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SELF AND SYSTEMS

# Relational Trauma and the Developing Right Brain

## An Interface of Psychoanalytic Self Psychology and Neuroscience

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Psychoanalysis, the science of unconscious processes, has recently undergone a significant transformation. Self psychology, derived from the work of Heinz Kohut, represents perhaps the most important revision of Freud's theory as it has shifted its basic core concepts from an intrapsychic to a relational unconscious and from a cognitive ego to an emotion-processing self. As a result of a common interest in the essential, rapid, bodily based, affective processes that lie beneath conscious awareness, a productive dialogue is now occurring between psychoanalysis and neuroscience. Here I apply this interdisciplinary perspective to a deeper understanding of the nonconscious brain/mind/body mechanisms that lie at the core of self psychology. I offer a neuropsychanalytic conception of the development and structuralization of the self, focusing on the experience-dependent maturation of the emotion-processing right brain in infancy. I then articulate an interdisciplinary model of attachment trauma and pathological dissociation, an early forming defense against overwhelming affect that is a cardinal feature of self-psychopathologies. I end with some thoughts on the mechanism of the psychotherapeutic change process and suggest that self psychology is, in essence, a psychology of the unique functions of the right brain and that a rapprochement between psychoanalysis and neuroscience is now at hand.

**Key words:** neuropsychanalysis; right brain; trauma; dissociation; unconscious; attachment

### Introduction

At the present time a number of scientific and clinical disciplines are simultaneously experiencing a rapid expansion of relevant data and even a reorganization of their underlying theoretical concepts. Indeed, the term paradigm shift is appearing in a number of literatures. Although current significant advances in various technologies and the computer sciences have catalyzed this growth spurt, an important contributor has been the rapid communication of

information not only within but also between disciplines. In this period of accelerated growth of essential information about the human condition and the natural world, the transfer of knowledge across disciplinary boundaries is occurring at a faster rate. This trend is reflected in an increasing interest in interdisciplinary studies and in integrated models that synthesize data generated at the interface of different scientific and clinical fields.

Within this context there exists a potential for new and fresh solutions to certain fundamental problems, especially those concerning the essential mechanisms that lie at the core of adaptive and maladaptive human functions. Until very recently these problems have been studied from the unique vantage points of

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various scientific perspectives that span the sociological, psychological, biological, and chemical domains. The over emphasis on specialization within each of these disciplines has also fostered their isolation from one another, which has in turn inadvertently increased an artificial dichotomous separation between, for example, psychology and biology, brain and mind, mind and body, cognition and emotion. Earlier impermeable boundaries of knowledge between disciplines also intensified a tension and indeed a conflict between those studying unconscious involuntary processes and those studying conscious voluntary processes, that is between psychoanalysis—the science of unconscious process—and psychology—the study of behavior.

This ambivalent relationship between psychoanalysis and the other sciences has existed since its creation by Sigmund Freud. And yet it is often forgotten that Freud's early career was in neurology and that in 1895 he wrote *Project for a Scientific Psychology*, an attempt to create "a psychology which shall be a natural science" (Schore, 1997). In this remarkable document Freud used what was then known about neurophysiology and biology to begin to construct a set of regulatory principles for psychological processes and a neuropsychological model of brain function. Freud did not publish the *Project* in his lifetime and over the course of his career never returned to the problem of creating a model that could integrate the biological and psychological realms. And yet he predicted that at some point in the future "we shall have to find a point of contact with biology" (Freud, 1913). Freud thus saw neurobiology as a discipline that could bridge the gap between biology and psychoanalysis, especially in the study of the unconscious and its fundamental impact on all aspects of the human experience.

Over the course of the last century, a number of significant transformations have occurred in Freud's theory, although much of this work has not transferred outside of the field. The theoretical core of psychoanalysis, almost unchanged for most of its first century, is now undergo-

ing a substantial reformulation from an intrapsychic unconscious to a relational unconscious whereby the unconscious mind of one communicates with the unconscious mind of another. The scaffolding of clinical psychoanalysis is supported by conceptions of psychic development and structure, and it is these basic concepts that are now being reformulated. Self psychology, emergent from the seminal work of Heinz Kohut, represents perhaps the most significant updating of classical psychoanalysis since its inception. In 1971, Kohut, trained in neurology and then psychoanalysis, published his classic volume *The Analysis of the Self*, a detailed exposition of the central role of the self in human existence. He subsequently expanded the theoretical framework of self psychology in a second volume, *The Restoration of the Self* (1977), and finally in *How Does Analysis Cure?* (1984).

In all his clinical work and writings Kohut attempted to explore the four basic problems of psychoanalysis that he initially addressed in his seminal volume: how do early relational affective transactions with the social environment facilitate the emergence of self (*development of the self*); how are these experiences internalized into maturing self-regulating structures (*structuralization of the self*); how do early deficits of self-structure lead to later self-pathologies (*psychopathogenesis*); and how can a therapeutic relationship lead to a restoration of self (*mechanism of psychotherapeutic change*).

Despite the fact that he was originally trained as a neurologist, Kohut was highly ambivalent about the incorporation of scientific data into the core of psychoanalytic self psychology. Indeed, like Freud before him, he eschewed his earlier neurological knowledge and attempted to create a purely psychological model of the unconscious systems that underlie all human functioning. However, in the last 10 years, over the course and since the "decade of the brain" an interdisciplinary perspective has emerged both within psychoanalysis and the disciplines that border it. Because of a common interest in the essential, rapid, bodily based, affective

2 processes that lie beneath conscious awareness,  
3 a productive dialogue is now occurring be-  
4 tween psychoanalysis and neuroscience. This  
5 convergence has facilitated the emergence of  
6 a new discipline, neuropsychanalysis, and a  
7 subspecialization, developmental psychoanaly-  
8 **Q3** sis (Schore, 1997). This discipline returns to  
9 Freud's attempt to create "a psychology which  
10 shall be a natural science" by specifically focus-  
11 ing on the essential psychobiological role of the  
12 unconscious in all human affect, cognition, and  
13 behavior.

14 In a number of works I have suggested  
15 that the time is right for a rapprochement be-  
16 tween psychoanalysis and the biological sci-  
17 **Q4** ences (Schore, 1994, 1997, 2002a, 2002b,  
18 2003, 2005a). In this period when neuroscience  
19 is "rediscovering the unconscious", neuropsy-  
20 choanalysis is identifying the "intrapsychic"  
21 brain systems involved in a redefined dynamic  
22 unconscious and developmental psychoanaly-  
23 sis is generating a complex model of the social-  
24 emotional origins of the self and the early on-  
25 togeny of the biological substrate of the human  
26 unconscious. It is now clear that Freud was cor-  
27 rect in positing the unconscious mind develops  
28 before the conscious and that the early devel-  
29 opment of the unconscious is equivalent to the  
30 genesis of a self-system that operates beneath  
31 conscious verbal levels for the rest of the life  
32 span. I believe a deeper understanding of early  
33 human development can never be attained by  
34 narrowly focusing infant studies on the precu-  
35 sors of language, conscious thought, and vol-  
36 untary behavior.

37 A complete model of human development  
38 (and psychoanalysis) can only be psychobiolog-  
39 ical, not merely psychological. A deeper under-  
40 standing of one of the fundamental questions of  
41 science, why early developmental processes are  
42 essential to the short- and long-term survival  
43 of the organism, will not come from single or  
44 even multiple discoveries within any one dis-  
45 cipline (Schore, 1994). Rather, an integration  
46 of related fields is essential to the creation of  
47 a heuristic model of both developmental struc-  
tures and functions that can accommodate and

interpret the data of various biological and  
psychological disciplines and can freely shift  
back and forth between their different levels of  
analysis.

In this chapter on the integration of self psy-  
chology and neuroscience, I outline my neu-  
ropsychanalytic work on the interpersonal  
neurobiological origins of the self. I first present  
a brief overview of Kohut's concepts that repre-  
sent the core of self psychology. Subsequently I  
integrate interdisciplinary data in order to con-  
struct a neuropsychanalytic conception of the  
*development* and *structuralization* of the self, focus-  
ing on the experience-dependent maturation  
of the early developing right brain. Then, in a  
major focus of this work, I apply this develop-  
mental neuropsychanalytic perspective to the  
*psychopathogenesis* of severe deficits in the self-  
system. Citing my work in this area, I articu-  
late a model of the self psychology and neu-  
robiology of early relational trauma and the  
etiology of pathological dissociation, an early  
forming defense that is a cardinal feature of  
a number of early forming psychopathologies.  
I end with some thoughts on *psychotherapeutic  
change* and argue that the time is right for a rap-  
prochement between psychoanalysis and neu-  
roscience. Throughout I suggest that the "point  
of contact with biology" that Freud referred  
to is specifically the central role of right brain  
psychobiological processes in the unconscious  
regulation of affect, motivation, and cognition,  
areas of intense interest to both contemporary  
self psychology and neuroscience.

### **Self-Psychological Developmental Models: Psychobiology of Attachment**

Perhaps Kohut's most original and outstand-  
ing intellectual contribution was his devel-  
opmental construct of selfobject. Indeed, self  
psychology is built upon a fundamental devel-  
opmental principle—that parents with mature  
psychological organizations serve as selfobjects  
that perform critical regulatory functions for



2 the mother's sensitive psychobiological at-  
3 tunement to the infant's internal states of  
4 arousal.

5 Importantly, research now clearly demon-  
6 strates that the primary caregiver is not al-  
7 ways attuned and optimally mirroring, that  
8 there are frequent moments of misattunement  
9 in the dyad, ruptures of the attachment bond.  
10 The disruption of attachment bonds leads to  
11 a regulatory failure and an impaired auto-  
12 nomic homeostasis. Studies of "interactive re-  
13 pair" following dyadic misattunement (Tron-  
14 ick, 1989) support Kohut's (1977) assertion  
15 that the parental selfobject acts to "remedy  
16 the child's homeostatic imbalance." In this pat-  
17 tern of "disruption and repair" (Beebe & Lach-  
18 mann, 1994), the "good enough" caregiver who  
19 induces a stress response through misattune-  
20 ment in a timely fashion reinvokes a reattun-  
21 ment, a regulation of the infant's negatively  
22 charged arousal.

23 In current psychobiological models, attach-  
24 ment is defined as the interactive regulation  
25 of states of biological synchronicity between  
26 and within organisms (Schore, 2000, 2003a,  
27 2005b). The dual regulatory processes of af-  
28 fect synchrony that creates states of positive  
29 arousal and interactive repair that modulates  
30 states of negative arousal are the fundamen-  
31 tal building blocks of attachment and its asso-  
32 ciated emotions. These interactive regulatory  
33 mechanisms optimize the communication of  
34 emotional states within an intimate dyad and  
35 represent the psychobiological underpinning  
36 of empathy, a phenomenon of intense inter-  
37 est to self psychology. Kohut (1977) deduced  
38 that as a result of the empathic merger of the  
39 child's rudimentary psyche with the maternal  
40 selfobject's highly developed psychic organiza-  
41 tion, the child experiences the feeling states of  
42 the selfobject as if they were his own. Selfob-  
43 jects are thus external psychobiological regula-  
44 tors that facilitate the regulation of affective  
45 experiences, and they act at nonverbal lev-  
46 els beneath conscious awareness in the regu-  
47 lation of self-esteem and the maintenance of  
q7 self-cohesiveness (Schore, 1994, 2002).

## **Self-Psychological Models of Structuralization: Links to Interpersonal Neurobiology**

A cardinal principle of self psychology dic-  
tates that, as a result of optimal self-selfobject  
relational experiences, the infant becomes able  
to perform the drive-regulating, adaptive, and  
integrating functions that had previously been  
performed by the external object. Kohut specifi-  
cally posited that phase-appropriate, maternal,  
optimal frustrations of the infant elicit "trans-  
muting internalization", the developmental  
process by which selfobject function is internal-  
ized by the infant and psychological regulatory  
structures are formed. Developmental data are  
consonant with this, although interdisciplinary  
data emphasize that not just optimal stressful  
frustration but interactive repair is essential to  
the formation of a structural system that can  
regulate stressful affect. The formative experi-  
ences of the self are built out of internalized self-  
object functions that facilitate the emergence of  
more complex regulatory structures.

Recent research also support Kohut's specu-  
lation that the infant's regulatory transactions  
with the maternal selfobject allow for mainte-  
nance of his homeostatic equilibrium. Accord-  
ing to Ovtsharoff and Braun (2001), "The  
dyadic interaction between the newborn and  
the mother...serves as a regulator of the de-  
veloping individual's internal homeostasis. The  
regulatory function of the newborn-mother in-  
teraction may be an essential promoter to en-  
sure the normal development and maintenance  
of synaptic connections during the establish-  
ment of functional brain circuits." These re-  
searchers conclude that subtle emotion regu-  
lating attachment interactions permanently  
alter the brain by establishing and maintain-  
ing developing limbic circuits (Ziabreva *et al.*,  
2003).

A large body of studies now clarifies the  
developmental neurobiology of the selfobject  
mechanism. In my own work I have sug-  
gested that the self-organization of the de-  
veloping brain occurs in the context of a

relationship with another self, another brain. More specifically, the self–selfobject relationship is embedded in infant–caregiver, right hemisphere to right hemisphere, affective, attachment communications (Schore, 1994, 2000, 2003, 2005a). In light of the observations that the emotion-processing human limbic system myelinates in the first year-and-a-half (Kinney *et al.*, 1988) and that the early-maturing right hemisphere (Chiron *et al.*, 1997; Bogolepova & Malofeeva, 2001; Allman *et al.*, 2005; Gupta *et al.*, 2005; Sun *et al.*, 2005)—which is deeply connected into the limbic system—is undergoing a growth spurt at this time, attachment experiences specifically impact limbic and cortical areas of the developing right cerebral hemisphere (Henry, 1993; Schore, 1994; Siegel, 1999; Cozolino, 2002).

In very recent work on mother–infant emotional communication Lenzi *et al.* (in press) offer data from a functional magnetic resonance imaging study “supporting the theory that the right hemisphere is more involved than the left hemisphere in emotional processing and thus, mothering.” Also confirming this model Minagawa-Kawai *et al.* (in press) report a near-infrared spectroscopy study of infant–mother attachment at 12 months and conclude, “our results are in agreement with that of Schore (2000) who addressed the importance of the right hemisphere in the attachment system.” Supporting Kohut’s speculations on empathic mirroring, neuroscience researchers now conclude that developing children rely upon a “right hemisphere-mirroring mechanism—interfacing with the limbic system that processes the meaning of observed or imitated emotion” (Dapretto *et al.*, 2006).

Ongoing neurobiological research on the mother–infant intersubjective dialogue indicates, “A number of functions located within the right hemisphere work together to aid monitoring of a baby. As well as emotion and face processing the right hemisphere is also specialized in auditory perception, the perception of intonation, attention, and tactile information” (Bourne & Todd, 2004). Social experi-

ences thus facilitate the experience-dependent critical period maturation of right brain systems that process visual-facial, auditory-prosodic, and tactile-gestural affective communications. From infancy through all later stages of the life span, the right hemisphere is dominant for the nonconscious reception, expression, and communication of emotion and the cognitive and physiological components of emotional processing (Schore, 2003a, 2003b). With respect to empathy, a core process of self psychology, it is now thought that “self-awareness, empathy, identification with others, and more generally intersubjective processes, are largely dependent upon. . .right hemisphere resources, which are the first to develop” (Decety & Chaminade, 2003).

Furthermore, the “complex psychological regulatory structures” described by self psychology can now be located in “the right hemispheric specialization in regulating stress—and emotion-related processes” (Sullivan & Dufresne, 2006). Indeed, the brain’s major self-regulatory systems are located in the orbital prefrontal areas of the right hemisphere that undergo an anatomical maturation in postnatal periods of mammalian development (Bradshaw & Schore, 2007). The experience-dependent maturation of this affect regulatory system is thus directly related to the origin of the self (Schore, 1994). Earlier research documented that the development of the self and self-awareness is reflected in the ability of 2-year olds to recognize their own visual image in a mirror (Amsterdam, 1972). Functional magnetic resonance neuroimaging studies show that when subjects look at an image of their own face, activation seen in occipito–temporo–parietal junction and the right frontal operculum (Sugiura *et al.*, 2005), and self-face recognition activates a frontoparietal “mirror” network in the right hemisphere (Uddin *et al.*, 2005).

Indeed, a substantial amount of research indicates that the right hemisphere is specialized for generating self-awareness and self-recognition, and for the processing of “self-related material” (Miller *et al.*, 2001;

2 Decety & Chaminade, 2003; Fossati *et al.*, 2004;  
 3 Platak *et al.*, 2004; Feinberg & Keenan, 2005;  
 4 Perrin *et al.*, 2005). Neuroscientists now suggest  
 5 that the essential function of the right lateral-  
 6 ized system is to “maintain a coherent, con-  
 7 tinuous, and unified sense of self” (Devinsky,  
 8 2000). Summarizing this knowledge Molnar-  
 9 Szakacs and colleagues (2005) assert, “Studies  
 10 have demonstrated a special contribution of the  
 11 right hemisphere (RH) in self-related cognition,  
 12 own-body perception, self-awareness, autobio-  
 13 graphical memory and theory of mind. Many  
 14 studies of self-face recognition have also found  
 15 a RH advantage, suggesting a special role for  
 16 the RH in processing material related to the  
 17 self.” These data clearly indicate that self psy-  
 18 chology is in essence a psychology of the unique  
 19 functions of the right brain.

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 21  
 22 **Self-Psychological Models**  
 23 **of Psychopathogenesis: Negative**  
 24 **Impact of Attachment Trauma**  
 25 **on the Right Brain**  
 26

27 At the core of Kohut’s model of psychopatho-  
 28 genesis is the central hypothesis that the  
 29 mother’s traumatic failures of empathic mir-  
 30 roring lead to enduring defects in the infant’s  
 31 emerging self. Self psychology thus proposes  
 32 that disturbed physiological regulation results  
 33 from primary disturbances in selfobject experi-  
 34 ences and that a defective self and an impaired  
 35 regulatory structure lie at the foundation of  
 36 early forming psychopathologies. Kohut (1971)  
 37 highlighted the importance of “the role of spe-  
 38 cific environmental factors (the personality of  
 39 the parents, for example; certain *traumatic* exter-  
 40 nal events) in the genesis of the developmental  
 41 arrest,” especially when “the mother’s response  
 42 **Q10** are grossly unempathic and unreliable. . .no  
 43 transmuted internalization can take place, and  
 44 the psyche. . .does not develop the various in-  
 45 ternal functions which re-establish narcissistic  
 46 equilibrium.”

47 Although there is a long history of contro-  
 versy within psychoanalysis, the field is now

very interested in the problem of trauma and  
 in the unique survival defenses for dealing with  
 early relational trauma. Laub and Auerhahn  
 (1993) propose that the essential experience  
 of trauma is a disruption of the link between  
 the “self” and the mothering “empathic other”,  
 and therefore the maternal introject, or moth-  
 ering (selfobject regulatory) function, is defi-  
 cient or “damaged”. They further contend “it  
 is the nature of trauma to elude our knowledge  
 because of both *defence* and deficit. . .trauma  
 overwhelms and defeats our capacity to orga-  
 nize it.” In line with these self-psychological  
 principles, current neuropsychanalytic mod-  
 els now posit that, under the impact of devel-  
 opmental trauma, specific defensive and defec-  
 tive regulatory structures develop that lie at the  
 core of the patient’s psychopathology (Schore,  
 2002b).

Psychoanalysis, psychiatry, and developmen-  
 tal traumatology are all now converging on  
 dissociation, the bottom-line survival defense  
 against overwhelming, unbearable, emotional  
 experiences. Longitudinal attachment research  
 demonstrates an association between traumatic  
 childhood events and proneness to dissocia-  
 tion, described as “detachment from an un-  
 bearable situation”, “the escape when there is  
 no escape”, and “a last resort defensive strat-  
 egy” (Schore, 2003b, in press). Although Kohut  
 never used the term *dissociation*, in his last book  
 (1984) he characterized an early interaction in  
 which the traumatized child “walls himself off”  
 from traumatizing experiences:

If the mother’s empathic ability has remained in-  
 fantile, that is, if she tends to respond with panic  
 to the baby’s anxiety, then a deleterious chain will  
 be set into motion. She may chronically wall her-  
 self off from the baby, thus depriving him of the  
 beneficial effect of merging with her as she returns  
 from experiencing mild anxiety to calmness. Alter-  
 natively, she may continue to respond with panic, in  
 which case two negative consequences may ensue:  
 the mother may lay the groundwork in the child for  
 a lifelong propensity toward the uncurbed spread-  
 ing of anxiety or other emotions, or by forcing the  
 child to wall himself off from such an overly intense  
 and thus traumatizing [experience, she] may foster  
 in the child an impoverished psychic organization,

the psychic organization of a person who will later be unable to be empathic himself, to experience human experiences, in essence, to be fully human.

What can ongoing studies in developmental psychology, affective neuroscience, and neuropsychology tell us about the neurobiology and neuropsychology of attachment-relational trauma and about dissociation, the mechanism by which humans “wall themselves off” from overwhelming emotional trauma? In this last section I discuss interdisciplinary studies, which indicate that experiences with a traumatizing caregiver negatively impact the child’s attachment security, right brain maturation, and sense of self and thereby lay the ground work for the use of pathological dissociation in various self-pathologies.

### Developmental Psychobiology of Relational Trauma

During the brain growth spurt, relational, trauma-induced, arousal dysregulation precludes the aforementioned visual-facial, auditory-prosodic, and tactile-gestural attachment communications and alters the development of essential right brain functions. In contrast to an optimal attachment scenario, in a growth-inhibiting relational environment the primary caregiver induces traumatic states of enduring negative affective arousal in the child. This caregiver is inaccessible and reacts to her infant’s expressions of emotions and stress inappropriately and/or rejectingly and therefore shows minimal or unpredictable participation in the various types of arousal-regulating processes. Instead of modulating, she induces extreme levels of stimulation and arousal, very high in abuse and/or very low in neglect. And because she provides no interactive repair, the infant’s intense negative-affective states last for long periods of time.

Studies in developmental traumatology reveal that the infant’s psychobiological reaction to trauma is comprised of two separate response patterns: hyperarousal and dissociation (Schorer, 2001, 2002c). In the initial hyper-

arousal stage, the maternal haven of safety suddenly becomes a source of threat, triggering a startle reaction in the infant’s right hemisphere, the locus of both the attachment and the fear motivational systems. The maternal stressor activates the hypothalamic–pituitary–adrenal (HPA) stress axis, eliciting a sudden increase of the energy-expending sympathetic component of the infant’s autonomic nervous system (ANS); this results in significantly elevated heart rate, blood pressure, and respiration, the somatic expressions of a dysregulated psychobiological state of fear–terror. This active state of sympathetic hyperarousal is expressed in increased secretion of corticotropin releasing factor (CRF)—the brain’s major stress hormone. CRF regulates sympathetic catecholamine activity, creating a hypermetabolic state in the developing brain.

But a second later forming reaction to relational trauma is dissociation in which the child disengages from stimuli in the external world—traumatized infants are observed to be “staring off into space with a glazed look”. This parasympathetic dominant state of conservation withdrawal occurs in helpless and hopeless stressful situations in which the individual becomes inhibited and strives to avoid attention in order to become “unseen”. The dissociative metabolic shutdown state is a primary regulatory process by which the stressed individual passively disengages in order to conserve energies, fosters survival by the risky posture of feigning death, and allows restitution of depleted resources by immobility. In this hypometabolic state, heart rate, blood pressure, and respiration are decreased while pain-numbing and pain-blunting endogenous opiates are elevated. This energy-conserving parasympathetic (vagal) mechanism mediates the “profound detachment” of dissociation.

In fact there are two parasympathetic vagal systems in the brainstem medulla (Porges, 1997). The ventral vagal complex rapidly regulates cardiac output to foster fluid engagement and disengagement with the social environment, aspects of a secure attachment

2 bond of emotional communication. On the  
3 other hand, activity of the dorsal vagal com-  
4 plex is associated with intense emotional states  
5 and immobilization, and is responsible for the  
6 severe metabolic depression, hypoarousal, and  
7 pain blunting of dissociation. The traumatized  
8 infant's sudden state switch from sympathetic  
9 hyperarousal into parasympathetic dissociation  
10 is described by Porges (1997) as "the sud-  
11 den and rapid transition from an unsuccessful  
12 strategy of struggling requiring massive sympa-  
13 thetic activation to the metabolically conserva-  
14 tive immobilized state mimicking death associ-  
15 ated with the dorsal vagal complex." Whereas  
16 the ventral vagal complex exhibits rapid and  
17 transitory activations, the dorsal vagal nucleus  
18 exhibits an involuntary and prolonged pat-  
19 tern of vagal outflow, creating lengthy "void"  
20 states associated with pathological dissociative  
21 detachment.

22 How are the dual traumatic contexts of  
23 hyperarousal and dissociative hypoarousal ex-  
24 pressed behaviorally within the mother-infant  
25 dyad? Observational research demonstrates a  
26 link between frightening maternal behavior,  
27 dissociation, and disorganized infant attach-  
28 ment (Schuengel, Bakersmans-Kranenburg, &  
29 Van IJzendoorn, 1999). Hesse and Main (1999)  
30 observe the mother's frightening behavior: "in  
31 non-play contexts, stiff-legged 'stalking' of in-  
32 fant on all fours in a hunting posture; expo-  
33 sure of canine tooth accompanied by hissing;  
34 deep growls directed at infant." In recent work,  
35 Hesse and Main (2006) document that a fear  
36 alarm is triggered in the infant when the mother  
37 enters a dissociative freeze state: "Here the  
38 parent appears to have become completely un-  
39 responsive to, or even aware of, the external  
40 surround, including the physical and verbal  
41 behavior of their infant. . .[W]e observed one  
42 mother who remained seated in an immobi-  
43 lized and uncomfortable position with her hand  
44 in the air, blankly staring into space for 50 sec."  
45 Note the intergenerational transmission of not  
46 only relational trauma but the bottom-line de-  
47 fense against traumatic emotional experiences,  
dissociation.

## Right Brain Pathological Dissociation and Self-Psychological Deficits

Workers in the field of developmental trau-  
matology now assert that the overwhelming  
stress of maltreatment in childhood is associ-  
ated with adverse influences on not just be-  
havior but also on brain development (de  
Bellis *et al.*, 1999). During the intergenera-  
tional transmission of attachment trauma, the  
infant is matching the rhythmic structures of the  
mother's dysregulated arousal states. This syn-  
chronization is registered in the firing patterns  
of the stress-sensitive corticolimbic regions of  
the right brain, dominant for coping with neg-  
ative affects (Davidson *et al.*, 1990). Describing  
the essential survival functions of this lateral-  
ized system, Schutz (2005) notes "The right  
hemisphere operates a distributed network for  
rapid responding to danger and other urgent  
problems. It preferentially processes environ-  
mental challenge, stress and pain and manages  
self-protective responses such as avoidance and  
escape." The right brain is fundamentally in-  
volved in an avoidant-defensive mechanism for  
coping with emotional stress, including the pas-  
sive survival strategy of dissociation.

Current neurobiological data can be used to  
create models of the mechanism by which at-  
tachment trauma negatively impacts the right  
brain. Adamec and colleagues (2003) report  
experimental data that "implicate neuroplas-  
ticity in right hemispheric limbic circuitry in  
mediating long-lasting changes in negative af-  
fect following brief but severe stress." Accord-  
ing to Gadea *et al.* (2005) mild to moder-  
ate negative affective experiences activate the  
right hemisphere, but an intense experience  
"might interfere with right hemisphere pro-  
cessing, with eventual damage if some criti-  
cal point is reached." This damage is specifi-  
cally hyperarousal-induced apoptotic cell death  
in the hypermetabolic right brain. Thus, via  
a switch into a hypoarousal, a hypometabolic  
state allows for cell survival at times of intense  
excitotoxic stress (Schore, 1997b, 2001, 2002c,  
2003b).

Recall that right cortical areas and their connections with right subcortical structures are in a critical period of growth during early human development. The massive psychobiological stress associated with attachment trauma sets the stage for the characterological use of right brain pathological dissociation when encountering later stressors. Converging evidence indicates that early abuse negatively impacts limbic system maturation, producing enduring neurobiological alterations that underlie affective instability, inefficient stress tolerance, memory impairment, and dissociative disturbances. In this manner, traumatic stress in childhood leads to self-modulation of painful affect by directing attention away from internal emotional states (Lane *et al.*, 1997). The right brain, dominant for attention (Raz, 2004) and pain processing (Symonds *et al.*, 2006), thus generates dissociation, a defense by which intense negative affects associated with emotional pain are blocked from consciousness.

Congruent with developmental and clinical models, Spitzer *et al.* (2004) report a transcranial magnetic stimulation study of adults and conclude, "In dissociation-prone individuals, a trauma that is perceived and processed by the right hemisphere will lead to a 'disruption in the usually integrated functions of consciousness.'" In functional magnetic resonance imaging research, Lanius *et al.* (2005) show predominantly right hemispheric activation in psychiatric patients while they are dissociating and conclude that dissociation, an escape from the overwhelming emotions associated with the traumatic memory, can be interpreted as representing a nonverbal response to the traumatic memory.

These studies explore the evolution of a developmentally impaired regulatory system and provide evidence that prefrontal cortical and limbic areas of the right hemisphere are centrally involved in the deficits in mind and body that are associated with a pathological dissociative response (Schore, 2002c, in press). This right hemisphere, more so than the left, is densely reciprocally interconnected with

emotion-processing limbic regions as well as with subcortical areas that generate both the arousal and autonomic bodily based aspect of emotions. Sympathetic nervous system activity is manifest in tight engagement with the external environment and high level of energy mobilization, while the parasympathetic component drives disengagement from the external environment and uses low levels of internal energy (Recordati, 2003). These ANS components are uncoupled in relational trauma.

In a recent psychoanalytic formulation that echoes Kohut's "uncurbed spreading of anxiety or other emotions", Bromberg (2006) links right brain trauma to autonomic hyperarousal, "a chaotic and terrifying flooding of affect that can threaten to overwhelm sanity and imperil psychological survival." Dissociation is then automatically and immediately triggered as the fundamental defense to the arousal dysregulation of overwhelming affective states. And in the psychiatric literature, Nijenhuis<sup>67</sup> asserts that "somatoform dissociation" is an outcome of early onset traumatization expressed as a lack of integration of sensorimotor experiences, reactions, and functions of the individual's self-representation. Dissociatively detached individuals are not only detached from the environment but also from the self—their body, their actions, and their sense of identity (Allen, Console, & Lewis, 1999). Crucian *et al.* (2000) describe "a dissociation between the emotional evaluation of an event and the physiological reaction to that event, with the process being dependent on intact right hemisphere function."

Pathological dissociation thus reflects the chronic disintegration of a right brain system and a resultant adaptive failure of its capacity to rapidly and nonconsciously detect, process, and cope with unbearable emotional information and overwhelming survival threat. A poorly developed right cortical-subcortical implicit self-system is inefficient at recognizing and processing external stimuli (exteroceptive information coming from the relational environment) and on a moment-to-moment basis

2 integrating them with internal stimuli (intero-  
3 ceptive information from the body). This too  
4 frequent failure of integration of the higher  
5 right hemisphere with the lower right brain  
6 induces an instant collapse of both subjectiv-  
7 ity and intersubjectivity, even at lower levels of  
8 interpersonal stress.

9 In summary, the developing brain imprints  
10 not only the overwhelming affective states that  
11 are at the core of attachment trauma but  
12 also the primitive defense used against these  
13 affects—the regulatory strategy of dissociation.  
14 It is now established that maternal care in-  
15 fluences both the infant's reactivity (Menard,  
16 Champagne, & Meaney, 2004) and the trans-  
17 mission of individual differences in defensive  
18 responses (Parent *et al.*, 2005). A large body  
19 of psychiatric, psychological, and neurologi-  
20 cal studies supports the link between child-  
21 hood trauma and pathological dissociation  
22 (e.g., Draijer & Langeland, 1999; Macfie,  
23 Cicchetti, & Toth, 2001; Merckelbach & Muris,  
24 2001; Dikel, Fennell, & Gilmore, 2003; Liotti,  
25 2004).

### 26 27 28 **Conclusion: Rapprochement** 29 **between Psychoanalysis** 30 **and Neuroscience** 31

32 Researchers now conclude that, because of  
33 dissociation, elements of a trauma are not in-  
34 tegrated into a unitary whole or an integrated  
35 sense of self (Van der Kolk *et al.*, 1996). The  
36 symptomatology of pathological dissociation,  
37 or what Kohut described as “walling one-  
38 self off” from intense, traumatizing experience,  
39 thus represents a structural impairment and de-  
40 ficiency of the right brain, the locus of a “cor-  
41 poreal image of self” (Devinsky, 2000), affective  
42 empathy (Schore, 1994; Decety & Chaminade,  
43 2003), and a “sense of humanness” (Mendez  
44 & Lim, 2004). Recall Kohut's speculation that  
45 early trauma acts as a growth-inhibiting envi-  
46 ronment for the developing self, one which gen-  
47 erates “an impoverished psychic organization”,  
a deficit in being empathic, and an inability “to

be fully human”. The self-depleting structure-  
altering cost of characterological dissociation is  
thus a central psychopathogenetic concept of  
both self psychology and neuroscience.

A central tenet of Kohut's model of psy-  
chopathogenesis is that the long-term effects  
of chronic maternal failure to provide growth-  
facilitating selfobject regulatory functions is the  
genesis of a “developmental arrest”. Recall  
the self-psychological proposal that, because of  
early trauma, the developing selfobject regula-  
tory function is deficient or “damaged”. This  
development impairment can now be identified  
as a maturational failure of the right brain af-  
fect regulatory system. A large body of clinical  
observations and psychiatric research strongly  
suggests that the most significant consequence  
of early relational trauma is the child's failure  
to develop the capacity to self-regulate the in-  
tensity and duration of emotional states. The  
principle that maltreatment in childhood is as-  
sociated with adverse influences on brain de-  
velopment specifically refers to an impairment  
of a higher circuit of emotion regulation on the  
right side of the brain.

At the beginning of this chapter I stated that  
a central area of inquiry of Kohut's psycho-  
analytic theory was the problem of how the  
therapeutic relationship scaffolds the “restora-  
tion of self”. Early relational trauma and the  
characterological use of the right brain strategy  
of pathological dissociation are common ele-  
ments of the histories of severe self-pathologies  
of personality disorders, a clinical population of  
increasing interest to self psychology and psy-  
chotherapists in general. A large multicenter  
study of adult patients with a history of early  
childhood trauma reports that psychotherapy  
is an essential element of the treatment of such  
cases and indeed is superior to pharmacother-  
apy as an effective intervention (Nemeroff *et al.*,  
2003).

Any psychotherapeutic intervention with  
these patients must treat not only traumatic  
symptoms but also the dissociative defense  
(Bromberg, 2006). Spitzer's (2007) research  
shows that higher levels of dissociation predict

poorer outcome in patients in psychodynamic psychotherapy. These authors conclude dissociative patients have an insecure attachment pattern negatively affecting the therapeutic relationship and that they dissociate as a response to negative emotions arising in psychotherapy. Clinical authors now suggest that the treatment of traumatic dissociation is essential to effective psychotherapy with these patients (Spiegel, 2006; Schore, 2007).

The self-psychological focus on selfobject regulation clearly suggests that deficits and defenses of affect and affect regulation are a primary focus of the treatment of these early forming psychopathologies. With respect to the mechanism of change, Kohut (1984) postulated “psychoanalysis cures by the laying down of psychological structure.” This structure is essentially in the right brain and its limbic emotion-regulating circuits. Studies indicate that emotional self-regulatory processes constitute the core of psychotherapeutic approaches (Beauregard, Levesque, & Bourgouin, 2001), that the development of self-regulation is open to change in adult life, providing a basis for what is attempted in therapy (Posner & Rothbart, 1998), and that psychotherapy affects clinical recovery by modulating limbic and cortical regions (Goldapple *et al.*, 2004).

In addition to a more complex understanding of the psychotherapy change process an integration of neuroscience and self psychology has another important potential benefit. Psychoanalysis, neuroscience, and child psychiatry all share the well-established psychopathogenic principle that maltreatment in childhood is associated with adverse influences on the infant’s brain/mind/body and thereby alters the developmental trajectory of the self over the ensuing life span. Interdisciplinary research that incorporates psychoanalytic self psychology with the developmental and biological sciences can deepen our understanding of the underlying psychoneurobiological mechanisms by which early relational trauma mediates the unconscious intergenerational transmission of the deficits in affect regulation of

early forming self-psychopathologies. This information may, in turn, generate more effective models of early intervention during the brain growth spurt and thereby contribute to the prevention of a broad range of psychiatric disorders.

### Conflicts of Interest

The author declares no conflicts of interest.

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## Queries

- Q1** Author: Do you mean right part of the brain?
- Q2** Author: 1997a or b? Please check.
- Q3** Author: 1997a or b? Please check.
- Q4** Author: 2003a or b? Please check.
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- Q6** Author: 2002a, b or c? Please check.
- Q7** Author: 2002a, b or c? Please check.
- Q8** Author: 2003a or b? Please check.
- Q9** Author: Meaning unclear. Do you mean right hemisphere of the brain?
- Q10** Author: Should this be responses are?
- Q11** Author: Insertion correct?
- Q12** Author: Spitzer 2007 is not listed in the reference list. Please check.
- Q13** Author: Right part of the brain?
- Q14** Author: Please update.
- Q15** Author: Please update.
- Q16** Author: Please cite Spitzer et al. 2007 in the text.