

FAMILY LAW AND THE NEUROSCIENCE OF ATTACHMENT, PART I

Allan Schore and Jennifer McIntosh

In this far-reaching interview, Allan Schore, renowned scientist, clinical psychologist, and clinical neuropsychologist, considers the place of neuroscience in facilitating developmental knowledge and better decision making in family law matters. He details current science on the neurology of attachment formation, the function of early caregiving relationships, gender, neuroscience perspectives on conflict and family violence, and implications for parenting arrangements. At the meta level, Schore describes the responsibilities of the family law system in promoting the development of the child. On the faculty of the Department of Psychiatry and Biobehavioral Sciences, UCLA, Schore is on the editorial staff of 35 journals in various academic and clinical fields. His integration of neuroscience with attachment theory is documented in three seminal volumes, *Affect Regulation and the Origin of the Self*, *Affect Dysregulation and Disorders of the Self*, and *Affect Regulation and the Repair of the Self*, as well as numerous articles and chapters. He has justifiably earned the nickname of “America’s Bowlby.”

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ATTACHMENT THEORY AND THE EMOTIONAL REVOLUTION IN NEUROSCIENCE

McIntosh: Allan Schore, welcome to the Family Court Review. It is a privilege to have this opportunity to hear from you. Let me begin with this. Dramatic developments in neuroscience during the recent “decade of the brain” have blown some cobwebs off attachment theory and reinstated it as a central, evidence-based theory of development. You have been working in the epicenter of these developments. What would you like to tell us about that?

Schore: First off, thank you for inviting me to be part of this extremely important project. I agree that attachment theory, first created by the psychiatrist-psychoanalyst John Bowlby over 50 years ago, is now revitalized, particularly by its deep connections with neuroscience. At this point in time, we have in attachment theory a coherent theory of development that is grounded in both psychological science and neuroscience, and thereby is on a much firmer ground than it used to be. The practical applications of this interdisciplinary theory of emotional and social development have expanded tremendously, and attachment theory is now bridging many gaps between the academic world and the clinical world. This essential information about how the early beginnings of human life impact what follows is ready to be delivered into the legal system, and as far as I understand, there is a real hunger for this type of updated information. Our basic understanding of human infancy has changed dramatically, and family law, like other professions, needs to be aware of this information in order to make informed legal decisions.

McIntosh: Let’s start with recent advances in science, and later talk in detail about the implications of this new knowledge for family law.

Schore: In the last 10 years, the rapid growth in attachment theory has allowed it to become the most complex theory of the development of the brain/mind/body available to science. I think the reason for that, as opposed to other developmental theories, is because attachment theory, from its origins, has always been an integration of psychology *and* biology. In his classic 1969 volume, *Attachment*, Bowlby used the perspectives of both Freud and Darwin in order to understand the instinctive mother-infant bond in terms of psychoanalysis and behavioral biology, and he even speculated about the brain systems involved in the evolutionary mechanism of attachment. Today, it is clear that framing attachment solely in terms of psychology is inadequate. And so we are now exploring the underlying neurological and biological mechanisms of attachment. Neuroscience allows

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us to know in greater detail and in real time the mechanisms of early attachment relationships and how they shape the formation of internal psychic structures across the life span.

McIntosh: We frequently hear reference to an “emotional revolution” in neuroscience. This is a short hand way of describing a paradigm shift in the science of human development. Can you explain that for us?

Schore: It is important to note that, from the beginning, John Bowlby said that the attachment bond between mother and infant was defined as an emotional bond, and not just a sharing of cognitive information. (I use the term “mother” because the first central attachment figure is usually the mother—I’ll elaborate on gender later, because I know this is of interest and importance in family law). When the theory was created in the 1960s, psychology was dominated by *behavioral* models, and the focus was on attachment behavior. Psychology shifted in the 70s and 80s when *cognitive* psychology became dominant, and so the focus moved towards cognitive representations and internal working models of attachment. But by the 1990s research, theoretical, and clinical science began a deeper study of the problem of *emotion*, the central core of attachment theory. In 1994, in my first book, *Affect Regulation and the Origin of the Self: The Neurobiology of Emotional Development*, I integrated then current studies of brain development and developmental psychology of the first 2 years of life to create a theory of social-emotional development. Over the last two decades we have seen an explosion of studies on emotion and with them a paradigm shift. Beginning in “the decade of the brain,” neuroscience, especially affective and social neuroscience, began to explore the brain system involved in not just behavior, language, and cognition, but the processing of bodily-based emotional and social information, constructs central to attachment theory.

INTERPERSONAL NEUROBIOLOGY: ATTACHMENT DRIVES BRAIN DEVELOPMENT

McIntosh: Family law professionals are curious to know more of this era of brain science, how it is relevant to them, and where attachment fits in. What is interpersonal neurobiology, and what has it got to do with understanding attachment and children’s development?

Schore: Essentially, interpersonal neurobiology explains how early experience indelibly influences later experience—by impacting and altering the developing brain. It also describes the mechanism by which early attachment is central to the organization of the individual’s personality, including the individual’s ability to cope with later stress. In other words, the emotional relational environment provided by the primary caregiver shapes, for better or worse, the experience-dependent maturation of the brain systems involved in attachment functions that are accessed throughout the life span.

In the last 15 years, two major trends of research have converged to confirm the basic tenets of interpersonal neurobiology. Number one, from psychology: as opposed to earlier models that posited the beginnings of personality between the third and fourth year, we now have good evidence that the prenatal and postnatal stages of human infancy represent *the* critical period for the organization of the central dimensions of the personality. Number two, from neuroscience: the peak interval of attachment formation overlaps the most rapid period of massive human brain growth that takes place from the last trimester of pregnancy through the end of the 3rd year.

McIntosh: Attachment is far more than it used to be in “Bowlby 101” classes taught in the 70s and 80s. You are describing current knowledge that positions attachment as a central driver of brain development, not just an evolutionary mechanism designed to help us survive.

Schore: Right. We now know that the evolutionary mechanism of attachment does more than just provide the baby with a sense of safety and security. Rather, attachment drives brain development, five-sixths of which happens postnatally. In fact the brain grows more extensively and more rapidly in infancy than at any other stage of life. It more than doubles by 12 months, and 40,000 new synapses are formed every second in the infant’s brain. But, importantly, this brain growth is influenced by “social forces,” and therefore is “experience-dependent.” It requires not only nutrients, but the emotional experiences embedded in the relationship it co-creates with the primary caregiver.

There is now agreement in my field that the essential task of the 1st year of human life is the co-creation of a secure attachment bond of emotional communication between the infant and his/her primary caregiver. The baby communicates its burgeoning positive emotional states (e.g., joy, excitement) and negative emotional states (e.g., fear, anger) to the caregiver so that she can then regulate them. The attachment relationship shapes the ability of the baby to communicate with not just the mother, but ultimately with other human beings. This survival function—the capacity to communicate one’s own subjective internal states to other human beings—is the basis of all later social relations. Thus, the major developmental accomplishments of infancy are the capacity to communicate emotional states, and subsequently the capacity for self-regulation, which is the ability to regulate emotional states.

McIntosh: Your work describes the primary attachment as a continuous relationship that is uniquely designed to facilitate the baby’s growing ability to know and communicate his or her needs. What makes that relationship unique?

Schore: Number one: essentially the attachment relationship is emotional and bodily based. Number two: the essential communication involved in attachment formation in the first year is entirely nonverbal. (It is not until the middle of the second year that the left hemisphere and the speech centers in Broca’s and Wernicke’s language areas come online.) The baby’s ability to communicate his/her emotional states is now seen as a survival function, and nature has made sure that emotion circuits come online before the verbal language circuits.

EMOTION: THE LANGUAGE OF ATTACHMENT

Schore: Bowlby originally stated that mother-infant attachment communications are “accompanied by the strongest of feelings and emotions.” I think in some ways we’ve lost sight of this, with such a heavy emphasis on cognition, and on mind over body.

Developmental neuroscience research now demonstrates that the limbic system processes emotional information, and the autonomic nervous system is responsible for the bodily based/somatic aspects of emotion. Studies show that both are in a critical period of growth in the first and much of the 2nd year, and that the maturation of these emotional brain circuits is significantly influenced by early socioemotional experience. We also know that the right hemisphere is more connected into the limbic and autonomic systems, and that it develops pre- and postnatally, before the left hemisphere. The brain systems involved in attachment and emotion are thus located in the right hemisphere.

Attachment forms through communications that occur essentially between the right brain of the baby and the right brain of the primary caregiver. They are not transmitted through language, or semantics. Rather, from the beginning and indeed for the rest of the life span, these are nonverbal, social-emotional, bodily based communications. Specifically, attachment communication is expressed in (1) visual, face-to-face transactions; (2) auditory expressions of the emotional tone of the voice; and (3) tactile-gestural cues of the body. All of these are performed very rapidly by the right brains of the infant and mother. For the rest of the life span, we use these nonverbal communication skills in all of our interpersonal relationships.

Here’s another new insight about attachment, informed by neuroscience. Bowlby thought that the key to the attachment bond was that the mother was soothing, or regulating the baby’s negative fear states. There is now strong evidence that the secure primary attachment figure not only down-regulates negative states, but up-regulates positive emotions in play states. When we are evaluating an attachment relationship, we should be looking at not only the ability to calm and soothe, but also the ability to stimulate the baby into states of joy, interest and excitement. These positive emotions are important for brain development. So what we have in the attachment relationship is the developing ability of the child to communicate and to regulate positive *and* negative emotional states, and both are components of healthy self-esteem.

McIntosh: What are the essential developmental experiences an infant requires for optimal brain development?

Schore: Right brain development is not just genetically encoded; it requires these human intimate experiences for its optimal growth. What the child is looking for, and what the child is gaining from the attachment relationship and imprinting into the circuits of its maturing right brain are these critical emotional, right brain-to-right brain experiences. How those experiences are provided or not provided by the primary caregiver is going to impact the wiring of the circuits of that right brain. The mother's history of her own secure or insecure emotional experiences, including when she was an infant to her mother, are stored in her right brain, creating what we call the epigenetic transmission of attachment patterns across generations.

McIntosh: I want to pull up here for a minute. My concern is that some readers will miss the subtlety of what you are saying, because they may get caught on the use of a gendered language which places mother as the primary attachment figure. You flagged this earlier: let's go further into that territory now.

THE FUNCTION OF A PRIMARY CAREGIVER AND THE ROLE OF GENDER

When parents of an infant separate and are involved in a divorce dispute, family law sometimes grapples with the idea of a primary caregiver. It is a much debated topic, with strong socio-political origins, and gender tensions. In neurological terms, is there a primary caregiver, why, and what is the function of the primary caregiver?

Schore: To my mind there is one single "primary" caregiver. A good definition of the primary caregiver is that, under stress, the baby moves towards this single person in order to seek the external regulation he/she needs at the moment. Under stress, the baby will usually turn to the primary caregiver, not the secondary caregivers. In most family settings, things are building with the father in the first year and he is definitely getting a good sense of who the baby is, but the primary bond in most cases is to the mother in the first year and then, in addition to her, to the father and others in the 2nd and 3rd years.

The idea that everything before birth is genetic and everything after birth is learned is a fallacy. Learning goes on in the fetus, when the brain is in a rapid period of maturation from the last trimester of the pregnancy through the 2nd year. This means that in the last trimester, the biological mother's emotional state influences the infant's developing brain. We know that the stress hormone, cortisol, crosses the placenta, so the emotional state of the mother at that point in time has already begun to influence the infant. This continues after birth, when the mother usually is the one who continues to act as a regulator of the baby's emotional states. The brain is immature and does not have these regulatory mechanisms in place until somewhere in the 2nd year, so mother acts as an external regulator to the baby's stressful states and must continue to do this until the baby internalizes this soothing function into its own right-brain circuits.

Studies now show that one parent is the primary organizer of the infant's stress states, and in nuclear setups, this is usually the mother. The hypothalamic-pituitary-adrenal axis (HPA axis) is the stress-regulating axis in the brain, and its early organization is impacted specifically by the mother-infant attachment relationship. With emotional access to the empathic primary caregiver's calming and soothing functions, the child can take in interactive regulation and comfort and come out of a stressful fear state. Ultimately this allows for the further maturation of the child's right brain, which is dominant for the control of vital functions supporting survival and enabling the organism to cope with stresses and challenges. Indeed the right orbitofrontal cortex, which begins a critical period of maturation at the end of the 1st year, comes to act as the control center of attachment and the executive regulator of the right brain.

McIntosh: Mother is the primary organizer of the infant's stress states? Does that reflect where research is up to, or does it reflect a known neurological difference between men and women as caretakers of infants?

Schore: First, by far, most of the studies in both attachment theory and neuroscience are on the impact of the mother on the baby's brain. And again, what they are showing is that her sensitivity and

receptivity to stressful shifts in the infant's affective states allow her to function as a psychobiological regulator, and ultimately to impact the wiring of the child's developing right limbic system and HPA axis. Second, we know that there is a difference between the father and the mother even in the 1st year and that the father's play is more arousing and energetic, while the mother's is more calming. There are extensive differences between females and males in terms of the ability to process emotional information. Females show an enhanced capacity to more effectively read nonverbal communications and to empathically resonate with emotional states than men. When it comes to reading facial expressions, tone of voice, and gestures, women are generally better than men. This is why, in all human societies, the very young and the very old are often attended to by females. Furthermore, the orbitofrontal cortex, the control center of attachment and the brain's major system of affect regulation, is in general larger in females, although there is variation in size and complexity, dependent on early attachment experiences.

McIntosh: And the role of fathers? Are we talking about a sociologically based gender difference in rearing? On balance, are mothers predisposed in terms of their brain makeup to facilitate a certain aspect of infant development?

Schore: The whole area of the father has been less well studied, and research in this area has been overlooked, if not suppressed. Attachment workers have suggested that although the mother's soothing is essential to the child's attachment security, the father's arousing play is thought to be critical for the child's competent exploration of the physical world. In 1994, I proposed that the mother has a major impact on the baby's brain in the first year of right brain dominance, and the father in the 2nd year, when the left brain enters a growth spurt. There is now a small but significant body of studies showing that the father differentially impacts brain development. These are newer studies, and not many of them are coming out of the United States. Braun's laboratory in Germany has offered a series of studies clearly demonstrating that paternal care affects synaptic development of the developing brain. Studying a species that is similar to humans in that both mother and father act as caregivers, this body of work shows the father's play behavior has a different impact on the limbic system and that deprivation of a father impacts the left hemisphere more so than the right.

Now, Bowlby originally proposed that the infant first has experiences with a supportive mother and "a little later, father." My read of the current research is that the child's first bond is to the primary caregiver's (the mother's) right brain. At a later point, the 2nd year, the child will bond to the father if he is also providing regular care. At this later point, separation from the father will also elicit a stress reaction from the baby, the same as it would with separation from the mother. The second attachment and separation reaction is thus occurring at a later point in time than it would for the mother. Expanding upon these ideas I've suggested that although the mother is essential to the infant's capacity for fear regulation in the first year, in the second the father becomes critically involved in both the male and female toddler's aggression regulation.

McIntosh: I wonder if the gender distinction is an historic artifact from Bowlby's era? Would the finding hold today? In contemporary society, there are diverse family units out there, families with two mothers or two fathers, families where mothers have died, or where one parent spends long periods away working inter-state, or overseas at war, and so on.

Schore: In those diverse situations, we are still looking at how the parent's right brain shapes the infant's right brain. There are differences in the wiring of the emotion processing limbic system between males and females, influenced by individual attachment history. That being the case, what has been overlooked when it comes to gender is not biological but psychological gender. In both males and females, there are different early internalizations around gender. Both developing males and females usually first internalize a maternal and then a paternal attachment. In the 2nd year, in both sexes, psychological gender (the sense of maleness or femaleness) is not only genetically encoded, but also epigenetically molded by early experiences with masculine and feminine caregivers. This allows access to affiliative and nurturant feminine aspects, and to pragmatic masculine aspects of the evolving personality.

Ultimately, what the infant needs for a secure attachment is access to a well-functioning adult right brain that can empathically receive and regulate the infant's emotional communications. It is not just

the gender but the attachment security and emotional health of the parent that is the key to who can best provide right brain primary caregiving in the 1st year. Indeed, securely attached males also have efficient right orbitofrontal systems. When you see families where there is a switch, where the father is the primary caregiver and nurturer, and he's home and the mother's out in the world, I would suggest the couple has figured out together who's better at what, and have agreed to divide their roles accordingly. It could very well be that that infant now has optimal access to the more efficient right hemisphere in that particular set of parents.

On the other hand, an insecure "disorganized-disoriented" mother with a history of abuse and/or neglect, even though she's female, is going to have serious difficulties in providing right brain functions for her infant. Some other family member might be a better interactive regulator of her baby. That's important. Recall that I earlier said the primary caregiver shapes, for better or worse, the experience-dependent maturation of the brain. A major predisposition to psychopathology lies in having early repeated care with a primary caregiver who, instead of regulating, chronically dysregulates the infant's right brain.

CONSEQUENCES OF STRESSING THE ATTACHMENT SYSTEM DURING CRITICAL PERIODS

McIntosh: You have been referring throughout to an evolving hierarchy of attachment. This seems a central concept for family law to consider: that attachment needs at age one are different from age three, and that change in caregiving arrangements will be felt differently at these stages, and will have different developmental impacts, depending on stage and security of attachment formation.

Schore: Absolutely. A fundamental principle of developmental science is that one cannot understand the impact of any effect on the child without understanding the stage of development. Attachment in the first year of life and into the second, when the emotional right brain circuits are in a critical period of formation, is different from attachment in the 3rd or 4th year of life, when the system is mature. In the 1st year, and much of the 2nd, separation from the primary caregiver and change in caregiving arrangements are potent stressors of the right brain, and will alter its early maturation. To interpersonally stress a system while it is organizing in the 1st year will have a much more negative impact than if you exposed the child to the same stressor at 3 years.

In the 3rd and 4th year of life, most children can begin to use both hemispheres to deal with stress. In the 1st and much of the 2nd year an infant has no access to left hemispheric verbal functions, since these do not begin to mature until the 2nd year. When under attachment stress, the baby only has access to a still maturing right hemisphere, and thereby an immature, inefficient system of internal stress regulation. So under moderate to severe stress the infant is dependent on the external regulation provided by the mother's right hemisphere.

IMPLICATIONS FOR CARE ARRANGEMENTS

In order to co-create a secure attachment, the infant seeks *proximity* to the primary caregiver, who must be subjectively perceived as *predictable*, *consistent*, and *emotionally available*. A caregiving arrangement in this essential time period that deprives the infant of this proximity, consistency and emotional availability will inhibit the development of the attachment system. Prolonged and repeated removal from the regulating primary caregiver not only deprives the child of an external coping mechanism, it also negatively impacts the ongoing maturation of the right brain. Let me say that in another way. If you expose a 9-year-old child, or a 29-year-old to an attachment stressor (say loss of an important emotional relationship), you will see an established system disorganize and regress, with a temporary loss of function. On the other hand, if you stress the system at, for example, 9 months, while it is still in a critical period of growth, you will alter the trajectory of its development.

Consequently these internal regulatory structures will not have the maturity and will not have the efficiency to regulate the individual's emotional state when she is challenged by future interpersonal stressors.

On the matter of a primary caregiver, neuroscience indicates that pre- and postnatally, the mother's right brain is the key to this role. This is time sensitive, as it is occurring in early critical periods. Neuroscience uses the term "critical periods," while developmental psychology uses the term "sensitive periods" (which I think downgrades the importance of the timing and the later impact of emotional experiences that are needed by the right brain during the human brain growth spurt). The idea of 50-50 custody splits in the first 2 years is to my mind, highly problematic, and will have negative long-term consequences. Considering the neuroscience, the data indicates that weekly paternal visitations in the first year would allow the father and baby to begin to know each other, a strong motivator for their forming an attachment. These contacts are important in the 2nd year, when his impact on brain development increases dramatically. I've written that essentially, as the mother is to the development of the right hemisphere, the father is to the left, because the left comes online at about a year and a half, and generates new language functions and voluntary behaviors in a much more verbal, mobile toddler. I would say that if the baby is deprived of a sensitive, responsive father in the 2nd year, it has an even more negative effect than if that father is absent or less available in the 1st year. And it would have a more deleterious effect on the toddler's psychological gender formation and capacity to regulate aggression.

McIntosh: First 2 years? Can science draw a line somewhere?

Schore: I would say the neurobiological dividing line would be between 3 and 4, the point at which both attachments and both hemispheres are fully functioning in the child. Even at this point with some children this might be too early, and so each case would have to be evaluated by a mental health professional. The human brain growth spurt ends between the third and fourth birthdays. The most rapid increase occurs in the first 12 months, when brain volume increases by 100%, and then drops off to 15% in the 2nd. It is not until between three and four that humans show the adult pattern of left brain dominance. Again, I emphasize that in human infancy, right brain functions are dominant and need to be allowed to fully mature. Throughout life, the right, and not left brain, is centrally involved in critical survival functions: the allocation of attention, the capacity to experience positive and negative emotions, the regulation of stress, the ability to empathically and intuitively read the emotional states of other human beings, and indeed, morality. By the way, I would suggest that the analytical left hemisphere is overvalued by the legal profession. The dialogue we are having now is an attempt to deliver recent discoveries of the essential functions of the right brain to a left brain profession!

McIntosh: The emotional and neurological development of the infant is not to my knowledge a compulsory family law subject. However, if we do a good job here, it might soon be!

NEUROPLASTICITY

More generally, many parents and professionals alike rely on the notion that children are resilient and can cope with a great deal, and will recover soon enough from change to their routines or family life. Where does neuroplasticity fit in here?

Schore: There is now evidence that although the right hemisphere enters a major growth spurt before the left, both hemispheres later enter into subsequent minor growth spurts, right-left, right-left, throughout the entire life span. So yes, there is plasticity, especially in the frontal lobes. A major reorganization of the brain occurs in adolescence, but the magnitude is nothing like in infancy. Never again will the child's brain have as much plasticity as it does in the critical periods of the first year of life. In the past, even developmental scientists doubted that infants had a mind, or could generate states of consciousness, or a personality and sense of self. We now know this is incorrect, that not only does she have a mind, but it is one that can efficiently communicate with other minds. The time of rapid brain growth before speech provides the essential emotional undergirding of the self.

ON RESILIENCE, OR THE ILLUSION THEREOF

Schore: On the matter of resilience—there has been some confusion here. Emotional resilience is not a given ability in infants. Resilience in the face of stress is the outcome of a secure attachment. When it comes to attachment trauma, all infants are vulnerable and will suffer emotional (if not also cognitive) consequences if their primary care context is sufficiently disrupted. Relational traumas during infancy (early abuse and neglect) override all genetic, temperamental, constitutional, and intellectual factors and negatively impact right brain development, leading to a predisposition to future psychopathologies.

McIntosh: Infancy is not the right time to dilute children's attachment experiences, if they are primarily healthy ones? This is part of the long day care debate too. It is interesting, if sobering, to speculate on the potential combined effects for preschoolers of long term day care plus dividing overnight care between two homes in a divorce scenario. That research is still to come.

Schore: Right. Still, not one neurobiological study has been done on the brains of infants who enter early day care, yet, in the United States, over 50% of mothers with children under 1 year are in the work force. Due to the poor national policy on maternal leave, many return to work after six weeks, and place the child in day care. It is now widely accepted that the quality of day care is poor in the United States. Large-scale studies repeatedly show that placing an infant in early child care centers increases levels of insecure attachments and subsequent externalizing behaviors (aggression and disobedience). Neuropsychological models explain this.

THE NEUROSCIENCE OF NIGHT-TIME SEPARATION AND INFANT STRESS

McIntosh: I wonder if neuroscience can yet shed any light on the thinking and decision making we must do in family law about where and with whom infants spend their nights, as well as their days?

Schore: The attachment mechanism of interactive regulation of stress does not operate only during the day. It plays an essential role in allowing the infant to initiate and maintain sleep. Maternal well-being shapes the child's sleep patterns, including the development at 2 to 4 months of the infant's sleep/waking cycles. According to attachment theory, danger, including darkness and aloneness, triggers the attachment system. Thus the attachment system is activated at night, and crying represents an attempt to seek proximity and regulation from the primary caregiver. Sleep disturbances are common: they occur in 20% to 30% of infants and toddlers. An effective intervention for these early sleep difficulties is a nightly bedtime routine, where the parent engages the child in the same activities in the same order on a nightly basis prior to "lights out." These data indicate that in the 1st year or so, access to a *predictable, consistent, and emotionally available* primary caregiver is as important during the night as the day. So with respect to the problem of where the infant is going to sleep and who the infant is going to have as a regulator for these sleep states, the science suggests that this person needs to be a constant source of a nightly bedtime routine.

You may remember the Kibbutz situation in Israel, where they separated the living quarters of the parents and children. The problem with infants and young children was not only being separated from their parents during the day, but also at night. The brain mechanisms involved in attachment are activated as the immature brain attempts to transition from waking to sleeping. At the end of each day the infant may experience a stress state, and if this stress is chronically unregulated by the primary caregiver, a sleep disturbance will result. The ability to down-regulate stress before the baby goes into a sleep state is a critical matter for the immature brain. In the divorce context, this procedure of switching infants around day and night in the 1st year, back and forth between the parents, would be highly problematic. I would predict that research will reveal that this practice fosters future sleep disturbances. Any type of human behavior which opposes the way that well-regulated biological systems optimally function should be viewed as interfering with and not promoting the psychological and biological development of the infant.

McIntosh: As you know, scientific data in this area is only now accumulating, and lawyers and judges draw their advice from multiple and sometimes dubious sources, often having to weigh polar

opposite pieces of advice from experts. Some argue for frequent overnight care of a baby to grow and maintain attachments to both parents, and others highlight the risks of that lifestyle for a young child. Where does neuroscience weigh in?

Schore: We need to view this complex question from this perspective: how will any given arrangement affect the baby's developing mind, more so than the mother's mind or the father's mind? In terms of neuroscience this translates into this question: what kind of care and overnight experiences are needed to optimally shape the normal brain? What kinds of arrangements will lead to a growth-facilitating environment versus a growth-inhibiting environment?

When it comes to normal and abnormal development, a key factor is how the child responds under stress. After all, what is developing are the infant's coping capacities. According to classical attachment theory, babies will cry and protest when they are distressed, bidding for the attachment figure. Very recent research from neuroscience and child psychiatry now shows that under severe interpersonal stress or "relational trauma," an infant will disengage and shut down. If it becomes chronic, this "relational withdrawal" is the most pathological of all infant responses to stress. In this involuntary disengagement from the social environment the infant is immobile and silent. So, if you're looking at the external behavior of that infant, you're not going to see too much. This passive infant state could even be mistaken as being regulated, when internally the baby's brain and body are biologically extremely out of balance.

McIntosh: The baby must be fine, because she's not crying: that sort of reasoning?

Schore: Exactly. A self-preoccupied, nonempathic caregiver might routinely misperceive this noncrying silent state, when the child is not making any eye contact, as if the child is feeling safe. But the fact is the chronically withdrawn infant has moved from a safe state into a danger state of overwhelming emotional stress, and then into a survival state where the function of the developing brain is shut down. The disengaged parent is not available to repair this state, and so it endures. We now know that the key to understanding an infant is not only his emotional states, but the way he regulates these stressful states. And we know more about the early defense mechanisms the infant uses under stress. In an immobile silent state, when the attachment need is shut down, the stress hormone, cortisol, may be even higher than when the infant is crying. This is complex but crucial: the judicial system needs to have access to infant mental health professionals who are aware of current advances in interpersonal neurobiology and developmental psychopathology.

McIntosh: Another factor feeding into misunderstandings in the family law system seems to be the notion that there is a critical window of opportunity for attachment, and if for example, one parent has less time than the other during that window, the opportunity for secure attachment may be compromised. The child moving between the parents is thought to be one solution, with the idea that equal attachments can be formed with both. What are your views?

Schore: Attachment histories, for better or worse, are expressed in adulthood in all intimate relationships, including romantic or marital relationships. In fact, attachment stressors are responsible for the divorce. These psychological forces, acting at unconscious levels, fuel custody battles. Equally dividing the infants' day and night times between parents may seem to satisfy the motivations and needs of one or both parents, but not the developmental needs of their child. Two halves do not make a whole. Just by giving an infant half of the mother and half of the father does not necessarily make for a secure attachment with either of them. In fact, this split caregiver arrangement is probably making it harder because it is interfering with the creation of a basic attachment system.

The window does not shut. Although the massive brain growth spurt is from the last trimester of pregnancy through the end of the third year, there are parts of the brain that continue to evolve after this point in time. The right and left frontal lobes enter into separate subsequent growth stages, and the human prefrontal cortex re-organizes in adolescence, and indeed over the life span. The early forming right brain attachment system can and routinely is shaped by later relationships. The emotion processing limbic system continues to be impacted by ongoing social and emotional experiences, including therapeutic relationships. If later in childhood a child is exposed to the kind of emotional sensitivity that the right brain needs to build an attachment bond, this also allows for further right brain

development. This later plasticity permits the formation of new bonds that form between adults and children in second marriages.

HIGH-CONFLICT ENVIRONMENTS AND BRAIN DEVELOPMENT

McIntosh: The climate in which divorced children find themselves varies, but typically, family courts and legal process deal with parents who communicate poorly, and whose acrimony is high. The behavioral manifestation of conflict may include violent behaviors, but often looks more like coercive control. From the neurological perspective, what is the impact of insidious ongoing conflict between parents, between attachment figures?

Schore: It is psychologically inaccurate to think that the negative emotion only moves between the parents and that the conflict is isolated to them alone. The infant's right brain specializes in detecting negative emotions. Further, research shows that intense stress interferes with parenting infants. Mothers become less sensitive as caregivers, more autocratic, and less able to pick up subtle infant emotional communications. If they become so overwhelmed that they cannot regulate their own stress state, they cannot act as a regulator of their baby's state. This is also going to interfere with a mother's ability to be in play states with the baby. Chronic stress is not good for anyone, and certainly not for an infant's immature brain. As I said earlier, it may lead to relational withdrawal and later psychopathology.

McIntosh: Sometimes the dilemma comes up about granting regular contact to a parent who has perpetrated domestic violence. The argument may run that the parent was not violent to the child; the parent was "only" violent to the other parent. I am guessing you will be able to tell us about the fallacy in that idea.

Schore: Yes. In the 1990s the major theoretical model about how violence negatively impacts the developing child's mind was that the child witnessed violence. This usually meant that the child observed the father's physical violence or verbal abuse of the mother. There is no doubt that this occurs and that this frightening experience would significantly increase the stress level of the child. However, my work and that of others is looking at a more direct mechanism: relational trauma, and the effect of abuse and neglect from the primary caregiver on the baby.

There is now good evidence that shows neglect has an even more negative effect on brain development than abuse. The child is in a great state of danger when the threat, neglectful or abusive, comes from the haven of safety, the primary caregiver. We know that massive increases in stress hormones have a detrimental effect on brain development. This represents the psychobiological intergenerational transmission of a predisposition to violence. There is also good evidence to show that the male brain is more vulnerable to this dynamic than the female brain because the male brain matures more slowly than the female brain.

McIntosh: So when the attachment figure is chronically stressed, the baby's ability to regulate stress is directly affected. Let's talk about the difference between stress and distress. When does conflict between parents become pathogenic for a young child?

Schore: The idea that stress is a bad thing and that all infants should be protected from stress is not the case. Essentially, within their attachment relationships, the infant is learning how to cope with stress through rupture-and-repair interactions with the primary caregiver. The problem is not stress per se, but misattunement to the baby's stress and a lack of repair. Negative emotions are not pathological: unrepaid and dysregulated negative emotions are. Parental abuse and/or neglect induces chronic stress in infants, and these conditions are clearly pathogenic. So the infant is responsive not only to the conflict, but to the deficit in care, because the caregivers do not know how to or cannot focus on and repair their infant's distress. These relational factors are even more important in the case of high risk (such as low birth weight) infants.

Family law should understand that the stress tolerance level of young children is limited. The key is not just the intensity of the stress, but due to the lack of parental interactive repair, the duration of the stress. The unregulated aspects of chronic stress are beyond what an immature infant brain can

cope with, and ultimately they have a negative impact on the wiring of the developing brain. Very high levels of stress alter brain neurochemistry via high levels of cortisol, causing a later inability of cortical areas of the right brain to regulate overwhelming emotional states, generated subcortically.

IMPLICATIONS FOR FAMILY LAW PRACTICES AND PRIORITIES

Schore: Practitioners in family law are not uncommonly in a position where they have to make Solomonian decisions about the current and future welfare of infants. Evaluations of individual cases need to be informed by recent advances in our understanding of the infant's developing brain/mind/body. This entails input from professionals in infant mental health, who can evaluate attachment dynamics, emotional communication in stress states and in play states, and affect regulation, as well as interpersonal neurobiology and brain development. The key is evaluating the relationship, and especially in the first year, the relationship with the primary caregiver.

McIntosh: Family law also has an opportunity to support troubled early attachment relationships, particularly those damaged when a parent has been chronically overwhelmed or traumatized.

Schore: Right. Although the infant is extremely susceptible in critical periods, there is also tremendous plasticity in the 1st year, which makes the baby very responsive to the right kind of repair. There are now effective mother-infant psychotherapy programs that focus on attachment. The goal is to enable the pair to synchronize with each other, to get the attachment system back on track developmentally, and to co-create a relational environment that optimizes brain development. When that child is older, it may take much longer to psychotherapeutically undo pathological attachment histories. Better to prevent later problems in the first place.

McIntosh: Would you advocate for a family court system that prioritizes prevention, via protection of that first attachment bond?

Schore: That is exactly the direction the mental health professions are moving into right now.

McIntosh: I wonder what this means for a set of principles for safeguarding a child's development in high-conflict divorce situations. If developmental security was our goal, what is it that family law and its systems should be aspiring to?

Schore: Over the course of this conversation I've tried to briefly outline what science now sees as the essential mechanisms of human development. It is not a neat list of principles, but a perspective grounded in attachment, emotion, and interpersonal neurobiology. When the attachment relationship within the marriage or relationship fails in the first years of an infant's life, the central questions would be:

- Who can best fill the crucial role of *predictable, consistent, and emotionally available* primary caregiver?
- Who can be intuitively sensitive to the child's emotional needs that are communicated in a nonverbal way?
- Who can act as a psychobiological regulator of the infant's emotional states? What types of emotional experiences provided by each parent will optimize the experience-dependent maturation of the right brain?
- At what points in time are these different experiences needed?
- Can the parents negotiate a solution that is in the best interest of the child's hard-wired brain development—that is, directed towards who the child is now and who the child will become?
- If not, can the court help the parents negotiate such a situation via a mandated referral to psychotherapy?
- Are there certain experiences which this child will be exposed to in a care arrangement which are so negative to development that it would be better to withdraw the child out of that context?

McIntosh: I appreciate what you've said: it is complex, and we cannot have a fixed set of rules. But the neuroscience now underpinning attachment theory gives some clear guidelines.

Schore: Because of the explosion in developmental psychology and brain research we now have important information about human infancy that bears on the critical matters the family court addresses. The court needs a greater understanding of the needs of all developing infants, as well as an appreciation of the unique relational context of each case. The developing baby is not a cognitive machine, but an emotional being with a developing mind. Remember, there is a wide range of variations in infant temperaments, so there is no “one model fits all” solution.

Parental conflicts represent a clash of narcissisms. Frequently what is best for each of the adult parents is at odds with what optimizes the infant’s development. Both adults are using verbal systems and power dynamics, but infants have neither. Even though infants cannot verbally articulate their needs, they can communicate them to someone who can read these nonverbal communications. The question is, in the family law system, who can give voice to the young child? Can divorce mediators, the court and its advisors understand and protect the essential needs that all humans have at the very beginning of life?

McIntosh: Professor Allan Schore, I appreciate your candor. Thank you for your generous insights.

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