlying close family relationships, paternal investment, and mate choice. In conjunction with the scenario provided by Lovejoy, it is reasonable to suppose that this system evolved as a proximal mechanism underlying pair bonding and paternal investment in children.

Indeed, any theory of human evolution must be compatible with the psychological end products of the evolutionary process. For example, a theory based solely on the well-documented human tendency for polygyny in many societies is unable to account for the existence of the system to be described here. Nevertheless, the present view is compatible with the finding that polygyny, lack of affection and conjugality as expectations for marriage, and low levels of paternal investment in children are commonly found under certain ecological conditions and that humans retain a suite of psychological and morphological characteristics underlying these tendencies (MacDonald, 1988; 1989). From the perspective developed here, these phenomena reflect the evolution of discrete systems underlying human reproductive behavior. As indicated in the following section, the plasticity of the human affectional system allows for the adaptive programming of individual development in a wide range of human ecological conditions.

Conceptualizing Warmth: Genetic and Environmental Sources of Variation, Sex Differences, and the Issue of Plasticity

Warmth as a Personality Dimension.--The foregoing suggests a very wide distribution of a well-defined, species-typical cluster of behaviors we label warm and affectionate, a distribution that ranges from foraging societies to advanced industrialized societies. A blank slate theory of this distribution cannot provide an intelligible account of the specific characteristics of these behaviors. From a blank slate perspective, there would be no reason to suppose that human pair bonding would be characterized by what we label as warmth and intimacy rather than, say, mutual grooming, or why the behaviors we label as warm and affectionate should appear in such a wide variety of cultures and would have a consistent set of correlates within those cultures. (See review below.) Moreover, the fact that it is possible to set up laboratory procedures involving social reinforcers that will reliably result in a positive affective response in infants (e. g., Cichetti & Sroufe, 1978) further indicates the species-typical nature of the affectional systems. The behaviors of parents labeled warm are thus a non-random set of behaviors which reliably result in pleasure for the child.

An ethological analysis of the parent-child behaviors labeled as warm and affectionate utilizes a generalized version of Bowlby's (1969) idea of a "natural clue". A natural clue is a stimulus which results in an affective response as the result of a biologically mediated (unlearned) connection. Thus, for example, if sugar is presented as a gustatory stimulus, the typical result is the pleasant taste of sweetness. Similarly the stimulus of the mother exceeding the child's attachment set point is a natural clue for the activation of the attachment system. Children do not have to learn these connections by trial and error or as a result of generalization from some more fundamental set of reinforcers or punishers: the basic result of Harlow's experiments with monkeys (e. g., Harlow & Harlow, 1965) as well as similar research on dogs (Igel & Calvin, 1960) is that the secondary drive theory of social

reinforcers is incorrect. The list of evolved motivational systems must be expanded beyond the list of a few basic drives posited by behaviorists and psychoanalysts as the basis of human motivation.

The essential proposal here is that the human affectional system be conceptualized as an evolved reward system. The stimuli which activate this system act as natural clues for pleasurable affective response. Intimate relationships are thus pleasurable to the participants and are actively sought after. Their termination is met with disappointment and grief, while there is eager anticipation of reunion with a loved one.

On the other hand, individuals who do not seek to engage in intimate relationships lack an understanding of the attractions of close relationships. Freeman and Leaf (1989) describe schizoid individuals as seeming "to have little or no idea about why people affiliate. They see other people involved in relationships but see relating as part of a different language, culture, or universe" (p. 419). From the present perspective, these individuals are like people who cannot taste sugar: such a person would have no subjective basis by which they could come to value foods with sugar.

The view that the human affectional system constitutes a reward system fits well with several theoretical and empirical considerations (MacDonald, 1988). The affectional system clearly constitutes a fairly powerful motivational system. In our culture parents express intense attachments and love toward their children, and attachment theorists and researchers have chronicled the effects of disruptions in children's affectional relationships, such as separation and loss (e. g., Bowlby, 1969; 1973), as well as the occurrence of affectively positive interactions between parents and securely attached children (see review below). Attachment research and the research on early parent-child interaction clearly indicate highly pleasurable interactions to be characteristic of parent-child relationships labeled as warm and affectionate--the dance of affective modulation whose goal is "to be with and enjoy someone else" (Stern, 1977; p. 71) or to "maintain a relational state that is evaluated positively" (Tronick, 1982; p. 3).

The human affectional system may be viewed as reflecting the typical manner in which evolution shapes the motivation to engage in behavior (see, e. g., Barash, 1977; Wilson, 1975). As a thought experiment, imagine an evolved cognitive algorithm which would be able to detect cheaters (exploiters) during resource exchange interactions. In order to be effective it would also have to motivate the person to alter the situation. Simply knowing that one is being exploited is not enough to engage in adaptive behavior. A motivating device is necessary, and it is for this reason that so much of the psychological research in the areas of altruism and prosocial behavior is concerned with emotions such as guilt, empathy, and sympathy, as well as negative emotions resulting from non-reciprocated altruistic behavior (Charlesworth, 1990; MacDonald, 1988). Simply knowing that one should avoid exploitative relationships, stay near one's mother, or engage in high investment parenting is not enough to result in

adaptive behavior. Evolution seems to have resulted in an array of affective motivational systems which are triggered by specific types of stimulation (e. g., the taste of sweet foods; the pleasure of sexual intercourse, the joy of the infant in close, intimate contact with its mother) and it is difficult to conceptualize how it could have done otherwise. At a basic level, motivation, virtually by definition, involves affect: "A goal may be defined as a mental image or other end point representation associated with affect toward which action may be directed" (Pervin, 1989; p. 474; my italics). The evolutionary basis of motivation is thus the evolution of affective systems underlying particular adaptive behaviors in the environment of evolutionary adaptedness.

The idea that reward systems underlie the evolved basis of human appetitive traits is reflected in the literature on the biological basis of personality. Zuckerman (1983), Gray (1982; see also Gray, Owen, & Tsaltas, 1983), and Panksepp (1989) have proposed that appetitive traits such as those involved in sensation seeking, impulsivity, foraging and sexual behavior fundamentally involve sensitivity to various rewards. Panksepp (1986, 1989) notes that the limbic system and other sub-cortical structures of the brain which underlie these appetitive systems also support self-stimulation in laboratory animals; i. e., animals will continue to stimulate these centers because of the subjective pleasure which they provide. In the case of the affectional systems, Panksepp provides evidence that opioid systems underlie the emotions of social separation and social support (See also Liebowitz, 1983).

Within this perspective, individual differences in attraction to the rewards of intimacy and affection are viewed as a personality dimension. Digman (1990) notes that such a dimension has been consistently found in factor analytic studies of personality performed over the last 50 years, and characterizes it as involving "the more humane aspects of humanity--characteristics such as altruism, nurturance, caring, and emotional support at the one end of the dimension, and hostility, indifference to others, self-centeredness, spitefulness, and jealousy at the other" (pp. 422, 424). (See, for example, descriptions of reward dependence (Sigvardsson, Bohman, & Cloninger, 1987), psychoticism (reversed) (Eysenck & Eysenck, 1976), and agreeableness (John, 1990). Reflecting the conceptualization of this dimension as a reward system specifically underlying human affectional relationships, this dimension has been termed the "positive social reward" (PSR) system (MacDonald, 1988) and this terminology will be followed here.

Sex Differences in the PSR System.--As indicated above, one reason to distinguish warmth and security of attachment is that there are sex differences in warmth but not in security of attachment. If indeed the main evolutionary impetus for the development of the human affectional system is the need for high investment parenting, females are expected to have a greater interest in ensuring high investment than males. Females, because of their

very high, morphologically imposed investments in pregnancy and lactation are expected to be highly discriminating matters compared to males (e. g., Daly & Wilson, 1983).

The tendency for females to be higher on the PSR dimension and its relation to the evolutionarily predicted role in sexual behavior has empirical support. Personality research indicates that females score higher than males on the PSR dimension, the difference being .5 standard deviations (Sigvardsson et al, 1987; see also Eysenck & Eysenck, 1976). Indeed, girls are more prone to engage in intimate, confiding relationships than boys throughout development (Berndt, 1986; Buhrmester & Furman, 1987; Douvan & Adelson, 1966; Hunter & Youniss, 1982). Girls are also more prone to engage in moral reasoning which emphasizes relationships and communication (Gilligan, 1982). Females tend generally to place greater emphasis on love and commitment in sexual relationships (Astin, 1981; Douvan & Adelson, 1966; Haas, 1979; Miller & Simon, 1980); Normal & Harris, 1981).

The reward system theory proposed here is also compatible with the idea that the affectional system could be elaborated to such an extent that individuals would be pathologically motivated to obtain love and affection. Cloninger (1987) describes individuals who are overly dependent on social rewards and affection from others to the point of pathology (e. g., individuals with histrionic and dependent personality disorders). As predicted by an evolutionary theory, they are mostly women (e. g., Kernberg, 1986): given that phenotypically the PSR system approximates a normal distribution, women are expected to be more likely to be at the pathological extreme of being overly attracted to PSR stimulation, while men are expected to be more likely to be at the pathological extreme of sociopathy. This is indeed the case (Draper & Harpending, 1988).

Another reason to suppose that the PSR system would be stronger in females is that there is evidence that it facilitates nurturance in humans. Empathy, altruism and nurturance are consistent correlates of warm parent-child relationships (see review below). The evolutionary perspective suggests that the PSR system functions to facilitate within-family transfer of resources, and that the very high level of parental investment characteristic of females is facilitated by this system. Indeed, one might speculate that the specific characteristics of the human affectional system as a generalized system underlying human family functioning result from modifying this primitive function of nurturance.

Conceptualizing Individual Differences and Plasticity in the PSR System.--Behavioral genetic studies of psychoticism (see Fulker, 1981) and reward dependence (Cloninger, 1987) indicate heritabilities in the range of .5 for this trait (see also Digman, 1990; Lytton, 1991; Plomin & Bergeman, 1991; Rowe, 1983, 1991). Environmental variance acts within-families rather than between-families, so that normal environmental variation must be conceptualized as making members of families different.

These findings may be said to reflect average children in average environments in Western cultures, and do not preclude the effects of extreme environments. The results of research on children reared without attachment objects (e. g., Tizard, 1978; see reviews by MacDonald, 1985; Rutter, 1979) indicates that profound environmental effects on this system are possible. Moreover, since the range of environmental variation cross-culturally is likely to be much greater than within one culture (Katz & Konner, 1976; Levine & Miller, 1990; Weisner, 1984), the data are compatible with the proposal that many human cultures have adopted extreme patterns of child rearing characterized by parent-child aloofness and rejection of children or by state intervention in the socialization process (MacDonald, 1988).

Evidence for rapid historical alterations in the degree to which close, intimate relationships typify a society also provide evidence for the plasticity and manipulability of the PSR system. Secular trends in familial affective relationships which occur in less than 1000 years can confidently be ascribed to non-genetic changes (Lumsden & Wilson, 1981), and there appear to be several such examples. Classical historians have noted shifts from cold and distant marital relationships early in Roman history to an increasing emphasis on conjugality as the basis of marriage later in Roman history (Garnsey & Saller, 1987; Hallett, 1984; Veyne, 1987). A similar shift appears to have occurred in early Medieval European history coinciding with the decline in the importance of extended kinship relationships and the rise of monogamy resulting from the Christianization of Western Europe (Herlihy, 1984; Rouche, 1987). Finally, several historians have noted a shift toward warmer parent-child and husband-wife relations after the Middle Ages (Hanawalt, 1986) or after the 17th century in Western Europe (Stone, 1977), although this view has been challenged (Pollack, 1983).

These results indicate that the PSR system shows considerable plasticity. Moreover, the discrete emotions perspective implies that environmental influences are conceptualized as involving specific types of stimulation directed at particular evolved systems. (See, e. g., Belsky, Fish, and Isabella's (1991) review of socialization influences on temperament systems in infancy). If indeed the PSR system is a reward system, the relevant environmental influences may well consist of the positive, affectively toned stimulation to which the PSR system responds.

The PSR system is an environment-expectant system in the sense that the biology of the system programs for affective responses to expected environmental stimulation. Providing high levels of this rewarding stimulation during development is proposed to make the individual more sensitive to the reward value of this stimulation, while providing lower levels would result in a less elaborated reward system. Such a model is compatible with animal models for the effects of environmental enrichment on neuroanatomical structures (e. g., Greenough, Black, & Wallace, 1987).

The Developmental Correlates of Warmth

A Theoretical Perspective on the Developmental Correlates of Warmth.--This perspective implies that the PSR system is above all a motivational system. Moreover, it is a system based predominantly on positive, appetitive motivation rather than negative emotions such as fear and anxiety. The child who is high on the PSR dimension finds the stimuli characteristic of intimate, affectionate relationships to be highly rewarding and eagerly seeks out relationships, including peer relationships of friendship, in which this stimulation is available. Because the other person in such a relationship also finds this stimulation rewarding, the relationship is characterized by reciprocal positive affective exchanges. Friends are "intimate associates" and their relationships are characterized by reciprocity, commitment, cooperation and engaging in reciprocated prosocial support, intimacy and affection (Hartup, 1989). Because of the motivating role of affection for nurturance, a child high on the PSR dimension is expected to be relatively empathic and altruistic, especially within friendships where these feelings and actions are reciprocated.

A continuing relationship of warmth and affection between parents and children is expected to result in the acceptance of adult values by the child, identifying with the parent, and a generally higher level of compliance. The finding that warmth of the model facilitates imitation and identification has long been noted by social learning theorists (Bandura, 1969; Mischel, 1976). From the present theoretical perspective this is expected because the behavior of the child is part of a relationship characterized by reciprocated positive interactions, and the parent's evaluation of the child's behavior is an aspect of this reciprocated positive interchange. The rejection of parental values and standards of appropriate behavior by the child would be expected to be viewed in a very negative manner by parents and thus be incompatible with a continued relationship based on reciprocated positive interaction.

Data on the Correlates of Parental Warmth.--The following is not meant to be an exhaustive review of the correlates of parental warmth (see e. g., Belsky & Pensky, 1988; Grusec & Lytton, 1988; Maccoby & Martin, 1983; MacDonald, 1988), but rather an attempt to show that the relationships predicted above hold. As expected, parental warmth is associated with the development of conscience and an internalized moral orientation (Hoffman, 1970; Londerville & Main, 1981; Zahn-Waxler, Radke-Yarrow, & King, 1979). Lack of warmth, on the other hand is associated with delinquency and aggression rather than relationships based on reciprocated positive interaction (East, 1991; Grusec & Lytton, 1988; Hetherington & Martin, 1979, 1986; Martin, 1975; Olweus, 1980; Parke & Slaby, 1983), an effect also clearly emerging in the cross-cultural literature (MacDonald, 1988; Rohner, 1975). Consistent with this, Hinshaw (1987) finds that hyperactive-aggressive children tend to have negative, hostile family relationships, while this is not the case for hyperactive children who are non-aggressive.

Psychopathology and various types of maladjustment are characteristic of hostile-rejecting parent-child relationships: "Parental hostility, rejection, or neglect consistently occur more frequently than acceptance, love, and trust in the backgrounds of children with a wide range of problems..., [including] impaired social relationships with peers and adults...neurotic disorders, psychophysiological and psychosomatic disturbances, and character problems such as delinquency" (Conger & Petersen, 1984; p. 220; see also Hetherington & Martin, 1979, 1986).

Moreover, although the predicted relationship between parental warmth and altruism has not been robust (Staub, 1979; Mussen & Eisenberg-Berg, 1977; Radke-Yarrow, Zahn-Waxler, & Chapman, 1983), this may be due to measurement problems (Radke-Yarrow et al, 1983), the low cost of the behaviors used as dependent variables in assessing altruistic and prosocial behaviors, and the existence of compartmentalization (see below). The cross-cultural literature suggests that societies characterized by distant, hostile family relationships are also low on prosocial and altruistic behavior (MacDonald, 1988; Rohner, 1975). Finally, two studies have shown that high cost prosocial behavior is indeed associated with warm parenting as well as parental commitment to prosocial behavior (Clary & Miller, 1986; Rosenhan, 1970).

Although the above indicates a large main effect for the warmth variable, there are indications that the correlates of parental warmth are influenced by the level of the other dimension revealed in the factor analytic studies of parenting described above, that of parental control (Maccoby & Martin, 1983). Parental control involves discipline and monitoring of children's behavior and (at moderate levels) can be viewed within an evolutionary perspective as an aspect of parental investment (MacDonald, 1988). Thus fairly high levels of parental control are tolerated by children if the control is accompanied by parental warmth. For example, Jessor and Jessor (1974) found that adolescents with a relative absence of deviant behaviors (including drug and alcohol use and sexual activities) were more likely to have parents who disapproved of these behaviors and exhibited both a reasonable degree of control over their children (e. g., monitoring school performance and activities) and had an affectionate relationship with them.

Conceptualizing the Relationships among Warmth, Attachment, and Temperament

Research on the Relationship Between Warmth and Attachment.--Despite the considerations leading to the idea that warmth and security of attachment are quite different constructs, there is reason to suppose that they are related. Although attachment theorists have emphasized responsiveness and sensitivity to infant signals as the hallmark of the ideal mother, Clarke-Stewart (1973) found that mother's warmth is highly correlated with her contingent responsiveness to infant's social signals and distress. The following review indicates that reciprocated positive interaction between infant and caretaker is characteristic of securely attached infants in Western societies.

Ainsworth, Blehar, Waters, and Wall (1978) found that mothers of securely attached babies were significantly more affectionate than the other categories in home observations. Similarly, Matas, Arend and Sroufe (1978) found that mothers of securely attached infants were more affectively positive, and Waters, Wippman, and Sroufe (1979) found that attachment classification was predictable from positive affective interchanges prior to separation.

Isabella and Belsky (1991) found that secure infants engaged in more "reciprocal and mutually rewarding" interactions with their mothers than insecure infants (See also Malatesta et al, 1989). In a recent Q-sort study, Vaughn and Waters (1990) found that among the items distinguishing securely attached from insecurely attached infants, the following items had a mean Q-ranking of 7.4 on a 9-point scale, and are thus highly characteristic of secure attachment: "Enjoys playful physical contact with mother", "Affectively responsive and expressive", "Affective sharing occurs during play", "Laughs easily with mother".

Main and Cassidy (1988) found that the securely attached child at age six "initiates positive interaction, proximity, or contact with the parent, is positively responsive to the parent's initiations, or both" (p. 418). For the "very secure" child there were interactions of an "unambivalent and affectionate nature", and the child initiated "warm and personal conversation" (p. 418). Belsky, Fish, and Isabella (1991) found that differences in attachment security were associated with changes in positive emotionality, a measure based mainly on observations and ratings of positive parent-child interactions. Change in positive emotionality was more strongly associated with attachment security at one year of age than was negative emotionality.

Moreover, secure attachment also predicts positive relationships with peers (Leiberman, 1977; Pastor, 1983; Waters, Wippman, & Sroufe, 1979) as well as close friendship. Sroufe and Fleeson (1988) and Park and Waters (1989) have found that securely attached children are more likely to have close friends and that their relationships are characterized by reciprocated positive interactions later in childhood. As adolescents they appear more likely to develop romantic attachments (Sroufe, personal communication).

While positive interactions are characteristic of secure attachment, several studies have shown that child abuse is associated with insecurity of attachment (see Lamb, Thompson, Gardner, and Charnov (1985) for a review.) Lamb et al (1985) conclude that maltreatment often--though not always--is associated with insecure patterns of attachment behavior.

Warmth and Attachment: Theory.--The foregoing suggests the possibility that security of attachment is not identical to warmth and affection, but that there is a non-random relationship between them.

1. One might propose that, while warmth and security are different biological systems, the quality of attachment is a simple function of warmth so that individual differences in attachment classification merely reflect

individual differences in the PSR dimension. Further, one could suppose that avoidant individuals are lower on the PSR dimension than ambivalent individuals, since there is some indication in the data that the parent-child relations of avoidant babies are particularly lacking in warmth (see below).

This model is internally consistent and is compatible with some data. However, it is not an adequate explanation of the finding of sex differences in warmth and affection in the absence of sex differences in attachment classification. Nor is it compatible with Ainsworth's (1967) Ugandan data and LeVine and LeVine's (1966, 1988) Kenyan data which strongly suggest that sensitive, responsive parenting and a feeling of security can occur in the absence of affection and warmth. Moreover, the behavior of ambivalent infants appears not to be simply a matter of being intermediate between avoidant and secure infants on a scale of warmth, but is rather a combination of strong attraction to the parent as a source of warmth and security combined with hostility and insecurity (e. g., Main & Cassidy, 1988).

2. Another possibility is that attachment classification is the result of a complex interplay between two different biological systems, one involving the PSR system, and the other the security/separation distress system. The security/separation distress system functions to keep the infant close to the mother and its affective components are separation distress when the attachment set point is exceeded and "felt security" (Sroufe & Waters, 1977) when the attachment object is present.

In congruence with the ethological approach, environmental influences on the security/separation distress system are viewed as the result of variation in sensitivity and responsivity of the caregiver. However, individual differences in this system may also be influenced by temperament differences in behavioral inhibition, emotionality, and extraversion (see following section). As Bowlby proposed, children differ in the extent to which their caregivers provide a source of security during times of threat, and the essential features of parental behavior which result in security are sensitivity and responsivity to child's cues. Nevertheless, although variation in separation distress and the extent to which contact terminates distress are non-randomly distributed among attachment classifications, attachment classification is not a simple function of these characteristics (Sroufe, 1985).

It is hypothesized that status on the PSR dimension is also non-randomly associated with attachment classification. Infants are hypothesized to vary in the extent to which they have an affectionate relationship with their caregivers independent of their status on the security/separation distress system. In Westernized societies the data indicate that the great majority of securely attached infants have an affectionate relationship with their caregivers, although there is expected to be some variation within the secure group in this regard. For example, Main and Cassidy's (1988) "very secure" group describes children who have a very affectionate relationship with the caregiver. The present perspective also predicts sex differences in affectionate interchange within the secure group.

Moreover, since the Strange Situation is not a direct assessment of the warmth of parent-child relationships, it is possible that some infants are classified as secure primarily because reunion is effective in terminating distress rather than the extent to which they have an affectionate relationship with the caregiver.

This theory is thus compatible with the possibility that sensitive, responsive parenting is a necessary and sufficient condition for secure attachment. However, while it is quite plausible that parents who are affectionate will also be sensitive and responsive, the data suggest that sensitivity and responsiveness to security issues are not necessarily accompanied by affection.

Within this perspective insecure-avoidant infants may be hypothesized as having failed to establish an affectionate relationship with the caregiver. As would be expected for infants who do not value affectionate, intimate contact with the mother, avoidant infants do not appear to be motivated to seek or maintain contact, and actively avoid the mother (e. g., Sroufe, 1985). Although some avoidant infants show separation distress, most do not (e. g., Sroufe, 1985), perhaps because the tendency for avoidance conflicts with a desire for contact maintenance during separation. Consistent with this interpretation, Ainsworth et al (1978) suggest that the distress of avoidant infants is a reaction to being left alone rather than absence from the mother--a remark which is also highly compatible with the idea that the security/separation distress system is independent from the affectional relationship with the mother. Clearly the most salient feature of avoidant infants is the lack of motivation to engage the mother in positive interaction.

One interpretation of ambivalent attachment is that there is an interaction between the PSR system and the security system such that felt insecurity results in ambivalence even in the presence of affectionate interaction with the caregiver. A child who had developed a model of the parent as an unreliable source of protection and/or as generally insensitive and unresponsive may be hypothesized to be ambivalent toward the parent even if the caregiver also engaged in affectionate interaction. A second interpretation of ambivalent attachment involves compartmentalization (see p. xxx below).

This interpretation of ambivalent attachment implies that individuals who are relatively high on the PSR dimension are expected to continue to approach possible sources of affection, but with ambivalence because the basic security needs of the infant have not been met. The reward system perspective further suggests that some individuals (i. e., individuals who are genetically predisposed to be high on the PSR dimension) could remain highly motivated to obtain the pleasure of affectionate stimulation even if they failed to receive this stimulation from their environment. It would then be possible that such individuals would engage in fantasies of ideal affectionate relationships--what psychoanalytic writers such as Breger (1974) term 'dissociation'.

In any event, despite the reasons for supposing that the security/separation distress system and the affectional system are independent, these two systems are closely intertwined in actual relationships. Obviously, there is a need for further empirical research on the relationships between these systems.

Temperament, Attachment, and Warmth.--We have seen that Bowlby proposed that attachment was closely intertwined with the fear system. If this is the case, it would seem reasonable to suppose that temperament differences related to fear would be related to individual differences in attachment. This has in fact been the position of some of the proponents of a temperament approach to attachment (e. g., Kagan, 1989; see Goldsmith & Alansky (1987) for a review). For example, Thompson, Connell, and Bridges (1988) found that temperamental fear has both direct and indirect associations with emotional and social interaction behavior in the Strange Situation. The point here is that, although it is theoretically plausible to suppose that variation in several temperament systems affects behavior in the Strange Situation, the affectional system, as a system designed by natural selection, has a different evolutionary history and function from these other systems.

Because of the close relationship between attachment and fear proposed by Bowlby, the Strange Situation was designed to test the infant's reaction to maternal separation in a fear-inducing situation. Indeed, Ainsworth et al (1978) note that the Strange Situation was invented in order to produce distress in American infants which was comparable to the distress found among Gandan infants separated from their mothers in the home. (American infants were far less distressed by brief separations in the home than were the Gandan infants.)

It is not surprising then that temperament explanations of attachment have focused on the entirely reasonable possibility that variation in behavior in the Strange Situation would be related to individual differences in the phylogenetically ancient fear system, and that highly reactive, behaviorally inhibited children would be especially prone to separation distress.

Yet the importance of individual differences in fearfulness in the Strange Situation can be only part of the story. A basic interest of attachment theorists is to explain the affective content of intimate relationships, and especially feelings of love, affection, and grief. They propose that the affectional relationship between adult and child is a powerful predictor of future affectional relationships between peers and spouses. These ideas are not well captured by the concepts of behavioral inhibition (fearfulness), negative emotionality (see Goldsmith & Alansky (1987) and Vaughn, Lefever, Seifer, & Barglow (1989) for reviews), or by the trait of sociability (extraversion)¹. It

¹Buss and Plomin (1984) have proposed that attachment security is closely related to sociability. However, sociability, as typically measured in personality tests is one of a number of intercorrelated appetitive traits, including extraversion, impulsivity, and sensation seeking which are orthogonal to personality dimensions which tap attraction to close, intimate relationships (e. g., Digman, 1990; Eysenck, 1981; John, 1990). Extraverted, sociable individuals dislike being alone and enjoy the social stimulation provided by others. They tend to have extensive, but not necessarily intensive and intimate relationships with others. As predicted by evolutionary theory (MacDonald, 1988), men tend to score higher on extraversion, sensation seeking, and impulsivity (Zuckerman, 1983). Women

is not at all surprising that behavior in the Strange Situation is influenced by these evolved systems, but the point here has been to show that the affectional system is a distinct system with its own evolutionary history.

A Discrete Systems Perspective Versus an Organizational Perspective

We have seen that one reason to distinguish warmth from attachment security derives from discrete emotions theory. The discrete emotions perspective does not fit well with the organizational perspective of continuity proposed by some attachment theorists. The organizational view (e. g., Erikson, 1968; Sroufe, 1979) proposes that each age has certain crucial adaptational issues which must be faced and that success at the previous age's task predisposes one to success at the next level. The organizational theory thus provides an interpretation of the continuity of development which does not depend on continuity in particular systems.

The purpose of the following is to develop a contrary position which relies on the idea of independent behavioral systems. At an intuitive level, the idea of independent behavioral systems makes evolutionary sense because different systems evolve in order to respond to different environmental demands. An organism which responds to all environmental contingencies with aggression and brutal self-interest is less flexibly responsive than an organism which is able to respond adaptively with aggression in some situations and with affiliation, cooperation, and intimacy in others.

The discrete systems idea proposes that different systems can be selectively programmed and that the result is a highly differentiated, flexible, context-sensitive personality. The discrete systems model is compatible with different socialization influences (and genetic variation) influencing specific systems. As a result there are strong sources of continuity (e. g., status on the PSR dimension), while at the same time children have the ability to use different systems in different situations and in different relationships. The discrete systems perspective is thus highly compatible with a relationships perspective on the affectional system (see Sroufe, 1985).

The discrete systems model is consistent with a great deal of interaction among the systems as proposed above for attachment security and the PSR system, and even with 'lawful discontinuity' (Belsky, Fish, and Isabella, 1991). Nevertheless, the systems are separate and do not meld into a fused, generalized ability to coordinate thought, affect and behavior typical of each age. It is thus antithetical to a stage theory of social/personality development.

score higher on scales assessing attraction to intimacy, and, as described above, girls tend to be more likely to have intensive, intimate relationships with their friends, while the relationships of boys tend to be extensive but less intimate.

The present perspective thus implies at least two different types of systems underlying positive emotions, one underlying warmth, intimacy and affection as described here. The other systems underlie tendencies toward impulsivity, novelty seeking, sociability, extraversion, positive emotionality, and sensation seeking in the literature on personality in adults, and appear in the developmental literature as sociability and positive emotionality (Bates, 1989), sociability (Buss & Plomin, 1984), pleasurable approach (Goldsmith & Campos, 1990), self-regulatory approach (Rothbart, 1989), and novelty seeking (Sigvardsson et al, 1987).

The problem with the organizational perspective is that it is unlikely that development is adequately characterized at any age solely in terms of one overriding issue such that an organizational fusion of thought, affect and behavior would be adaptive. At each age different relationships require different abilities. Being able to form close ties with friends and family members may be important, but resource competition and status seeking may also be important human goals for which intimate relationships are not important.

The view developed here proposes the existence of specific biological systems as the basis of human relationships. Because different systems are involved, it is consistent with compartmentalization; i. e., the possibility that people can have radically different relationships with others depending on the context.

The Compartmentalization of Affect as a Test of Discrete Systems Theory.--The crucial test for distinguishing between the organizational view and the discrete systems view is whether individuals can be simultaneously high on traits which would be viewed as incompatible on the organizational perspective. Could a person be simultaneously affectionate and intimate with some people and quite aggressive and brutal toward others?

The classic study of Freud and Dann (1951) on children reared in a Nazi concentration camp indicates compartmentalization of affect as well as extreme levels of within-group social cohesion, affection and altruism. While the children were extremely altruistic and affectionate toward each other, they showed hostility and suspicion toward adults in the early days. Similarly, the classic study of Sherif, Harvey, White, Hood, and Sherif (1961) showed that children are able to compartmentalize their relationships between setting, resulting in groups with strong in-group, out-group feelings. Reciprocated positive affective relationships within a group were not incompatible with a complete lack of empathy and high levels of brutality against outsiders.

Sroufe and Fleeson (1986) discuss two case studies which suggest compartmentalization. The first is the seductive parent who behaves with a combination of overly affectionate behavior (including especially physically sensuous interactions) with opposite sex children combined with little emotional support and in conjunction with physical punishment. Secondly, they discuss a case provided by Cottrell (1969). A man, Otto, was treated in quite different ways by his father (harsh disciplinarian) and his uncle (friendly kidding) respectively. Moreover, he had a close relationship with his mother and sister. As an adult, he had a loving relationship with his wife and hostile relationships with his son and with his bosses at work.

The proposal here is that the relationships of these individuals are compartmentalized: in the case of Otto, the affectionate stimulation provided by his mother did not prevent the development of hostility and aggression as a result of the treatment by his father. Similarly, one might propose that the seductive mother was fairly high on the PSR dimension, perhaps the result of affectionate treatment during development, but is also prone to rejection and hostility, the result of socialization with high levels of hostility, rejection and other aversive events.

Profiles of ambivalent attachment also emphasize combinations of attraction to intimacy as well as hostility and anger (Ainsworth et al, 1978), suggesting that compartmentalization can occur not only between relationships but within relationships. Especially noteworthy is Main and Cassidy's (1988) profile of ambivalent attachment at age 6 as characterized by exaggerated intimacy combined with avoidance and hostility. On the other hand, the active avoidance characteristic of avoidant attachment suggests not simply the lack of a relationship based on affection and intimacy (see pp. xxx), but a relationship based primarily on hostility, or at least indifference. Such a relationship does not suggest compartmentalization.

These cases are similar to those of multiple personality disorder (MPD) familiar to clinicians (see e. g., Hilgard, 1986; Kluft, 1985; Ross, 1989). Putnam (1989) describes MPD as characterized by "highly discrete states of consciousness organized around a prevailing affect" (p. 103). Significantly, MPD is strongly associated with traumatic childhood events. Ross (1989) finds that data from two samples of MPD patients indicated that approximately 89% had been sexually or physically abused as children. "The association between MPD and childhood trauma is stronger than for any other psychiatric disorder" (p. 101) (see also Putnam, 1989). These phenomena are strong evidence for the existence of independent systems underlying personality.

Finally, there are specific historical examples where societies appear to have socialized children simultaneously to promote strong affective bonding within the family or larger social group as well as inculcate attitudes of extreme aggression and cruelty toward outsiders by the provision of aversive socialization events strongly associated with the development of aggression (MacDonald, 1988). For example, ancient Sparta systematically brutalized children with a harsh, militarized discipline, but also inculcated very strong affective ties among the males within the group (e. g., Jones, 1967). There is also evidence that traditional socialization in Roman society was highly compartmentalized, with relationships mediated through the mother (including mother's brother) characterized by warmth and affection, while relationships mediated through the father (including father's brother) were hostile and rejecting (see Hallett, 1984; Veyne, 1987).

This highly compartmentalized pattern of socialization may still be echoed in contemporary societies. Block (1978) found that fathers in six industrialized countries were more authoritarian with boys, used physical punishment more with their sons, and were intolerant of aggression directed at them by their sons. Maccoby and Jacklin (1974) and Block (1978) both note that girls tend to receive more warmth and affection from their parents than boys, while father-daughter relationships are characterized by more warmth and affection than father-son relations. Since there is no suggestion of such differential treatment of sons by mothers, this suggests that the socialization of boys, to a greater extent than girls, is characterized by compartmentalization.

Conclusion

Given the above conceptualization of the human affectional system, it is difficult to conceive how the primary source of environmental influences on the human affectional system under normal circumstances could be other than from adult caregivers. If the relevant environmental stimulation is that which we label warm and affectionate, this type of stimulation is unlikely to come from other sources, at least during infancy. Moreover, data on the plasticity of this system indicate that the early years are of disproportionate importance in an individual's long term tendency to form close relationships (MacDonald, 1985).

The perspective developed here also suggests a conceptualization of continuity in the human affectional system. Perhaps because he lacked an adequate theory of the positive emotions involved in intimate relationships, Bowlby proposed a cognitive mechanism underlying the long term continuity of attachment. The internal working model is a cognitive model of expectations regarding the behavior of others. In order to serve as a vehicle of continuity, the working model must be self-sustaining and enduring, properties which suggest some sort of biological explanation (Main, Kaplan, & Cassidy, 1985).

The present perspective suggests that an important source of continuity is provided by continuities in the neurochemical systems underlying the PSR system. This continuity is reflected in studies in the stability of PSR system viewed as a personality trait (See, e. g., Digman, 1990). This biological perspective on continuity provides a particularly compelling account of the loss of an attachment figure. The loss of an attachment figure is the loss of someone who is an important source of the positive stimulation to which the PSR system is sensitive. It is difficult to conceive how a purely cognitive model of human relationships would result in such a sense of loss. Individuals become literally addicted to the positive stimulation provided by others, so that the loss is experienced as a highly negative event. Indeed, Panksepp, Siviy and Normansell (1985) liken the social dependence characteristic of attachment to opioid dependence: The administration of opioids is intrinsically rewarding to humans and animals, and their withdrawal results in severe distress.

Finally, the perspective developed here is compatible with a hierarchical system of motivation (see Emmons, 1989) in which many of the highest level human goals, such as affection, are profoundly shaped by our ontogenetic and phylogenetic history (MacDonald, 1991). In this view, evolution does not act by programming for a host of motivational (reward) systems geared for specific environmental contingencies. Rather, the affectional system motivates behavior partly by facilitating the transmission of parental values and culture. As a result, a child may be motivated to refrain from drug use or to work diligently in school in order to preserve a relationship based on reciprocated affection.

The human affectional system may therefore be viewed as a mechanism which can influence children's behavior in a wide range of situations which evolution could never have foreseen, and does so in a manner which allows children to take advantage of adults' greater experience and cognitive competence. It is not the only motivational system for children, but it is a very central one.

Future research should attempt to systematically investigate the relationships between security of attachment and direct measures of parent-child warmth in order to test the hypothesis of the independence of these constructs. In addition, longitudinal studies on the long range sequelae of warm, affectionate early interactions are important. It should be noted that because of compartmentalization, associations between parent-child warmth and other behaviors, such as prosocial behavior and altruism, are not expected to be extremely robust.

However, the literature reviewed above indicates a significant relationship among these variables. Warmth, all things being equal, seems to make people nicer towards at least a few people, and people whose personality is dominated by needs for warmth and affection may even be pathologically predisposed toward empathy and altruism. Nevertheless, in many individuals, warmth must compete with other evolutionarily prepared interests and goals. Indeed, an evolutionist can only be impressed that this precarious system, developed in a world long vanished and so often overridden by competing interests in a wide range of human societies, retains the power it has in contemporary societies.

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