prefrontal limbic cortex, more than any other part of the cerebral cortex, retains the plastic capacities of early development. The orbitofrontal cortex, even in adulthood, continues to express anatomical and biochemical features observed in ontogeny, and this accounts for its great plasticity and involvement in learning, memory, and cognitive-emotional interactions (Barbas, 1995). Such findings suggest that this particular system, with its capacity for utilizing and directing the psychobiological expression of learning encoded within the limbic system (Rossi, 1993), is a critical site of the psychic structural changes that are a product of a long-term, growth-facilitating psychotherapeutic relationship.
early speculations. Indeed, in the very first paragraph of Attachment, Bowlby began his work with specific reference to Freud's fundamental goal of understanding early development. In his opening passage, he contrasted Freud's methodology for generating developmental hypotheses—analyzing the dreams and symptoms of adult neurotic patients and the behavior of primitive peoples—to his own, and stated, "Although in his search for explanation [Freud] was in each case led to events of early childhood, he himself only rarely drew for his basic data on direct observation of children" (1969a, p. 3). Expanding this latter theme is the focus of the book, yet in the final chapter he returned to a summary of developmental psychoanalytic concepts with a chapter titled, "The Child's Tie to His Mother: A Review of the Psychoanalytic Literature."

In this lecture I want to present some recent interdisciplinary advances that are forging tighter links between the common goals of classical psychoanalysis and attachment theory. It may appear surprising that the new developments that are recoupling Freud and Bowlby come from neuroscience. Yet this information bears upon a shared interest of the two most important contributors to a theory of the development of the early mind, specifically, an interest in internal psychic structure and how it is influenced by early relational interactions.

At the very outset of his first chapter, Bowlby (1969b) quoted Freud's (1915/1957d) final paragraph of Repression: "We must select first one and then another point of view, and follow it up through the material as long as the application of it seems to yield results." In ongoing writings I am presenting, from a psychoneurobiological point of view, a specification of the structural systems of the developing unconscious in terms of recent brain research. This work on "the origin of the self" (a phrase I deliberately used to evoke an echo of Darwin's phylogenetic speculations on "the origin of species") attempts to document the ontogenetic evolution of the neurobiology of subjectivity and intersubjectivity, which I equate with specifically the experience-dependent self-organization of the early-developing right hemisphere. In a 1997 article in the Journal of the American Psychoanalytic Association and another in 1999 in Neuro-Psychoanalysis, I suggested that the structural development of the right hemisphere mediates the functional development of the unconscious mind. And this year, in Attachment and Human Development, I offer further evidence to demonstrate that the right hemisphere is the repository of Bowlby's unconscious internal working models of the attachment relationship (Henry, 1993; Schore, 1994, 2000a; Siegel, 1999).

Taking this even further, in the following I want to suggest that an integration of current findings in the neurobiological and developmental sciences can offer a deeper understanding of the origins and dynamic mechanisms of the system that represents the core of psychoanalysis, the system unconscious. Psychoanalysis has been called the scientific study of the unconscious mind (Brenner, 1980), clearly implying both that the unconscious is its definitional realm of study and that this realm is accessible to scientific analysis. This has been so from its very inception. Although Freud was well aware of Darwin's groundbreaking biological concepts, the major science that influenced his thinking was neurology (Schore, 1997a). Despite the fact that he failed to produce "a psychology which shall be a natural science" in the Project for a Scientific Psychology (1895/1966), Freud transplanted its germinal hypotheses concerning the regulatory structures and dynamics of the system unconscious in the seventh chapter of his masterwork, The Interpretation of Dreams (1900/1953b).

As you remember, Freud predicted that there would someday be a rapprochement between psychoanalysis and neurobiology. A number of current rapidly expanding trends indicate that this convergence with the other sciences is now underway. Indeed, in this last year we have seen the appearance of a new journal, Neuro-Psychoanalysis, with a dual editorial board composed of psychoanalysts and neuroscientists. The first issue centers on Freud's theory of affect, and in that journal 1 (1999a) presented evidence from both domains of science, the study of the brain and the study of the mind, to argue that the early developing right brain (or, as Ornstein [1997] called it, "the right mind") is the neurobiological substrate of Freud's system unconscious. Freud, of course, deduced that the unconscious system appears very early in life, well before verbal conscious functions. A body of research now indicates that the right hemisphere is dominant in human infancy, and indeed, for the first 3 years of life (Chiron et al., 1997).

Freud (1916–1917/1961 & 1963) described the unconscious as "a special realm, with its own desires and modes of expression and peculiar mental mechanisms not elsewhere operative." Due to its central role in unconscious functions and primary process activities, psychoanalysis has been intrigued with the unique operations of the early developing right brain for the last quarter of a century. In the 1970s, Calin (1974), Hoppe (1977), Stone (1977), and McLaughlin (1978), stimulated by the split-brain studies of the time, began to link up psychoanalysis and neurobiology by positing that the right hemisphere is dominant for unconscious and the left for conscious processes.

The relevance of hemispheric specialization to psychoanalysis continued in the work of Miller (1991), Levin (1991), and particularly Watt (1990), who offered data to show that the right hemisphere contains an affective-configuration representational system, one that encodes self-and-object images, while the left utilizes a lexical-semantic mode. In fact, current neurobiological studies are revealing greater right than left hemispheric involvement in the unconscious processing of affect-evoking stimuli (Wexer, Warrenburg, Schwartz, & Janer, 1992). Most intriguingly, a neuroimaging study by Morris, Ohman, and Dolan (1998) demonstrated that unconscious processing of emotional stimuli is specifically associated with activation of the right and not left hemisphere, and the reporter in the journal Science described this finding as indicating that "the left side is involved with conscious response and the right with the unconscious mind" (Mlot, 1998, p. 1006).
In an updated description of the unconscious, Winson concluded, “Rather than being a cauldron of untamed passions and destructive wishes, I propose that the unconscious is a cohesive, continually active mental structure that takes note of life’s experiences and reacts according to its scheme of interpretation” (1990, p. 96). Notice his use of the term structure. Although psychoanalysis has used this term to describe internal cognitive processes such as representations and defenses, and content such as conflicts and fantasies, I suggest that structure refers to those specific brain systems, particularly right-brain systems, that underlie these various mental functions. In other words, the internal psychic systems involved in processing information at levels beneath awareness, described by Freud in his topographic (1900/1953b) and structural (1923/1961b) models, can now be identified by neuroscience.

A common ground of psychoanalysis, neurobiology, and psychology is an emphasis on the centrality of early development. In 1913 Freud proclaimed, from the very first, psychoanalysis was directed towards tracing developmental processes. It . . . was led . . . to construct a genetic psychology” (1913/1958c, p. 182–183). Continuing this tradition, I would argue that the most significant psychoanalytic contribution to our understanding of developmental processes has, indeed, Bowlby (Scorre, 2000a, 2000c). As mentioned earlier, in Attachment he applied then-current biology to a psychoanalytic understanding of infant–mother bonding, and in so doing offered his “Project,” an attempt to produce a natural science of developmental psychology. This volume focused upon one of the major questions of science, specifically, how and why do certain early ontogenetic events have such an inordinate effect on everything that follows? Bowlby’s scientifically informed curiosity about this question envisioned the center stage of human infancy, on which is played the first chapter of the human drama, to be a context in which a mother and her infant experience connections and disconnections of their vital emotional communications.

Because these communications are occurring in the period of the brain growth spurt that continues through the second year of life (Dobbing & Sands, 1973), attachment transactions mediate “the social construction of the human brain” (Eisenberg, 1995), specifically the social emotional brain that supports the unique operations of the “right mind.” Attachment is thus inextricably linked to developmental neuroscience. Stern wrote, “Today it seems incredible that until Bowlby no one placed attachment at the center of human development” (2000, p. xiii). I suggest that the great advances in our knowledge of early development have been the engine that has transformed contemporary psychoanalysis, which according to Cooper is “anchored in its scientific base in developmental psychology and in the biology of attachment and affects” (1987, p. 83).

In 1920, Freud proclaimed that “the unconscious is the infantile mental life” (1920/1955; italics added). This fundamental tenet is directly relevant to the topic of today’s Bowlby Memorial Conference, Minds in the Making, and suggests that what particularly interests us here are unconscious minds in the making. We now know that an infant functions in a fundamentally unconscious way, and unconscious processes in an older child or adult can be traced back to the primitive functioning of the infant. Knowledge of how the maturation of the right brain, “the right mind,” is directly influenced by the attachment relationship offers us a chance to more deeply understand not just the contents of the unconscious, but its origin, structure, and dynamics.

In Affect Regulation and the Origin of the Self (1994), I described a number of psychoneurobiological mechanisms by which attachment experiences specifically impact the experience-dependent maturation of the right hemisphere. In a continuation of this work, (Scorre, 2000a), I offered an overview of Bowlby’s classic volume and argued that attachment theory is fundamentally a regulatory theory. In the following talk I wish to offer some ideas about the psychobiological regulatory events that mediate the attachment process, and the psychoneurobiological regulatory mechanisms by which “the right mind” organizes in infancy.

In the latter part of this lecture I will suggest that regulation theory describes the mechanisms by which the patient forms an attachment, that is, a working alliance with the therapist. This construct—created to define the subtle, interactive dynamic relationship between patient and therapist—is the most important conceptualization of the common elements of the different therapy modalities (Horvath & Greenberg, 1994; Safran & Muran, 2000). Bradley (2000) pointed out that all psychotherapies—psychodynamic, cognitive-behavioral, experiential, and interactional—show a similarity in promoting affect regulation.

In other words, this information about attachment, regulation, and the emotion-processing right brain is describing the “nonspecific factors” that are common to all forms of clinical treatment, factors particularly accessed in developmentally oriented psychoanalytic psychotherapy (Scorre, 2000b). The major contribution of attachment theory to clinical models is thus its elucidation of the nonconscious dyadic affect transacting mechanisms that mediate a positive therapeutic working alliance between the patient and the empathic therapist. Complementing this, the neurobiological aspects of attachment theory allow for a deeper understanding of how an affect-focused developmentally oriented treatment can alter internal structure within the patient’s brain/mind/body systems. (Throughout the following, the term psychoanalyst is equated with psychoanalytically oriented psychotherapist).

THE NEUROBIOLOGY OF A SECURE ATTACHMENT

The essential task of the first year of human life is the creation of a secure attachment bond between the infant and primary caregiver. Indeed, as soon as the child is born it uses its maturing sensory capacities, especially smell, taste, and touch, to interact with the social environment. But at 2 months a developmental milestone occurs in the infant brain; specifically, the onset of a critical
period in the maturation of the occipital cortex (Yamada et al., 2000). This allows for a dramatic progression of its social and emotional capacities. In particular, the mother's emotionally expressive face is, by far, the most potent visual stimulus in the infant's environment, and the child's intense interest in her face, especially in her eyes, leads him/her to track it in space, and to engage in periods of intense mutual gaze. The infant's gaze, in turn, reliably evokes the mother's gaze, thereby acting as a potent interpersonal channel for the transmission of "reciprocal mutual influences." It has been observed that the pupil of the eye acts as a nonverbal communication device (Hess, 1975a) and that large pupils in the infant release caregiver behavior (Figure 2.1).

According to Feldman, Greenbaum, and Yirmiya (1999):

Face-to-face interactions, emerging at approximately 2 months of age, are highly arousing, affect-laden, short interpersonal events that expose infants to high levels of cognitive and social information. To regulate the high positive arousal, mothers and infants... synchronize the intensity of their affective behavior within lags of split seconds." (p. 223, italics added)

In this process of affect synchrony, the intuitive (Papousek & Papousek, 1995) mother initially attunes to and resonates with the infant's resting state, but as this state is dynamically activated (or deactivated or hyperactivated) she fine tunes and corrects the intensity and duration of her affective stimulation in order to maintain the child's positive affective state. As a result of this moment-by-moment state matching, both partners increase together their degree of engagement. The fact that the coordination of responses is so rapid suggests the existence of a bond of unconscious communication.

In this interpersonal context of "contingent responsivity" the more the mother tunes her activity level to the infant during periods of social engagement, the more she allows him/her to recover quietly in periods of disengagement, and the more she contingently responds to his/her signals for reengagement, the more synchronized their interaction becomes. Lester, Hoffman, and Brazelton (1985, p. 24) stated that "synchrony develops as a consequence of each partner's learning the rhythmic structure of the other and modifying his or her behavior to fit that structure." The primary caregiver thus facilitates the infant's information processing by adjusting the mode, amount, variability, and timing of stimulation to its actual temperamental-physiological abilities. These mutually attuned synchronized interactions are fundamental to the ongoing affective development of the infant.

Reciprocal facial signalling thus represents an open channel of social communication, and this interactive matrix promotes the outward expression of internal affects in infants. In order to enter into this communication, the mother must be psychobiologically attuned not so much to the child's overt behavior as to the reflections of his/her internal state. In light of the fact that misattunements are a common developmental phenomena, she also must modulate nonoptimal high levels of stimulation that would trigger hyperarousal, or low levels that engender hypoarousal in the infant.

Most importantly, the arousal-regulating primary caregiver must participate in interactive repair to regulate interactively induced stress states in the infant. If attachment is interactive synchrony, stress is defined as an asynchrony in an interactional sequence, and, following this, a period of reestablished synchrony allows for stress recovery. In this reattachment pattern of "disruption and repair" the "good-enough" caregiver who induces a stress response in her infant through a misattunement, self-corrects and in a timely fashion reinvokes her psychobiologically attuned regulation of the infant's negative affect state that she has triggered. The key to this is the caregiver's capacity to monitor and regulate her own affect, especially negative affect.

These regulatory processes are precursors of psychological attachment and its associated emotions. An essential attachment function is "to promote the synchrony or regulation of biological and behavioral systems on an organismic level" (Reiss & Capistrano, 1985, p. 235). Indeed, psychobiological attunement, interactive resonance, and the mutual synchronization and entrainment of physiological rhythms are fundamental processes that mediates attachment bond formation, and attachment can be defined as the interactive regulation of biological synchronicity between organisms. (Schore, 1994, 2000a, 2000b, 2000h, 2001c)

To put this another way, in forming an attachment bond of somatically expressed emotional communications, the mother is synchronizing and resonating with the rhythms of the infant's dynamic internal states and then regulating the arousal level of these negative and positive states. Attachment is thus the dyadic (interactive) regulation of emotion (Sroufe, 1996). The baby becomes
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attached to the psychobiologically attuned regulating primary caregiver who not only minimizes negative affect but also maximizes opportunities for positive affect. Attachment is not just the reestablishment of security after a dysregulating experience and a stressful negative state; it is also the interactive amplification of positive affects, as in play states. Regulated interactions with a familiar, predictable primary caregiver create not only a sense of safety, but also a positively charged curiosity that fuels the burgeoning self's exploration of novel socioemotional and physical environments.

Furthermore, attachment is more than overt behavior, it is internal, "being built into the nervous system, in the course and as a result of the baby's experience of his transactions with the mother" (Ainsworth, 1967, p. 429). Next question: In this transfer of affect between mother and infant, what do we know of the processes whereby the primary object relations become internalized and transformed into psychic structure? The work of Trevarthen on maternal-infant protoconversations bears directly on this problem. He noted, "The intrinsic regulators of human brain growth in a child are specifically adapted to be coupled, by emotional communication, to the regulators of adult brains" (1990, p. 357). In these transactions, the resonance of the dyad ultimately permits the intercommunication of positive affective brain states. Trevarthen's work underscored the fundamental principle that the baby's brain is not only affected by these transactions, its growth requires brain-brain interaction and occurs in the context of an intimate positive affective relationship. These findings support Ende's assertion that "it is the emotional availability of the caregiver in intimacy which seems to be the most central growth-promoting feature of the early caring experience" (1988, p. 32).

There is consensus that interactions with the environment during sensitive periods are necessary for the brain as a whole to mature. But we know that different regions of the brain mature at different times. Can we tell which specific parts of the growing brain are affected by these emotion-transacting events? It has been observed that: "The emotional experience of the infant develops through the sounds, images, and pictures that constitute much of an infant's early learning experience, and are disproportionately stored or processed in the right hemisphere during the formative stages of brain ontogeny" (Sennelager & Hynd, 1989, p. 198). A body of evidence shows that the right hemisphere matures before the left, a finding in line with Freud's assertion that primary process ontogenetically precedes secondary process functions.

The learning mechanism of attachment, imprinting, is defined as synchrony between sequential infant maternal stimuli and behavior (Petrovich & Gewirtz, 1985). I suggest that in these affectively synchronized, psychobiologically attuned face-to-face interactions the infant's right hemisphere, which is dominant for the infant's recognition of the maternal face and for the perception of vocal and facial affective expressions, visual emotional information, and the prosody of the mother's voice, is focusing her attention on and therefore regulated by the output of the mother's right hemisphere, which is dominant for nonverbal communication, the processing and expression of facially and prosodically expressed emotional information, and the maternal capacity to comfort the infant. In support of this, Ryan and his colleagues, using electroencephalogram (EEG) and neuroimaging data, reported that "the positive emotional exchange resulting from autonomy-supportive parenting involves participation of right hemispheric cortical and subcortical systems that participate in global, tonic emotional modulation" (1997, p. 719).

There are clear experimental and theoretical indications that this emotional exchange also effects the development of the infant's consciousness (another factor primary to the theme here of "minds in the making"). Tronick and his colleagues described how microregulatory social-emotional processes of communication generate intersubjective states of consciousness in the infant-mother dyad. In such there is "a mutual mapping of (some of) the elements of each interactant's state of consciousness into each of their brains" (Tronick & Weinberg, 1997, p. 75). Tronick and his team (1998) argued that the infant's self-organizing system, when coupled with the mother's, allows for a brain organization that can be expanded into more coherent and complex states of consciousness. I suggest that Tronick was describing an expansion of what the neuroscientist Edelman (1989) called primary consciousness, which relates visceral and emotional information pertaining to the biological self to stored information processing pertaining to outside reality. Edelman lateralized primary consciousness to the right brain.

Thus, regulation theory suggests that attachment is, in essence, the right-brain regulation of biological synchronicity between organisms. Feldman and colleagues published a study entitled "Mother-Infant Affect Synchrony as an Antecedent of the Emergence of Self-Control" (1999, italics added). At the same time, Garavan, Ross, and Stein (1999) reported on a functional magnetic resonance imaging (fMRI) study, "Right Hemispheric Dominance of Inhibitory Control" (italics added). These data bear upon Bowlby's (1969) assertion, 30 years ago, that attachment behavior is organized and regulated by means of a "control system" within the central nervous system.

MATURATION OF AN ORBITOFRONTAL REGULATORY SYSTEM

Bowlby hypothesized that the maturation of the attachment control system is open to influence by the particular environment in which development occurs. Current neurobiological studies show that the mature orbitofrontal cortex acts in "the highest level of control of behavior, especially in relation to emotion" (Price, Carmichael, & Drevets, 1996, p. 523) and plays "a particularly prominent role in the emotional modulation of experience" (Mesulam, 1998, p. 1035). The orbitofrontal regions are not functional at birth. Over the course of the first year, limbic circuitries emerge in a sequential progression, from amygdala to anterior cingulate to insula and finally to orbitofrontal (Schore,
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And so, as a result of attachment experiences, this system enters a critical period of maturation in the last quarter of the first year, the same time that working models of attachment are first measured.

The orbital prefrontal cortex is positioned as a convergence zone where the cortex and subcortex meet. It is the only cortical structure with direct connections to the hypothalamus, the amygdala, and the reticular formation in the brain stem that regulates arousal, and through these connections it can modulate instinctual behavior and internal drives. But because it contains neurons that process face and voice information, this system is also capable of appraising changes in the external environment, especially the social, object-related environment. Due to its unique connections, at the orbitofrontal level cortically processed information concerning the external environment (e.g., visual and auditory stimuli emanating from the emotional face or object) is integrated with subcortically processed information regarding the internal visceral environment (e.g., concurrent changes in the emotional or bodily self state). In this manner, the (right) orbitofrontal cortex and its connections function in the "integration of adaptive bodily responses with ongoing emotional and attentional states of the organism" (Critchley, Elliot, et al., 2000, p. 3033).

The orbitofrontal system is now described as "a nodal cortical region that is important in assembling and monitoring relevant past and current experiences, including their affective and social values" (Cavada, Company, Tejedor, Cruz-Rizzolo, & Reinoso-Suarez, 2000, p. 238). In a recent entire issue of the journal Cerebral Cortex on "The Mysterious Orbitofrontal Cortex," the editors concluded, "[T]he orbitofrontal cortex is involved in critical human functions, such as social adjustment and the control of mood, drive and responsibility, traits that are crucial in defining the "personality" of an individual" (Cavada & Schultz, 2000, p. 205).

This frontolimbic network is situated at the hierarchical apex of an "anterior limbic prefrontal network" interconnecting the orbitofrontal and medial prefrontal cortex with the temporal pole, cingulate, and amygdala. This cortical-subcortical limbic network is involved in "affective responses to events and in the mnemonic processing and storage of these responses" (Carmichael & Price, 1995, p. 639). The limbic system is thought to be centrally implicated in the implicit processing of facial expressions without conscious awareness (Critchley, Dalg, et al., 2000), in the capacity to "adapt to a rapidly changing environment," and in "the organization of new learning" (Mesulam, 1998, p. 1028). Current findings thus support Bowlby's (1969a) and Andersen's and Zeanan's (1984) speculation that the limbic system is the site of developmental changes associated with the rise of attachment behaviors. Indeed, it is held that "The integrity of the orbitofrontal cortex," the highest level of the limbic system, is "necessary for acquiring very specific forms of knowledge for regulating interpersonal and social behavior" (Dolan, 1999, p. 928).

The orbitofrontal system, the "Senior Executive" of the social-emotional brain, is especially expanded in the right cortex (Falk et al., 1990), and in its role as an executive of limbic arousal it comes to act in the capacity of an executive control function for the entire right brain. This hemisphere, which is dominant for unconscious processes, performs, on a moment-to-moment basis, a "valence tagging" function, in which perceptions receive a positive or negative affective charge, in accord, as Freud speculated, with a calibration of degrees of pleasure-unpleasure. Recent studies have shown that the right hemisphere is faster than the left in performing valence-dependent, automatic, preattentive appraisals of emotional facial expressions (Pizzagalli, Regard, & Lehmenn, 1999). It also contains a "nonverbal affect lexicon," a vocabulary for nonverbal affective signals such as facial expressions, gestures, and vocal tone or prosody (Bowers, Bauer, & Heilman, 1993; Snow, 2000), a finding directly relevant to Bowlby's (1969a, p. 120) speculation that in intimate settings human feelings are detected through "facial expressions, posture, tone of voice, physiological changes, tempo of movement, and incipient action."

The right hemisphere is, more so than the left, deeply connected into not only the limbic system but also both the sympathetic and parasympathetic branches of the autonomic nervous system (ANS) that are responsible for the
somatic expressions of all emotional states. For this reason, the right hemisphere is dominant for a sense of corporeal and emotional self (Devinsky, 2000; Schore, 1994). Indeed, the representation of visceral and somatic states and the processing of "self-related material" (Keenan et al., 1999) are under primary control of the "nondominant" hemisphere. The ANS has been called the "physiological bottom of the mind" (Jackson, 1931).

The connections of the highest centers of the limbic system into the hypothalamus (the head ganglion of the ANS and anatomical locus of drive centers) supports Freud's idea about the central role of drive in the system unconscious. The fact that the right hemisphere contains "the most comprehensive and integrated map of the body state available to the brain" (Damasio, 1994, p. 66) indicates that Freud's (1915/1957a) definition of "drive" as "the psychic representative of the stimuli originating from the organism and reaching the mind" may be more properly characterized as reaching the "right mind" (Onstein, 1997). It may also elucidate Freud's remark to Groddeck: "The unconscious is the proper mediator between the somatic and the mental, perhaps the long-sought 'missing link'" (Groddeck, 1977, p. 38).

For the rest of the lifespan, the right brain plays a superior role in the regulation of fundamental physiological and endocrinological functions whose primary control centers are located in subcortical regions of the brain. Because the hypothalamic-pituitary-adrenocortical axis and the sympathetic-adrenal medullary axis are both under the main control of the right cerebral cortex, this hemisphere contains "a unique response system preparing the organism to deal efficiently with external challenges" (Wittlinger, 1997, p. 55), and thus its adaptive functions mediate the human stress response. It therefore is centrally involved in the vital functions that support survival and enable the organism to cope actively and passively with stress (Sullivan & Gratton, 1999; Schore, 2001b). In support of Bowlby's speculation that the infant's "capacity to cope with stress" is correlated with certain maternal behaviors (1969a, p. 344), the attachment relationship directly shapes the maturation of the infant's right-brain stress-coping systems that act at levels beneath awareness.

The right hemisphere contributes to the development of reciprocal interactions within the mother-child regulatory system and mediates the capacity for biological synchronicity, the regulatory mechanism of attachment. Due to its role in regulating biological synchronically between organisms, the activity of this hemisphere is instrumental to the empathic perception of the emotional states of other human beings (Schore, 1994, 1996, 1997c, 1998a, 1998b, 1998d, 1998g, 2002b). According to Adolphs and colleagues, "Recognizing emotions from visually presented facial expressions requires right somatosensory cortices" and in this manner "we recognize another individual's emotional state by internally generating somatosensory representations that simulate how the individual would feel when displaying a certain facial expression" (2000, p. 2683). The interactive regulation of right brain attachment biology is thus the substrate of empathy.

The right brain stores an internal working model of the attachment relationship that encodes strategies of affect regulation that maintain basic regulation and positive affect even in the face of environmental challenge (Schore, 1994). Because the right hemisphere is centrally involved in unconscious processes and in "implicit learning" (Hugdahl, 1995), this unconscious model is stored in right-cerebral implicit-procedural memory. Neuropsychological studies now also reveal that the right hemisphere, "the right mind," and not the later forming verbal-linguistic left, is the substrate of affectively laden autobiographical memory (Fink et al., 1996).

Psychobiological models refer to representations of the infant's affective dialogue with the mother that can be accessed to regulate its affective state (Polan & Hofer, 1999). The orbitofrontal area is particularly involved in situations in which internally generated affective representations play a critical role (Zald & Kim, 1996). Because this system is responsible for "cognitive-emotional interactions" (Barbas, 1995), it generates internal working models. These mental representations, according to Main, Kaplan, and Cassidy (1985), contain cognitive as well as affective components and act to guide appraisals of experience. Recent findings—that the orbitofrontal cortex generates unconscious biases that guide behavior before conscious knowledge does (Bechara, Damasio, Tranel, & Damasio, 1997), codes the likely significance of future behavioral options (Dolan, 1999), and represents an important site of contact between emotional information and mechanisms of action selection (Rolls, 1996)—are consonant with Bowlby's (1981) assertion that unconscious internal working models are used as guides for future action.

According to Fonagy and Target (1997), an important outcome of a secure attachment is a reflective function, a mental operation that enables the perception of another's state. Brothers (1995, 1997) described a limbic circuit of orbitofrontal cortex, anterior cingulate gyrus, amygdala, and temporal pole that functions as a social "editor" that is "specialized for processing others' social intentions" by appraising "significant gestures and expressions" (Brothers, 1997, p. 27) and "encourages the rest of the brain to report on features of the social environment" (p. 15). The editor acts as a unitary system "specialized for responding to social signals of all kinds, a system that would ultimately construe representations of the mind" (p. 27). Neuropsychological studies have indicated that the orbitofrontal cortex is "particularly involved in theory of mind tasks with an affective component" (Stone, Baron-Cohen, & Knight, 1998, p. 651) and in empathy (Eislinger, 1998).

As previously mentioned, the orbitofrontal control system plays an essential role in the regulation of emotion. This frontal system provides a high-level coding that flexibly coordinates exteroceptive and interoceptive domains and functions to correct responses as social conditions change; processes feedback information; and thereby monitors, adjusts, and corrects emotional responses and modulates the motivational control of goal-directed behavior. It thus acts as a recovery mechanism that efficiently monitors and regulates the
duration, frequency, and intensity of not only positive but negative affect states. Damasio has emphasized that developmental neurological damage of this system in the first 2 years leads to abnormal development of social and moral behaviors (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999).

The orbital cortex matures in the middle of the second year, a time when the average child has a productive vocabulary of less than 70 words. The core of the self is thus nonverbal and unconscious, and it lies in patterns of affect regulation. This structural development allows for an internal sense of security and resilience that comes from the intuitive knowledge that one can regulate the flows and shifts of one's bodily based emotional states either by one's own coping capacities or within a relationship with caring others. In developmental neurobiological studies, Ryan, Kuhl, and Ceci (1997) concluded that the operation of the right prefrontal cortex is integral to autonomous regulation, and that the activation of this system facilitates increases in positive affect in response to optimally challenging or personally meaningful situations, or decreases in negative affect in response to stressful events. Confirming earlier proposals for a central role of the right orbitofrontal areas in essential self-functions (Schore, 1994, 1996), current neuroimaging studies now demonstrate that the processing of self occurs within the right prefrontal cortices (Keenan et al., 2000), and that the self-concept is represented in right frontal areas (Craig et al., 1999).

The functioning of the "self-correcting" orbitofrontal system is central to self-regulation, the ability to flexibly regulate emotional states through interactions with other humans (interactive regulation in interconnected contexts via a two-person psychology) and without other humans (autoregulation in autonomous contexts via a one-person psychology). The adaptive capacity to shift between these dual regulatory modes, depending upon the social context, emerges out of a history of secure attachment interactions of a maturing biological organism and an early attuned social environment. The essential aspect of this function is highlighted by Westen (1997, p. 542) who asserted that "The attempt to regulate affect—to minimize unpleasant feelings and to maximize pleasant ones—is the driving force in human motivation."

THE RIGHT HEMISPHERE, ATTACHMENT THEORY, AND THE EMPATHIC RECEPTION OF UNCONSCIOUS EMOTIONAL COMMUNICATIONS

Earlier I described an optimal developmental scenario, one that facilitates the experience-dependent growth of an efficient regulatory system in the right hemisphere that supports functions associated with a secure attachment. On the other hand, growth-inhibiting environments negatively impact the ontogeny of self-regulatory prefrontal systems and generate attachment disorders, and such early disturbances of personality formation are mechanisms for the transmission of psychopathology. Recall Bowlby's well-known prediction that "in the fields of etiology and psychopathology [attachment theory] can be used to frame specific hypotheses which relate different family experiences to different forms of psychiatric disorder and also, possibly, to the neurophysiological changes that accompany them" (1978). Very recent neuropsychiatric research demonstrates that reduced volume of prefrontal areas serves as an "endophenotypic marker of disposition to psychopathology" (Matsui, Gur, Turetsky, Yan, & Gur, 2000, p. 155).

In a number of works I have provided clinical and neurobiological evidence to show that various forms of attachment pathologies specifically represent inefficient patterns of organization of the right brain, especially the right orbitofrontal areas (Schore, 1994, 1996, 1997b; see 2001c for a theory of trauma). Yet all share a common deficit: Due to the impaired development of the right-cortical preconsciously system that decodes emotional stimuli by actual felt emotional responses to stimuli, individuals with poor attachment histories display empathy disorders, the limited capacity to perceive the emotional states of others. An inability to read facial expressions leads to a misattribution of emotional states and a misinterpretation of the intentions of others. Thus, there are impairments in the processing of socioemotional information.

In addition to this deficit in social cognition, the deficit in self-regulation is manifest in a limited capacity to modulate the intensity and duration of affects, especially biologically primitive affects like shame, rage, excitement, elation, disgust, panic-terror, and hopelessness-despair. Under stress such individuals experience not discrete and differentiated affects, but diffuse, undifferentiated, chaotic states accompanied by overwhelming somatic and visceral sensations. The poor capacity for what Fonagy and Target (1997) call "mentalization" leads to a restricted ability to reflect upon one's emotional states. Right-cortical dysfunction is specifically associated with alterations in body perception and disintegration of self-representation (Weinberg, 2000). Solms also described a mechanism by which disorganization of a damaged or developmentally deficient right hemisphere is associated with a "collapse of internalized representations of the external world" in which "the patient regresses from whole to part object relationships" (1996, p. 347), a hallmark of early forming personality disorders.

There is consensus that the psychotherapy of these "developmental arrests" is directed toward the mobilization of fundamental modes of development (Emde, 1990) and the completion of interrupted developmental processes (Gedo, 1979). This development is specifically emotional development. Recall Winnicott's dictum that the therapist must understand, at an intuitive level, specifically the emotional history of the patient: "In order to use the mutual experience one must have in one's bones a theory of the emotional development of the child and the relationship of the child to the environmental factors" (1971b, p. 3; italics added).

With patients, especially those manifesting early-forming attachment pathologies and therefore developmental disorders of self-regulation, the psychotherapeutic interaction functions as an attachment relationship. Recent models
suggest that affect dysregulation is a fundamental mechanism of all psychiatric disorders (Taylor, Bagby, & Parker, 1997), that all psychotherapies show a similarity in promoting affect regulation (Bradley, 2000), and that the goal of attachment-focused psychotherapy is the mutual regulation of affective homeostasis and the restructuring of interactive representations encoded in implicit-procedural memory (Amici et al., 1996) (see appendix for an outline of psychotherapy principles).

In 1913, Freud proclaimed, "It remains the first aim of treatment to attach him [the patient] to it [the process of analysis] and to the person of the doctor" (Freud, 1913/1958a, p. 139). What can current ideas about attachment as the dyadic regulation of emotion and research on the right brain tell us about this process? The direct relevance of developmental attachment studies to the psychotherapeutic process derives from the commonality of interactive right-brain-to-right-brain emotion-transacting mechanisms in the caregiver-infant attachment relationship and in the clinician-patient therapeutic relationship (Schore, 1994, 1997a, 1998d, 1999a, 2002b, 2002e). A number of authors have pointed out the direct parallels between the clinical attributes of an effective therapist and the parental characteristics of the psychobiologically attuned intuitive caregiver of a securely attached child (e.g., Dozier, Cuc, & Barnett, 1994; Holmes, 1997a; Sable, 2000; Schore, 1994).

Embedded in Freud's description of the aim of the treatment is the centrality of the concept of attachment to the operational definition of the therapeutic alliance. For a working alliance to be created, the therapist must be experienced as being in a state of vitalizing attunement to the patient; that is, the crescendo and decrescendo of the therapist's affective state must be in resonance with similar states of crescendos and decrescendos of the patient (Schore, 1994, 1997c). Studies of empathic processes between the "intuitive" attuned mother and her infant demonstrate that this affective synchrohny is entirely nonverbal and that resonance is not so much with his mental (cognitive) states as with his psychobiological (affective-bodily) states. Similarly, the intuitive empathetic therapist psychobiologically attunes to and resonates with the patient's shifting affective state, thereby co-creating with the patient a context in which the clinician can act as a regulator of the patient's physiology (Amici et al., 1996; Schore, 1994, 1997c).

The right-cortical hemisphere, which is centrally involved in attachment functions, is dominant for the perception of the emotional states of others, by a right-posterior-cortical mechanism involved in the perception of nonverbal expressions embedded in facial and prosodic stimuli (Schore, 1994, 1999a). It is also dominant for "subjective emotional experiences" (Witting & Roschmann, 1993; italics added) and for the detection of subjective objects (Atchley & Atchley, 1998; italics added). The interactive "transfer of affect" between the right brains of the members of the mother-infant and therapeutic dyads is thus best described as intersubjectivity. So, what can current developmental neuropsychological analysis tell us about psychotherapeutic intersubjectivity?

Minds in the Making

The right brain is centrally involved in unconscious activities, and just as the left brain communicates its states to other left brains via conscious linguistic behaviors, so the right nonverbally communicates its unconscious states to other right brains that are tuned to receive these communications. Freud asserted that "it is a very remarkable thing that the Ucs. of one human being can react upon that of another, without passing through the C's" (1915/1957d, p. 194; italics added). He also proposed that the therapist should "turn his own unconscious like a receptive organ towards the transmitting unconscious of the patient . . . so the doctor's unconscious is able . . . to reconstruct [the patient's] unconscious" (1912/1958b, p. 115). He called the state of receptive readiness "evenly suspended attention." Bion (1962b) referred to "rivering" or "dream state alpha," clearly implying a right-brain state. Indeed, Marcus wrote, "The analyst, by means of revery and intuition, listens with the right brain directly to the analysand's right brain" (1997, p. 238).

This same right brain-to-right-brain system was described in the neuropsychological literature by Buck (1994) as "spontaneous emotional communication":

Spontaneous communication employs species-specific expressive displays in the sender that, given attention, activate emotional preattentions and are directly perceived by the receiver. . . . The "meaning" of the display is known directly by the receiver. . . . This spontaneous emotional communication constitutes a conversation between limbic systems . . . . It is a biologically-based communication system that involves individual organisms directly with one another: the individuals in spontaneous communication constitute literally a biological unit. (p. 266; italics added)

Buck (1994) emphasized the importance of specifically the right limbic system, and localized this biologically based spontaneous emotional communication system to the right hemisphere, in accord with other research that indicates a right lateralization of spontaneous gestures (Blonder, Burns, Bowers, Moore, & Heilman, 1995) and emotional communication (Blonder, Bowers, & Heilman, 1991). Earlier, I pointed to Bowlby's (1969a) speculation that human feelings are recognized through facial expressions, posture, tone of voice, physiological changes, tempo of movement, and incipient action.

Indeed, this right brain process lies at the heart of the nonverbal relational communications between patient and therapist. Lyons-Ruth (2000), a member of Stern's Study Group (1998a, 1998b), described the centrality of the "recognition process" that occurs in the "ordinary moments of change in psychoanalytic treatment": "Most relational transactions rely heavily on a substrate of affective cues that give an evaluative valence or direction to each relational communication, and these communications are carried out at an implicit level of rapid cueing and response that occurs too rapidly for simultaneous verbal translation and conscious reflection." (Lyons-Ruth, 2000, pp. 91-92). Recall that the right
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in the regions around the eyes and from prosodic expressions from the mouth (Fridlund, 1991). Because the transference-countertransference is a reciprocal process, facially communicated "expressions of affect" that reflect changes in internal state are rapidly communicated and perceptually processed within the affectively synchronized therapeutic dialogue. This finding is relevant to the "reciprocal process," described by J. Munder Ross, in which the therapist has access to "the subliminal stimulation...that emanates from the patient" (1999, p. 95). In fact, these very same spontaneously communicated and nonconsciously perceived visual and auditory cues represent "the intrapsychic edge of the object world, the perceptual edge of the transference" (Smith, 1990, p. 225).

Only in a right hemispheric-dominant receptive state in which a private self is communicating with another "private self" can a self-self object system of spontaneous affective transference-countertransference communications be created. Fossat (1994), a self-psychoanalyst, noted that when the self object seeking dimension is in the foreground, the analyst must resonate at the deepest layers of his/her personality to be sufficiently available to the patient's developmental and self-regulatory needs. In other words, a state of resonance exists when the therapist's subjectivity is empathically attuned to the patient's inner state (one that may be unconscious to the patient), and this resonance then interactively amplifies, in both intensity and duration, the affective state in both members of the dyad. Sander (1992) stated that "moments of meeting" between patient and therapist occur when there are matched specificities between two systems in resonance, attuned to each other. Loewald (1986) described "resonances between the patient's and the analyst's unconscious."

Resonance phenomena are now thought to play one of the most important roles in brain organization and in central nervous system (CNS) regulatory processes (Schore, 2000c, 2002b). Although this principle is usually applied to the synchronization of processes within different parts of a whole brain, I have suggested that it also describes the resonance phenomena that occurs between the two right brains of the psychobiologically attuned mother-infant dyad. Thus, this also applies to the moments within the treatment process when right brains, two emotion-processing unconscious "right minds" within the therapeutic dyad, are communicating and in resonance. Kantrowitz suggested that "it is in the realm of preconscious communication that the interwoveness of intrapsychic and interpersonal phenomena becomes apparent," and emphasized the importance of "attunement and resonance." (1999, p. 72; italics added).

This leads to the following proposals: Empathic resonance results from dyadic attunement, and it induces a synchronization of patterns of activation of both right hemispheres of the therapeutic dyad. Misattunement is triggered by a mismatch, and describes a context of stressful desynchronization between and destabilization within their right brains. Interactive reattunement induces a resynchronization of their right brain states. These brain-state shifts occur primarily

The right hemisphere recognizes emotions from visually presented facial cues (Adolphs, Damasio, Tranel, Cooper, & Damasio, 2000), is specialized for "implicit learning" (Hugdahl, 1995), and performs rapid (80 msec) valence-dependent, automatic, appraisals of emotional facial expressions (Pizzagalli et al., 1999).

Furthermore, the right hemisphere uses an expansive attention mechanism that focuses on global features (while the left uses a restricted mode that focuses on local detail; Derryberry & Tucker, 1994), a characteristic that fits with Freud's "elected suspended attention." And, in contrast to the left-hemisphere's activation of "narrow semantic fields," the right hemisphere's "coarse semantic coding is useful for noting and integrating distorted related semantic information" (Beeman, 1998, p. 279), a function that allows for the process of free association. Bucci (1993) described free association as "following the tracks of onverbal schemata," by loosening the hold of the verbal system on the associative and expressive systems; that is, by shifting dominance from a left to right hemispheric state. In this manner, as Freud described, the clinician uses "the derivatives of the unconscious which are communicated to him to reconstruct the unconscious, which has determined the patient's free associations" (1912/1958, p. 116).

I have suggested that if Freud was describing how the unconscious can act as receptive organ, Klein's concept of projective identification (Schore, 2000g, 2002b) attempts to model how an unconscious system acts as a "transmitter," and how these transmissions will then influence the receptive functions of another unconscious mind. Klein proposed that although this primitive process communication between the unconscious of one person and the unconscious of another begins in early development, it continues throughout life.

These moments of right-brain-to-right-brain communication represent an alignment of what Zedddies (2000) called the "nonlinguistic dimension" of the "relational unconscious" of both the therapist and the patient.

There is a growing consensus that despite the existence of a number of different theoretical perspectives in psychoanalysis, the clinical concepts of transference (Wallenstein, 1990) and countertransference (Gabbard, 1995) represent common ground. In my ongoing work I propose that nonverbal transference-countertransference interactions that take place at preconscious-unconscious levels represent right-hemisphere-to-right-hemisphere communications of fast, automatic, regulated, and dysregulated emotional states between patient and therapist. Transferential events clearly occur during moments of emotional usage, and recent neurobiological studies indicate that "attention is altered during emotional arousal such that there is a heightened sensitivity to cues related to the current emotional state" (Lane, Chua, & Dolan, 1999, p. 986).

Psychoanalytic research highlights the role of "flitting facial expressions" act as indicators of transference and countertransference processes (Anderer, Reznik, & Manzella, 1996; Krause & Lutolf, 1988; Schore, 1994, 1998d). These cues are nonconsciously appraised from movements occurring primarily
processing (Rolls, 1996) and procedural (Rolls, 1996) or emotion-related learning (Rolls, Hornak, Wade, & McGrath, 1994). Such structure-function relationships may elucidate how alterations in what Stern, Bruchswiler-Stern, and colleagues (1998) called nonverbal “implicit relational knowledge” are at the core of therapeutic change. In light of the central role of the limbic system in both attachment functions and in “the organization of new learning,” the corrective emotional experience of psychotherapy, which can alter attachment patterns, must involve unconscious right-brain limbic learning.

But a dyadic-transactional perspective entails not only more closely examining the patient’s emotion dynamics, but also bringing the therapist’s emotions and personality structure more into the picture. During a therapeutic affective encounter, the therapist is describing his/her psychobiological state of mind and the countertransference impressions made upon it by the patient’s unconscious transference communications. These are expressed in clinical heightened affective moments when the patient’s internal working models are accessed, thereby revealing the patient’s fundamental transferences and coping strategies of affect regulation (Schor, 1997c).

Gans described the “ever-deepening grasp of the patient’s essence that can result from therapists’ ongoing efforts to distill meaning from reactions caused or evoked by their patients” (1994, p. 122). These countertransference reactions include the clinician’s “visceral reactions to the patient’s material” (Loewald, 1986, p. 278). Recall that attachment is fundamentally the right-brain regulation of biological synchronicity between organisms, and thus the empathic therapist’s resonant synchronization to the patient’s activated unconscious internal working model triggers, in the clinician, the procedural processing of his/her autonomously visceral responses to the patient’s nonverbal, unconscious communications. In rupture and repair transactions (Beebe & Lachmann, 1994; Lewis, 2000; Schore, 1994) the therapist also utilizes his/her autoregulatory capacities to modulate and contain the stressful negative state induced in him/her by the patient’s communications of dysregulated negative affect. The psychobiologically attuned therapist then has an opportunity to act as an interactive affect regulator of the patient’s dysregulated state (see Schore, 2002b). This model clearly suggests that the therapist’s role is much more than interpreting to the developmentally disordered patient either distortions of the transference, or disintegrated early attachment experiences that occur in incoherent moments of the patient’s narrative.

We need to go beyond objectively observing the disorganization of left-brain language capacities by dysregulating right-brain states and feeding this back to the patient in insight-oriented interpretations. Rather, we can directly engage and therefore regulate the patient’s inefficient right-brain processes with our own right brains. On the part of the therapist, the most effective interpretations are based on the clinician’s “awareness of his own physical, emotional, and ideational responses to the patient’s veiled messages” (Boyer, 1990, p. 304). On the part of the patient, the most “correct understandings” can be used by the

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at levels beneath awareness. In other words, the two right-brain systems that process unconscious attachment-related information within the coconstructed intersubjective field of the patient and therapist are temporally coactivated and coupled, deactivating and uncoupled, or reactivated and uncoupled. The unconscious minds and bodies of two self-systems are connected and coregulating, disconnected and autoregulating, or reconnected and again mutually regulating their activity. Recall self-regulation occurs in two modes, autoregulation, via the processes of a “one-person psychology,” or interactive regulation, via a “two-person psychology.”

IMPLICATIONS OF A PSYCHONEUROBIOLOGICAL MODEL OF EMOTIONAL DEVELOPMENT FOR CLINICAL PRACTICE

Even more specifically, during the treatment, the empathic therapist is consciously attending to the patient’s verbalizations in order to objectively diagnose and rationalize the patient’s dysregulating symptomatology. But he/she is also listening and interacting at another level, an experience—near subjective level, one that processes socioemotional information at level beneath awareness. According to Kohut (1971), the empathically immersed clinician is attuned to the continuous flow and shifts in the patient’s feelings and experiences. His/her “oscillating attunement” (Schwaber, 1995) is focused on the “barely perceptible cues that signal a change in state” (Sander, 1992), in both patient and therapist, and on nonverbal behaviors and shifts in affect (McLaughlin, 1996). The attuned, intuitive clinician, from the first point of contact, is learning the nonverbal moment-to-moment rhythmic structures of the patient’s internal states, and is relatively flexibly and fluidly modifying his/her own behavior to synchronize with that structure, thereby creating a context for the organization of the therapeutic alliance.

Freud (1915/1957a) asserted that the work of psychotherapy is always concerned with affect. Perhaps the most important clinical advances in this realm have come from those working in “the nonverbal realm of psychoanalysis” (e.g., Hollinger, 1999; Jacobs, 1994; Schore, 1994; Schwaber, 1998; Stem, Bruchswiler-Stern, et al., 1998; Stem, Sander, et al., 1998). The current emphasis in developmental studies on “heightened affective moments” and in emotion studies on “actual moments of experience” is mirrored in very recent psychotherapy research which is exploring “significant moments” in the therapeutic hour. And learning research on the importance of the implicit perception of affective information is echoed in the clinical principle, that in order for implicit affective learning to take place, the patient must have a vivid affective experience of the therapist (Animi et al., 1996).

Neurobiology is also delving into this theme—studies are delving the involvement of the right hemisphere in implicit learning (Hugdahl, 1995) and nonverbal processes (see Schore, 1994) and the orbitofrontal system in implicit
The exploration for meaning is thus not in the content but in the very process of sensing and communicating emotional states. In a growth-facilitating therapeutic context, meaning is not singularly discovered but dyadically created. Focusing, at levels beneath and above awareness, not so much on cognitions as on the subtle or abrupt ebbs and flows of affective states and on rhythms of attunement, misattunement, and reattunement within the therapeutic dyad allows us to understand the dynamic events that occur within what Holmes (1992b) called the spontaneous encounter of two solitudes. The essential mechanisms that regulate, in real time, the connections, disconnections, and reconnections of the inner worlds of the patient and the therapist are mediated by the transactions of the nonverbal transference-countertransference.

Brown asserted that the process of emotional development, as it continues in adulthood, brings the potential to observe and understand the processes of our own minds: “Adult affective development is the potential for self-observation and reflection on the very processes of mental functioning” (1993, p. 42). This involves not simply the affective content of experience but of the very processes by which affect comes into experience—how it is experienced by the self and what informs the self about its relationship to internal and external reality. As Brown noted, “Psychotherapy is one medium of adult affective development in the sense that it serves the purpose of disciplined conscious reflection on affective processes” (p. 56).

I suggest that Brown was describing a developmental progression in the patient’s internal psychic structures, namely the orbitofrontal system that performs functions central to affect regulation (Davidson, Putnam, & Larson, 2000; Schore, 1994). This—“the thinking part of the emotional brain” (Goleman, 1995)—acts to “integrate and assign emotional-motivational significance to cognitive impressions; the association of emotion with ideas and thoughts” (Joseph, 1996) and in “the processing of affect-related meanings” (Teasdale et al., 1999). Because its activity is associated with a lower threshold for awareness of sensations of both external and internal origin, it functions as an “internal reflecting and organizing agency” (Kaplan-Solms & Solms, 1996). This orbitofrontal role in “self-reflective awareness” (Stuss et al., 1992) allows the individual to reflect on one his or her own internal emotional states, as well as others (Povinelli & Preuss, 1995). Furthermore, in light of recent interest of neuroscience in the “mind’s eye” (Kawashima et al., 1995), I propose that the psychobiological operations of the right orbitofrontal system represent the “subjective lens of the mind’s eye.”

It is important to note that the right-hemisphere cycles back into growth phases throughout the lifespan (Schore, 1999a, 2002b, 2002e; Thatcher, 1994) and that the orbitofrontal cortex retains a capacity for plasticity in later life (Barbas, 1995), thereby allowing for the continuing experience-dependent maturation of a more efficient and flexible right frontal regulatory system within the growth-facilitating environment of an affect regulating therapeutic relationship. Although short-term treatment may allow the patient to return to a deregulated
hemispheric processes are central to implicit learning and that psychotherapy essentially alters and expands implicit relational knowledge. But in light of the intrinsic dyadic nature of attachment, this expansion occurs in the brain/mind/bodies of both the patient and therapist. In his last work, Bowlby (1991b) described the therapeutic process as a “joint exploration.” An attachment model grounded in both biology and psychoanalysis thus accounts for how a successful therapeutic relationship can act as an interactive affect-regulating context that optimizes the growth of two “minds in the making”; that is, increases in complexity in both the patient’s and the therapist’s continually developing unconscious right minds.

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