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Introduction

C. S. CARTER and L. AHNERT, Chairpersons
K. E. GROSSMANN, S. B. HRDY, M. E. LAMB, S. W. PORGES,
and N. SACHSER, Program Advisory Committee

Snow is rare in Berlin in late March, and it was an unexpected six inches of snow that stranded Sue Carter (on her way to an international conference) at the Atnert home. Briefly housebound, they began a discussion that ran late into the night. Both Atnert and Carter studied something they called “attachment,” yet as they talked, it was obvious that their perception of this construct had little in common except for the word. Furthermore, it became apparent that the differences in the way developmental psychologists (such as Atnert) and behavioral biologists (such as Carter) viewed and studied attachment went well beyond semantics.

This chance occurrence was the first stage of a proposal for a Dahlem Workshop. With the support of Dahlem’s Scientific Advisory Board, a program advisory committee (PAC), consisting of Atnert, Carter, Klaus Grossmann, Stephen Porges, and Norbert Sachser, was convened in 2002 to select the participants for the workshop and refine the scientific scope of the discussion themes. Although unable to attend the PAC, Sarah Hrdy and Michael Lamb contributed to this meeting and helped, as did the other members of the PAC, in the editing of this volume. We are especially grateful to Julia Lupp and the other members of the Dahlem Konferenzen staff (Caroline Rued-Engel, Gloria Custance, Angela Daberkow), who worked tirelessly to make this workshop and volume possible.

The goals of the 92nd Dahlem Workshop (held in Berlin, September 28 to October 3, 2003) were to explore the concepts of attachment and bonding from different scientific perspectives. To our knowledge, this workshop represents the first systematic attempt to bring together scientists with very diverse perspectives on this topic. At the workshop, we sought to initiate a dialog, question assumptions, reveal new directions for research, and to suggest the foundations of a synthesis or consilience\(^1\) (Wilson 1998).

\(^1\) As described by E.O. Wilson (1998, p. 8), the term “consilience” was coined by William Whewell in 1840, as a “‘jumping together’ of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation.”
Attachment, bonding, and related concepts have intrigued and inspired scientists and non-scientists alike and have been at the center of an intellectual maelstrom for several decades. These words — attachment and bonding — and the concepts that they represent have attracted scientists from many disciplines, including anthropology, psychology, psychiatry, pediatrics, neurobiology, endocrinology, and even molecular biology.

It is important at the onset to recognize that both attachment and bonding are hypothetical constructs. No one has ever seen an attachment or a social bond or directly measured their qualities or strengths. As the authors of this volume write about these constructs, we are still struggling to give words to processes that emerged long before modern human cognition. In addition, “attachment” and “bonding” have acquired colloquial meanings within different disciplines. Common to definitions of these words are selective social behaviors or feelings toward another individual. Beyond attempts to define attachment and bonding, most studies, including those summarized here, seek to understand either the causes or the consequences of attachment and bonding, in general, and their different qualities in individual development, in particular.

COMMON THEMES

There was general acceptance at this workshop that attachment and bonding are evolved processes which were once, and in many situations still are, adaptive. The mechanisms that permit the development of selective social bonds are assumed to be very ancient, based on neural circuitry and endocrine processes rooted deep in mammalian evolution (Hrdy; Keverne; Sachser, all this volume), although the nature and timing of these processes, along with their ultimate (evolutionary) and proximate (ontogenetic, epigenetic, and physiological) causes, are only in the earliest stages of being understood. The proximate processes necessary for social bonding tend to be species-typical, shaped by phylogeny and the history of local populations. These same processes, however, can be quite plastic. Within the lifespan of a single individual, ontogenetic and epigenetic processes, including learning and different forms of cognitive and affective experience, can result in much variation between individuals belonging to the same species (Trevarthen, this volume). In particular, physical states of the body involving the status of the central and autonomic nervous system can alter the readiness of an individual to form attachments, and the environment can foster and hinder attachment processes (Peres, this volume).

Humans are highly social creatures, capable of exhibiting and eliciting social interactions as early as the first day of life. From birth onwards, social involvement is essential for normal development (Trevarthen, this volume). In all humans, we can find mechanisms for transmitting social experiences from one generation to the next. The physiological substrates for social bonds are shared
with other processes, including those responsible for reproduction and the management of “stress” responses. The shared physiological substrates and shared experiences in turn allow social bonds to influence perceived safety or “psychological security,” individual survival, and eventually genetic fitness.

Selective social relationships are not limited to humans and can be found in other highly social species, particularly those that are socially monogamous or which rear offspring cooperatively, so that survival or reproduction depend heavily on social bonds. This fact has facilitated experimental analysis of some proximate mechanisms underlying social bonds using animal models.

A BRIEF HISTORY

Contemporary theories regarding attachment and bonding are generally traced to the twentieth century. John Bowlby, a British psychiatrist trained in Freudian psychoanalysis, did much to delineate the concept of attachment. Strongly influenced by Konrad Lorenz, Niko Tinbergen, and Robert Hinde, Bowlby laid the groundwork for an evolutionary theory of human development. All of Bowlby’s memoirs were acutely sensitive to the role of early experience in the formation of social systems and social bonds. Bowlby wrote several volumes in which he defined and elaborated the concepts of attachment (1969), separation (1973), and grief at the loss of attachments (1980) and a secure base (1988). He saw attachment in the context of human evolution, and what he called the “environment of evolutionary adaptedness.” Bowlby was galvanized by observations of children separated from their mothers, based on his own clinical work, as well as Rene Spitz’s earlier studies of children in orphanages (Spitz 1945). Upon separation from their mother (or other consistent caretaker), toddlers tended to show protest, followed by despair and then apparent detachment.

Based on the science of his time, Bowlby created a theoretical framework to explain the dynamic interaction between human infants and their caretakers. Bowlby conceptualized human attachment in complex, multidimensional terms ranging from a cybernetic process to an individual trait (Thompson et al., this volume). Attachment theory specified a hypothetical “attachment system” in the young child. Attachment behaviors were the observable interactions between a child and its caretaker. The attachment relationship was seen as a “bond” shaped by interactions between a child and its primary caretaker. Also influential in the development of attachment theory were the experiments of Harry Harlow (1961), who reared young rhesus monkeys in various conditions of separation, in artificial family situations, on inanimate surrogates as well as in total isolation in “pits of despair.” The atypical behaviors of surrogate-reared monkeys and motherless children were more than just strong support for the notion that early experience played a critical role in later social behaviors. When Harlow tried experimentally to see if rejection induces psychopathic behavior, it was John
Bowlby who told him that he had already seen more psychopathy in the single cages than anywhere else on the face of the earth (Blum 2002, p. 214).

ATTACHMENT

Developmental psychologists, working within the context of attachment theory (for details and references, see chapters by Grossmann and Grossmann; Belsky; Ahnert; Thompson et al.; and Kraemer et al.; all this volume), have defined attachment as a ‘phylogenetically programmed propensity’ of one person (usually a child) to bond to another who is viewed as “stronger and wiser.” Explicit in attachment theory is the notion that the attachment figure and the affectional bond cannot be replaced by another. In the absence of the security figure and especially as the child grows older, attachment theory posits another hypothetical construct termed the “internal working models” (IWMs). IWMs incorporate both cognitive and affective representations and expectations regarding attachment figures. In the terminology of attachment theory, bonds are relatively long-lived ties to unique individuals. However, across the lifespan of the individual, multiple bonds may be formed, broken, and reformed. Also, according to the convention of attachment theory, a child forms one primary attachment to a caretaker (usually the mother) but may have many affectional bonds, including bonds formed by a parent (or other caretakers) for their child, or between two adults (Ahnert, this volume).

Over time, Bowlby’s followers, especially Mary Ainsworth, Mary Main, Klaus and Karin Grossmann, and their students, have developed a subfield within developmental psychology — now commonly known as Attachment Theory. Standardized paradigms, with an emphasis on the response of a child to the presence or absence of its primary caretaker, were used to identify individual differences.

Ainsworth (1978) developed the Strange Situation tests, which categorized children based on how they responded to separation and reunion with caretakers, as well as their reactions to strangers. Children were identified as (a) avoidant insecurely-attached, (b) securely-attached, or (c) ambivalent insecurely-attached. Later, Mary Main and colleagues (Main and Solomon 1990) added a fourth category: (d) disorganized, which was used for previously hard to categorize children who displayed contradictory traits that did not fit the other categories or that resulted in a breakdown of organized secure or insecure strategies. They also devised an Adult Attachment Interview (AAI), which is increasingly used to examine the coherence between early measures of attachment and related adult behaviors (Thompson et al., this volume).

The usefulness of attachment classifications to predict social or cognitive response generations is discussed elsewhere in this volume. It has become common to search for relationships between measures of attachment (usually taken in early life) and other behavioral, physiological, or genetic processes (see
Belsky; Grossmann and Grossmann; Hennighausen and Lyons-Ruth; Kraemer et al.; all this volume).

BONDING

Whereas attachment theory focused on the child’s response to its mother, another point of view, championed by Marshall Klaus and John Kennell (1982, 1995), emphasized the notion that human mothers were programmed to develop strong bonds with their own infants. Based on observations of the mother–infant dyad, Klaus and Kennell, suggested that the immediate postpartum period was a time of unique emotional sensitivity on the part of the mother to her newborn. Klaus and Kennell’s emphasis on the novel capacity of a mother who had recently given birth to “bond” to her offspring was widely accepted and increased the attention on maternal–infant interactions in obstetrics and pediatrics. This theory, however, drew criticism from psychologists, who argued that other caretakers, including fathers and nonrelatives, could also form intense relationships with the newborn and that the social bonds could continue to form well beyond the time of birth (Pedersen et al., this volume).

Of particular value to an understanding of the substrates of social bonding has been the analysis of the selective responses of a mother toward her newborn infant (Fleming; Keverne; Leckman et al.; Pedersen et al.; all this volume). Neuroendocrine processes associated with birth and lactation have also been implicated in maternal behavior and more specifically in filial bonding. Studies of maternal bonding in turn provided clues regarding the neuroendocrine mechanisms necessary for the formation or expression of social bonds between adult animals (Pedersen et al., this volume). Animal research suggests that specific hormones and neurotransmitters, acting on definable (if at present incompletely understood) pathways, play a role in the formation of social bonds. Among the neuropeptide hormones that have been implicated in social bond formation are oxytocin, vasopressin, and corticotropin-releasing factor, all potentially capable of influencing social fear; under optimal conditions, these peptides may facilitate social engagement and other positive social interactions (Carter; Keverne; Porges; Pedersen et al.; all this volume). In addition, the salience of a relationship may be reinforced by neural mechanisms that are shared with reward and pleasure. At the core of the capacity to form selective social bonds are interactions among the above neuropeptides and other systems that rely on dopamine and the endogenous opioids (Fleming; Keverne; Leckman et al.; Pedersen et al., all this volume).

ATTACHMENT AND BONDING: THE SYNTHESIS

Because biologists often work with animal models, they have tended to use the terms attachment and bonding interchangeably. Positive social behaviors, such
as selective approaches or physical contacts, were commonly used to measure attachment or a social bond. Responses to separation and reunion, such as distress vocalizations or attempts to reunite with a partner after separation, were used to determine the presence or absence of a social bond or an attachment. However, it can be difficult to demonstrate that these responses are specific to attachment or bonding. It is important to understand the evolutionary and ecological context in which these responses ordinarily occur. Such background is essential for understanding the neural and endocrine substrates underlying social bonds (Belsky; Carter; Gunnar; Keverne; Sachser; all this volume).

Semantic issues notwithstanding, this workshop affirms the notion that social bonds and attachments do exist, although considerable differences between individuals are expected. Some of this variation will be adaptive, and some of it harmful to the individual and thus maladaptive (Kraemer et al., this volume). Under certain circumstances, the capacity or opportunity to engage socially and form social bonds may remain unexpressed or be defectively expressed (Porges; Trevarthen; this volume). The absence of close relationships and social bonds is associated throughout life with various kinds of maladaptive/typical behaviors or “disorders” (Hennighausen and Lyons-Ruth; Kraemer et al.; Pedersen et al.; Thompson et al.; all this volume). Evidence is mounting that the absence of secure or sensitive infant–caregiver relationships will have impairing consequences for subsequent social behavior and for the capacity to regulate physical and emotional reactions to stressors (Gunnar, this volume). Due to ethical and logistical constraints, however, controlled experiments to test these theories in humans are rare.

So far, attempts to examine the relative contributions of early attachment experiences to emotional reactivity or later patterns of behavior have focused on children exposed to different patterns of childrearing. For example, atypical behavioral responses in some children who have experienced inadequate care or multiple caregivers offer support for the importance of caretaker consistency (Ahner; Grossmann and Grossmann; Gunnar; Belsky; all this volume). Children raised under conditions of severe emotional deprivation in orphanages where they lacked opportunities to form selective social bonds during early development have provided some of the most extreme examples (O’Connor; Gunnar; this volume). Aberrant or atypical responses in such children have been categorized, but not explained, by the Diagnostic and Statistical Manual (DSM-IV) of the American Psychiatric Association as “Reactive Attachment Disorder.” It has been noted that some, but not all, institutionally reared children, especially those who experienced a pattern of inconsistent caretakers, may show indiscriminate social behaviors, without normal degrees of wariness—a pattern that has been termed “disinhibited disturbance.” An alternative, but less common pattern, involves the failure to respond to social interactions and apparently fearful “inhibited” behaviors. Children with either response pattern are also at risk for a variety of other behavioral disorders. Children who have
experienced foster care, insensitive parenting, and even maltreatment are also at risk for later psychopathology, but do not typically show disinhibited social behaviors.

These and many other examples leave little doubt that social bonds have consequences for virtually all aspects of behavior. Perceived social bonds may be protective in the face of both emotional and physical challenges. When positive social relationships are not present, either because attachments were not formed or because bonds are broken, the results may include changes in behavior and physiology that are considered “maladaptive” or pathological. The absence of normal social relationships and attachments may increase the risk for mental and physical illness. It is hypothesized that inconsistent early social experiences lead to disturbed relationships in later life. A variety of mental illnesses, such as autism, attention disorders, and depression, are conditions characterized by atypical attachment and bonding. Epidemiological studies suggest that the presence or absence of social bonds are important predictors of speed of recovery and subsequent longevity following illnesses as diverse as cancer and cardiovascular disease.

This volume, which grew out of the 92nd Dahlem Workshop, provides a snapshot of contemporary scientific theories and findings, presented in the form of background papers and the reports of the four discussion groups. Of course one workshop or book cannot unite diverse disciplines, especially in fields with such limited prior interaction. Our larger goal of a “synthesis” among various points of view must be viewed as a work still in progress. However, this volume is an already advanced progress report—one that we hope will encourage readers to engage in the interdisciplinary dialog and enrich the ongoing complex development of our understanding of attachment and bonding.

REFERENCES

