

## A NEUROSCIENCE DIGEST

**PART III**  
**NEUROSCIENCE IN SOMATIC PSYCHOTHERAPY**

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**ABSTRACT**

*This third section considers the emergent connections between neuroscience and somatic practice. Does neuroscience support or challenge our existing somatic approaches? Can neurobiological information be organized into a framework that enlightens our clinical somatic practice? Does it lead to new guidelines for crafting therapeutic interventions and suggest refinements and modifications to our existing frameworks? Intuitively, one would have to answer a resounding YES! Indeed, there is much to be excited about.*

As we have seen, the brain is a complex organ that constructs experience from many channels of sensory input, regulates our responses through thoughts and emotions, and controls our actions. Its *raison d'être* is to learn from experience so that we can adaptively meet the ever-changing challenges of our environments. In Part I we noted that we humans have a unique dual perspective on the brain; whereas neuroscientists grapple with the workings of the physical brain from an external viewpoint and examine its neural firings *objectively* with increasingly sophisticated instruments, psychologists study it *subjectively* from the position of what it feels like to *be* such a system. This dual viewpoint applies equally to the body. Whereas traditional medicine evaluates and investigates the functions of the body *objectively* and treats them with increasingly sophisticated instruments, contemporary somatic psychotherapy studies the body *subjectively*, from the position of the *experience* of being one.

Understanding the biological nature of perception, learning, memory, thought, feeling, and consciousness has emerged as the central challenge of the biological sciences. In Part I we reviewed the work of neuroscientist John Ratey who suggests that, in order to approach psychotherapy more effectively, we need a new, multifaceted paradigm. Because the body's neuronal memory is the ground within which our life experience is imprinted, Ratey proposes that psychological treatment begin with tracking experience. A clinician, in his opinion, should begin by investigating how a patient experiences the world, focusing the primary diagnostic inquiry not on "How do you *feel*?" but rather on "How do you *perceive* and comprehend the world?" He believes that because emotions are created by the physical firing of neurons, clinicians should delve below the emotional surface of feelings, first considering their biological cause and effect.

The approach Ratey recommends has been in development in our somatic practices since Wilhelm Reich who understood that the body's communication goes beyond the symbolic representation of verbal expression. Reich and his followers taught us how beliefs are bound in posture and movement; inner realities emphasized, masked, or betrayed by facial expressions; and emotions revealed by the rate and pattern of breath. Thus, in somatic work, posture, movement, breath, facial expression, and vocal tone provide important clues about the congruence between embodied inner experience and its outer expression. This legacy finds itself renewed and refined in the new generation of neuroscientifically informed books that bring current findings to somatic clinical practice.

For somatic psychology, the body is not separate from the self. From a body-centered perspective, our innovative therapeutic objectives seek to elicit a sensory dialogue that sets up a meeting point and establishes a conscious unity between mind and bodily self. One of our principle goals is to help our patients develop the ability to observe the bodily activities that reside on the fringes of sensory awareness and that are difficult to put into words—that is, experiences such body heat, involuntary and voluntary muscular contractions, organ vibrations, and skin sensitivity. Our body-centered approaches focus on felt sensory experiences as they rise, *bottom up*, from the implicit realms. Somatic methods use sensory tracking and the recognition of movement impulses to access the interactive links—or lack thereof—between sensation, behavior, affect, and cognition. Somatic work encompasses not only experiences processed in the neocortex, but reaches into experiences processed through the limbic, mid and lower brain centers. We could say that somatic work intends to harness the plasticity of the brain and nervous system, that it seeks to stimulate dendritic growth and neural connectivity by supporting the biological completion of developmental tasks and disruptive traumatic events.

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### NEUROSCIENCE IN SOMATIC PSYCHOTHERAPY

*The mind is like the wind and the body like the sand;  
if you want to know how the wind is blowing, you can look at the sand.*  
— Bonnie Bainbridge Cohen

***Body–Mind Psychotherapy: Principles, Techniques, and Practical Applications*** by Susan Aposhyan. W.W. Norton, 2004.

***Trauma and the Body: A Sensorimotor Approach to Psychotherapy*** by Pat Ogden, Kekuni Minton, & Claire Pain. W.W. Norton, 2006.

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These two books each propose a theoretical integration that expands the existing somatic traditions they draw upon and weaves them into the fabric of psychotherapy and neuroscience. Susan Aposhyan calls her work *Body-Mind Psychotherapy* (BMP), and Pat Ogden, Kekuni Minton, and Claire Pain call theirs

*Sensorimotor Psychotherapy*. Both approaches work with the basic tools of body–mind integration—body awareness, breath, and movement—providing what Aposhyan describes as the framework for understanding how body and mind are fundamentally connected in psychological development and growth. In addition, they create a clinical interface for the maturing evidence brought forward by developmental and affective neuroscience that confirms the significant importance of nonverbal processing, attachment, autonomic regulation, and implicit memory.

### ***Body-Mind Psychotherapy***

#### *Principles, Techniques and Practical Applications*

The basis for *Body–Mind Psychotherapy* lies in experiential anatomy, physiology, and early motor development. In her first book *Natural Intelligence* (1999), Aposhyan had introduced working with “a synergistic intelligence that combines all the creative resources of every tissue and fluid in the body down to the cellular level” (p. 34). *Body–Mind Psychotherapy* now looks at the relationship between psychological process and the tissues, fluids, and cells of the body. *Body–Mind Psychotherapy* continues to draw its foundational somatic principles in large part from the work of Bonnie Bainbridge Cohen (1993), founder of *Body-Mind Centering* (BMC), then greatly expands its reaches to incorporate the latest research in neuroscience. Aposhyan, who is a certified practitioner of the School for Body–Mind Centering, also acknowledges the strong influence of her 30 years of contemplative meditative practice.

In the book’s first of four parts, Aposhyan gives us a concise overview of the developmental lines of our field. She traces our somatic lineage back to the organic view that psychological forces use physical energy, first brought to the fore by French psychiatrist Pierre Janet. She connects our somatic origins to neurologist Sigmund Freud, whose early career was devoted to finding the neurophysiological basis of psychological disorders. Importantly, Aposhyan reviews the established principles of somatic psychology and positions her *Body-Mind Psychotherapy* within this framework:

- *Body and mind function in mutual feedback loops*. The state of the body reflects the mind, and the state of the mind reflects the body. This principle is the key to integrating cognitive and somatic processing in a therapeutic context. The recognition of mind–body mutuality is also the basis for processes of somatic self-discovery that emphasize an exploration of the relationship of sensation, posture, and movement to mental and emotional states. In BMP, this principle is articulated as the *positional functioning theory*. Following the Body–Mind Centering model, Aposhyan anchors this somatic portion of her theory in the stages of motor development. She writes: “By grounding diagnosis in early motor development, there is an indication of the direction of future development within the present structure” (p. 13).
- The link with early motor development leads to a second fundamental premise. Early development, which forms the template for later stages of development, is primarily nonverbal.

Therefore, *the body provides direct access to early developmental nonverbal and implicit behavioral issues*. Aposhyan makes the point that as mammals, we all have the capacity to read the signals of each other's physiology; however, the cultural overemphasis on the verbal has somewhat obscured the cultivation of this ability to translate nonverbal bodily states into verbal consciousness. Whereas past somatic approaches have stressed the nonverbal, at times even to the exclusion of the verbal, BMP supports the maturing trend of integrating the body into mainstream psychology. Working through the body allows access to the physiological aspects of autonomic neurological regulation, so necessary in the treatment of posttraumatic stress, dissociative processes, depression, and anxiety. Thus, BMP stresses the skillful integration of verbal and nonverbal awareness, explicit and implicit memory, and cognitive and somatic processing. It also stresses the importance of training therapists in the subtleties of nonverbal as well as verbal attunement. Clinicians who want to practice integrative mind–body psychotherapy must include a focus on their own ongoing mindfulness and deepen their understanding of somatic states. To this end, BMP recommends and offers embodiment training for clinicians.

- *Somatic approaches articulate concrete methods of cultivating and sharing positive affective states.* Attention is given to help clients develop resources that enhance their level of vitality and well-being and their capacity for self-care and self-regulation.
- *Somatic approaches provide concrete access to behavioral change.* Simple changes such as how to stand or walk are expanded into more complex changes like how we reach towards others or pull away, and move on to greater interactive complexities such as sexuality.

As noted, *Body–Mind Psychotherapy* incorporates the principles of Bonnie Bainbridge Cohen's Body-Mind Centering. Advocating self-knowledge through direct bodily experience, BMC supports the immersion in experiential physiology at the micro levels of cellular and molecular behavior, where body and mind are indistinguishable. Our conscious awareness tends to reside in the larger orders of affects, cognitions, and sensations, with little attention paid to the subtle dynamic processes out of which they arise. We now know that intelligence extends far beyond the human brain to every cell of the body. BMC trains its practitioners in the direct conscious experience of the processes of cellular metabolism and energy production so that they can connect with the various systems of the body's intelligence: cellular intelligence, chemical intelligence, vascular intelligence, neurological intelligence. I believe that this aspect of BMC, which brings us to experience ourselves on the microscopic level, is of the greatest consequence. The genius of both Bonnie Bainbridge Cohen and Susan Aposhyan is that they guide us to experience ourselves at smaller orders of magnitude than we normally use in the conscious perception of our embodied experience. The belief is that with focused attention, microscopic processes can be brought within perception's reach, no longer condemned to remain implicitly preconscious or unconscious. Bion, in his paper "Evidence", wrote that "we may be dealing with things which are so slight as to be virtually imperceptible, but which are so real that they could destroy us almost without our being aware of it." Body–Mind Psychotherapy reminds us that the focus on macro awarenesses may well curtail a rich web

of accessible direct microfeedback, if we center our attention on the subtler internal aspects of our experience.

As if this were not enough, *Body-Mind Psychotherapy* goes further in building its theoretical foundation. Aposhyan uses the wisdom of evolutionary psychology, highlighting the fact that the evolution of the nervous system is the result of the body's need for a communication network that links all body systems together. Anchoring this aspect of her work in the affective neuroscience of Jaak Panksepp (reviewed in Part II) that shows how evolutionarily based emotional operating systems set up our fundamental brain-body states and movement behaviors, adding Damasio's somatic marker theory, Hebb's rule for neuronal connections and associations, and the fundamental work of Schacter and Singer on how implicit memory unconsciously dictates behavior, BMP offers a clinical approach that focuses on facilitating cooperation among all systems, thus supporting the integrative role of the nervous system.

From these principles, Aposhyan unfolds the work of integrating cognitive and somatic processing by using the brain as a modulator and coordinator, rather than controller, of the various body systems. She identifies self-talk and body sensations as distinct players in the mutual brain-body feedback loops and weaves them together to generate behavioral changes that in turn support brain changes. BMP is about balance; its intent is to optimize the brain-body partnership, to facilitate an internal cooperation that can shift the emotional set-points that affect brain states and baseline moods. For Aposhyan, somatic techniques are not tacked on to psychological practice. Following the conclusions of mother-infant attunement research which calls for the inclusion of the nonverbal in the playing field of treatment, Aposhyan's sophisticated understanding of the realm of the body gives us a rich array of somatic resources from which to interface with psychological states.

### ***Trauma and the Body***

#### *A Sensorimotor Approach to Psychotherapy*

This is a book that intends to spread the word about the irrefutable value of somatic principles in the world of traditional psychology. *Trauma and the Body* addresses the traditional psychological market with theoretical underpinnings and treatment approaches that are clearly anchored in body-centered tradition. In the introduction, the authors write: "...while the majority of therapists are trained to notice the appearance and even the movements of the client's body, thoughtful engagement with the client's *embodied* experience has remained peripheral to traditional therapeutic intervention." They make the point that given the new research, the body is central and cannot be left out of the therapeutic field. Although the methods used in this book address trauma, the sensorimotor approach is equally applicable to the nontraumatic range of childhood and family dynamics that shape personality and interactive capacity.

The many influences that have gone into this broadly integrative work weave together a who's who of the fields of developmental and affective neuroscience, trauma, and somatic psychology. Ogden, Minton, and

Paine draw on neuroscience to construct the underlying rationale that supports the introduction of somatic interventions into the traditional model of the “talking cure.” Readers will find most of the neuroscience principles used in sensorimotor psychotherapy reviewed in Parts I and II of this neuroscience book review series.

*Trauma and the Body* is divided in two sections: theory and treatment. Part I is devoted to theory that draws on the work of contemporary experts in the area of trauma treatment, neuroscience, attachment, and dissociation to (1) provide the rationale for the somatic treatment of traumatic disruptions in physiological and emotional regulation; (2) describe how the body develops a low tolerance for arousal and falls prey to survival-oriented autonomic hypo and hyper arousal and dysregulation; (3) make the distinction between interactive and autoregulation; (4) explain the various kinds of orienting responses and the stages, for the traumatized person, of reintegrating sensory responses; (5) show how to recognize survival-related defensive responses and reestablish adaptability and flexibility; (6) describe the psychobiological systems that have evolved to support adaptive responses that optimize survival. The last chapter of this first part features as guest authors the well-respected neuroscience researchers Ruth Lanius, Ulrich Lanius, and Janina Fisher, who show how neuroimaging technology has made possible the detailed study of how trauma impacts both cortical and subcortical processing of information.

Part II of *Trauma and the Body* describes the treatment philosophy and techniques of sensorimotor psychotherapy, putting into practice the theoretical material described in the previous chapters. The work emphasizes what has already been proven to be sound approaches to working with trauma: careful pacing, clear boundaries, and gradual reconnection with the body. Ogden, who acknowledges 30-plus years of professional collaboration with Ron Kurtz, draws heavily on his Hakomi method to describe techniques that focus on the organization of experience in the present, rather than on insight, and on mindfulness techniques that facilitate the regulation of arousal. Issues of transference and countertransference specifically related to working somatically with a client are covered and will no doubt be useful to those who are new to working with the body.

Treatment itself is divided into three phases. Phase 1 describes the development and use of somatic resources that help clients to bring their trauma related autonomic dysregulation under greater conscious control so as not to exacerbate symptoms. This first phase, which expands a client’s self-regulatory skills, paves the way for the processing of traumatic memories in Phase 2. The renegotiation of trauma involves developing a sense of mastery over the intense feelings, body sensations, and impulses associated with the traumatic memories. Very much following a protocol developed in Peter Levine’s *Somatic Experiencing*, this chapter reviews how memory is safely reevoked, and how resources are retrieved, how empowering actions are discovered and executed. In Phase 3 the focus of treatment shifts to establishing a life beyond trauma. Somatic interventions are used to help clients resolve relational issues, reengage society, tolerate increased intimacy, take risks, and mediate change. Utilizing body states and movement together with

highlighting increasing tolerance of positive affect and capacity for pleasure create a template the client can use to practice new ways of being until they become automatic tendencies.

The authors give attention to the concerns that could be experienced by therapists who are new to the idea of working with the body and find this new terrain intimidating. Having personally struggled with professional encounters where clearly, the idea of working from a body-centered perspective was considered marginal, I am grateful to the authors for addressing this educational aspect. For those of us who have colleagues who want to be introduced to, or better understand, the somatic approach, this book is a great educational reference.

Sensorimotor psychotherapy can be woven in psychodynamic or cognitive-behavioral models of therapy, including EMDR, to help bring together body and mind. It combines the best of all worlds by examining each level of the triune brain-information processing separately, interweaving cognitions, emotions, and sensorimotor responses, supporting the interplay between bottom-up and top-down interventions. For example, although top-down techniques offer effective *management* of dysregulated body states and can provide significant relief, they do not fully address the issues. In sensorimotor psychotherapy, the top-down direction is harnessed to *support* sensorimotor processing: through mindful tracking (top-down) of physical sensations and impulses (bottom-up) this approach further develops the tools to work with the body and mind mutual feedback loops. This extremely well-written book will leave the reader with a clear understanding of how harnessing the principle of biological completion helps transform personal tragedy into personal triumph.

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**THE IMPLICIT, THE INTERSUBJECTIVE  
AND THE FLOW OF CONSCIOUSNESS**

*It is about experience as it is lived.*

— *Daniel Stern*

***The Present Moment*** by Daniel Stern. W.W. Norton, 2004

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The present moment can hold the past within its small grasp, and the past is only “alive” when on the stage of the present moment. Yet, because past, present, and future are so intimately intertwined, it can be difficult to remember and reflect on the *now* of our lives. Both Aposhyan and Ogden emphasize the fact that working somatically—in particular, when reclaiming the self out of traumatic events—entails working in the present. Stern’s inquiry into the nature, structure, and duration of the present moment is

therefore both appropriate and particularly helpful. Stern's philosophical discussion about what comprises the present moment gradually reveals how the architecture of the present moment permits us to make sense of experience directly, while it is happening, thus allowing us to be in our lived story as it evolves—in the *felt present*.

Daniel Stern is the author of the highly acclaimed *The Interpersonal World of the Infant* and several other landmark books on the mother–infant relationship. His appreciation of the present moment came about in the 1960s and 1970s when he began to use film and video to study mother–infant interactions. It is from the frame-by-frame examination of these dyadic interactions that the pivotal mother–infant attunement research evolved. He writes: “These tools gave me a sort of microscope to see an interaction unfold. A fascinating world opened up. I grew to realize how much occurs in a moment that lasts only seconds. I began to think of these moments as the basic building blocks of experience” (pp. xi–xii). Stern tells us that the frame-by-frame process remained unexplored outside of the mother–infant arena, and its greater potential “doggedly” followed him for several decades.

Healing occurs in the present moment. This book is not about explaining the present in terms of establishing and interpreting associative linkages with the past, as do usual clinical approaches. If we are not in the present moment, Stern writes, we are lost in the past or in the future, in our memories, in our dreams, in our conditioning. In my view, *The Present Moment* takes its place next to Eugene Gendlin's *Focusing* (1981), the little book that has been so foundational to somatic theoretical development. Just as the concept of the felt sense brought a new focus to the clinical process, so does Stern's use of the felt present moment. The technique of focusing was born out of Gendlin's perceptive observation that patients who benefited from therapy did something different within themselves, namely, use their bodies to experience their feelings. In a similar fashion, when Stern focuses his attention on the micro-analysis of a patient's experiential moment, a different therapeutic sensibility arises that opens subtle levels of communication between the therapist and the patient. Of course, focusing on the present moment is not new, but Stern's attention to the *micro-moment* expands the therapist–patient ability to explore the interplay between three basic neuroscientific concepts: implicit knowledge, intersubjectivity, and the flow of consciousness.

In order to cue us into the incredible wealth of detail packed within the present moment, Stern developed the *micro-analytic interview*. The micro-analytic interview reconstructs an event of short duration—rarely more than a minute—and the recounting focuses on the smallest remembered happening, feeling, thought, or action, which is told and retold until it is exhausted of remembered content. He points out that although the micro-analytic interview is an “after-the-fact telling,” it sheds light on the speed of the information that streams through consciousness. The result is a layered, co-constructed narrative, a *composite narrative*, which is not the lived experience itself, yet moves the therapeutic dyad closer to treating the lived moments with increasing mindfulness. The composite narrative is analogous to the micro-analysis

of the mother–infant interactions examined frame-by-frame. Although of extremely short duration, the composite narrative goes far deeper than the normal telling of an event and sets the tone for the therapeutic work. In a therapy session, the clinician–patient dyad moves along together, linking present moments. Stern writes: “A therapy session (or any intimate dialogue) is made up of a series of present moments that are driven forward by the desire for intersubjective contact and an enlargement of the shared intersubjective field” (p.219). For Stern, moments of change, whether therapeutic or intimate, happen when the present moment collides with the past. It is in the moment of their coming together, in the here and now, in the way in which now is experienced between two people, that the past is rewritten.

Stern has developed a detailed vocabulary with which to discuss the intricacies of the present moment. He takes us into the *now moment* of emergent properties that results from the patient–therapist’s *moving along process*. He describes how a now moment can become a *moment of meeting* “that implicitly reorganizes the intersubjective field so that it becomes more coherent, and the two people sense an opening up of the relationship, which permits them to explore new areas together implicitly or explicitly” (p. 220). Memory plays an important role in the structure of the present moment. The *present remembering context* refers to how the totality of what is going on in the moment triggers the selection of memory fragments that arise in consciousness. Neurologically, the past is always being permanently revised, based on the new information emerging in the moment, both as a neural pattern and as an experience of recall. In the present remembering context, small pieces of the past are continuously brought up to be updated. The emergent properties within now moments and moments of meeting permanently alter the selection of the past brought to bear on our assessment of the present.

Central to Stern’s micro-analysis of the present moment is a newfound access to *nonverbal and implicit events* that usually do not emerge in the broader therapeutic dialogue. The nonverbal implicit level plays an important role in the creation of the context within which the verbal explicit level can emerge. The relationship between conscious and unconscious has been well studied, but the relationship between the implicit and the explicit is far less well known. In the implicit, Stern realizes, thinking is largely in the form of visual, sensorimotor, visceral images, and feelings—not language. To create a coherent therapeutic narrative, the speaker must transduce images, sensations, feelings, and intuitions from the implicit domain into the verbal explicit domain. And, conversely, the listener must transduce the speaker’s words back into images, sensations, feelings, and intuitions to connect the speaker to his or her own implicit experience. When implicit and explicit interweave in this way, Stern notices that the impact of the exchange is more affective than cognitive and the “whole body and mind is gathered up in reappraisal.” Looking through the lens of the present moment, Stern describes how the clinician who becomes simultaneously and equally attentive to a patient’s implicit nonverbal experience in concert with its explicit verbal content greatly enriches the shared relational field and thus increases the spectrum of therapeutic possibility.

Stern's *The Present Moment* is inspirational reading, reminding us that less is more and that attuned relationship in a felt present is powerful medicine. The book poetically does justice to its William Blake opening quote: *To see a World in a Grain of Sand and a Heaven in a Wild Flower...*

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## NEUROSCIENCE AND PSYCHOTHERAPY

*Although the idea that the brain is built by experience during development and rebuilt during psychotherapy feels new, it was in fact suggested by Freud at the end of the 19<sup>th</sup> century.*

— Louis Cozolino

***The Neuroscience of Psychotherapy: Building and Rebuilding the Human Brain*** by Louis Cozolino. W.W. Norton, 2002

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In his book, which is part of Norton's series on interpersonal neurobiology edited by Daniel Siegel, Louis Cozolino draws on neuroscience to substantiate the psychological theories of how people change. Inspired and supported by Dan Siegel and Allan Schore, he uses the lens of neuroscience to consider psychotherapy as a tool for rebuilding the brain. Cozolino writes for therapists and using a framework in which neural integration plays a central role in the growth process, he gives us "new insights into the possible mechanisms underlying how psychotherapy works" (p. x). What emerges is a new paradigm of the psychotherapist as neuroscientist. This paradigm can serve as a useful guide for somatic practitioners as well.

Cozolino finds that the recent discoveries in the neurosciences seem to support the value of psychotherapy as an agent of change. With this scientific support comes a renewed optimism for the view of the brain as an organ of adaptation able to remain flexible and to benefit from enriched environments *throughout life*—what is now called *use-dependent development*. The brain's use-dependent adaptability, which is repeatedly emphasized in the books evaluated in this review, counters once and for all the old belief that can now be filed in our archives, that the brain is a relatively static entity, determined by the interaction of genetic preprogramming and early childhood experiences.

Cozolino presents his view of what is most interesting and relevant in the neuroscience research, inviting readers to become part of the informed clinicians who test new therapeutic applications. In a beginning chapter on rebuilding the brain, he lays out his view of how psychotherapy and neuroscience come together. He writes that regardless of theoretical orientation, "from the perspective of neuroscience, psychotherapy can be understood as a specific kind of enriched environment designed to enhance the

growth of neurons and the integration of neural networks” (p. 27). The growth and connectivity of neurons are the basic mechanism of all learning and adaptation. Given that at the heart of psychotherapy is an enriched learning environment, by necessity it must contribute to the building and rebuilding of neural networks. With new learning comes the process of neurogenesis—the growth of new neurons—and with the integration of new states of being comes the branching of dendrites as the brain expands and changes the connections between existing neurons. Thus Cozolino concludes that “all forms of therapy are successful to the degree to which they have found a way to tap into processes that build and modify neural structures within the brain” (p. 45).

From the basic neuronal building blocks to the complex organization of experience, Cozolino describes the development and organization of the healthy brain so that we have a reference from which to understand the experience of the private and social self and the pathology of such problems as perceptual distortions and defense mechanisms. In an engaging way, he gives an important place to the role of the different memory systems in psychotherapy noting that “just about everything we do in therapy depends on the patient’s memory” (p. 84). The descriptions of the healthy brain cover the executive brain, laterality, the interpersonal sculpting of the social brain, and the construction of the narrative self.

Cozolino uses the work of Panksepp and Schore to show how “emotions reflect our ability to subjectively experience states of our nervous system” (p. 31). Psychotherapy helps individuals experience increasing levels of positive and negative affect. By building tolerance for stress and increasing levels of arousal, psychotherapy expands neural organization and creates networks of descending control to help inhibit and regulate affect. He also relies on the work of Dan Siegel to reflect on the importance of language and narratives in psychotherapy. Language, he notes, particularly in the form of stories, appears to be a key mechanism of integration. Referring to both Siegel and Rossi (see following review), he describes how a storyline includes verbal and nonverbal expressions of emotion, activates both left and right hemispheres as well as cortical and subcortical processing. There appears to be at least three levels of language functioning during psychotherapy: (1) a *reflexive social language* that maintains ongoing communication; (2) an *internal dialogue* that guides, and is guided by, our thoughts and behavior and which often differs from our social language, allowing for survival-enhancing deception; (3) a *language of self-reflection*, which examines the social language and the internal dialogue. It is this third level of language that is most active in psychotherapy. It allows us to know what we are feeling about our thoughts and what we think about our feelings. It is a higher level of integration utilizing top-down and left-right processes to blend cognition and affect. These integrations seem essential to positive change.

The bridges between psychotherapy and neuroscience are most solid in the treatment of stress, anxiety, trauma, and codependency. Cozolino demonstrates that “because we now know that the mind and the brain, and nature and nurture, are one and the same, all of the disorders we have thought of as ‘psychological’ need to be reframed to include neurobiological correlates and mechanisms” (p. 319). And

so, he shows us how we can use the new science to diagnose, treat, and educate our clients who suffer from the disorganization of experience leading to narcissism, pathological caretaking, an anxious and fearful brain, and the continued effects of trauma. Taking into consideration the reality of damage or dysfunction in the brain itself, he suggests that treatment should be delivered in a context of support. Treatment should give attention to creating scaffolds for erratic executive control and to developing skill-building techniques for disorganized functions. He joins the rank of those who believe that psychotherapy must expand its horizons and break down traditional barriers to reach out to other disciplines. In his case, he sees the need to connect to such approaches as cognitive rehabilitation.

Cozolino repeatedly emphasizes that “the impact of an enriched environment has demonstrated the brain-building capacity of positive experiences throughout the lifespan” (p. 303). He concludes that it is in the understanding of the workings and limitations of our brains that we can take an essential and mindful step in the growth of human consciousness and move toward greater compassion for ourselves and others.

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## GENE EXPRESSION AND NEUROGENESIS

*Experiencing creative moments is the phenomenological correlate of a critical change in the molecular structure of proteins within the brain associated with the creation of new cell assemblies, memory and learning.*

— Ernest L. Rossi

***The Psychobiology of Gene Expression*** by Ernest L. Rossi. W.W. Norton, 2002

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Ernest Rossi has dedicated his life to developing therapeutic applications based on the merger of biology and psychology. Utilizing the biological nature of the human mind, he is a pioneer in what Nobel Laureate in physiology Eric Kandel calls the new science of mind. Rossi tells us that contrary to past beliefs, we now know that the human brain is capable of generating new brain cells throughout the life cycle. We are not, he reminds us, prisoners of our genes (nature) or environment (nurture).

In 1953, when James Watson and Francis Crick discovered the structure of the DNA, they revolutionized biology by providing a framework for understanding how information from genes controls the function of cells. This led to further breakthroughs: how the needs of the cells regulate the protein production of the genes, and how the course of development turns genes on and off to establish the body plan of an organism. Genes, Rossi writes, are an active society within every cell of our brain and body that respond in a cooperative and adaptive manner to signals from our environment. They also respond to our inner environment: Our hopes and fears, our thinking, passions, and strivings all can turn families of genes on and off to make the proteins that generate new brain cells.

Rossi's inspiration comes from Eric Kandel's seminal paper "A New Intellectual Framework for Psychiatry" (1998), from which he quotes the following:

Insofar as psychotherapy or counseling is effective and produces long-term changes in behavior, it presumably does so through learning, by producing changes in gene expression that alter the strength of synaptic connections and structural changes that alter the anatomical pattern of interconnections between nerve cells of the brain....Stated simply, the regulation of gene expression by social factors makes all bodily functions, including all functions of the brain, susceptible to social influences. These social influences will be biologically incorporated in the altered expressions of specific genes in specific nerve cells of specific regions of the brain.

As Rossi outlines the foundation of functional genomics, he unfolds his rationale for the creation of a new discipline that he calls *psychosocial genomics*. When it comes to genes, Rossi tells us, we are still in kindergarten. He hopes that his book serves as an inspiration and propels us to explore the possibilities of functional genomics to expand the effectiveness of mind-body psychotherapy.

How then, asks Rossi, can we maximize the expressive potential of our genes? Given that novelty or psychological shock can equally trigger molecular transformations in the brain, leading either to constructive learning or psychopathology, can we have a "psychobiological dialogue" with our genes that would modulate their expression in the positive direction of self-creation and physical healing? *The Psychobiology of Gene Expression* gives us the neuroscience of gene expression and a beginning exploration in how we may creatively facilitate the psychodynamics of gene expression, neurogenesis, and healing. Readers interested in a brief overview of Rossi's recent work can refer to an article entitled "The Genomic Science Foundation of Body Psychotherapy" in Volume 3, Number 2 of this journal.

### ***The Fundamentals of Gene Expression and Neurogenesis***

The brain, by design, strikes a balance between *circuit permanence* and *circuit plasticity*. We saw in Part I that the brain's plasticity is an essential feature of our capacity to learn and change, and its permanence stabilizes our psychological development, allowing us to establish long-lasting attachments. Rossi links brain plasticity to gene expression. A plastic brain has an open capacity to learn, adapt, and reorganize. Although in early life the brain has specific sensitive periods of development, its growth is not exclusively limited to these windows. Studies have shown that throughout our lives, repeated stimuli trigger the genes to transcribe and translate new proteins and stimulate the growth of new synapses. Over the lifespan, every part of the nerve cell is altered by its on-going responses to a stimulus-rich environment. Even in the adult, the receptive properties of the brain are clearly not fixed but shift within certain yet-to-be-quantified limits.

According to Rossi, three factors promote the gene expression that optimizes the constructive learning that leads to brain plasticity, neurogenesis, and healing at the molecular level: (1) *novelty*, (2) *environmental enrichment*, and (3) *exercise*. To influence the mechanisms of gene expression, he therefore proposes a therapeutic approach that maximizes the use of novelty, environmental enrichment, and creative experience. Rossi believes that the genetic genius of the brain and body can be unlocked, that we can learn to turn our genes on and off to create a better brain, improved health, and added well-being.

Rossi's work with gene expression comes as the crowning of a long career as a pioneer in new approaches to mind–body healing. From the beginning, with the publication of *Dreams and the Growth of Personality* (1972/1985), Rossi explored the implications of early research that documented how the psychological experience of novelty and enriched environments was encoded as new memory and learning in the organic structure of the brain. He is a pioneer of the widely accepted somatic approaches that cultivate positive affective states and empowering resources. As a Jungian analyst and close collaborator of Milton Erickson, whose *Collected Works* he edited, Rossi is a master at developing a language that elicits healing resources from the world of dreams and the unconscious—what he has come to call “the novelty–numinosum–neurogenesis generative cycle of consciousness.” Those who, over the years, have had the opportunity to observe Rossi's therapeutic demonstrations at conferences have witnessed how strongly he believes in the power of positive curiosity and wonder, and how enthusiastically he communicates his belief in the creativity of the unconscious. His nondirective way of holding the therapeutic space fosters the emergence of the implicit and supports the psychological utilization of biological wisdom.

In previous books, Rossi has presented his 4-stage creative process which he sees as the key to healing and regeneration. Briefly, the four stages are as follows: (1) Preparation and data gathering; (2) Incubation; (3) Illumination; (4) Verification. In *The Psychobiology of Gene Expression*, Rossi continues to develop the pathways that maximize the vital link between consciousness and health. Building on the foundation of his 4-stage creative process, he explores the new terrain of the Human Genome Project and articulates how the research data brings fresh vision and possibility to our view of human experience. With him, we take our first steps in exploring the surprising research on behavioral state-related gene expression: how behavioral states such as sleeping, dreaming, vigilance, emotional arousal, or depression are associated with different patterns of gene expression. We learn how a special class of genes, called *immediate early genes*, can respond to life events and psychosocial cues within minutes. We see how another class of genes, the *experience* or *activity-dependent genes*, generate the synthesis of proteins that encode new memory, learning, and behavior. It seems that our daily and hourly life experiences can modulate gene expression in ways that actually change the physical structure and functioning of our brain.

This book is full of fascinating facts. For example, Rossi explains how the genetic basis of individuality comes from the three million small variations in our genes—called *single nucleotide polymorphism*—which give each of us a unique psychogenomic endowment. This is thought to be the source of our unique

perceptions, potentials, and problems, as well as of the uniqueness of our individual paths to self-realization. This book demonstrates theory with clinical vignettes, session excerpts, and language suggestions that use implicit processing heuristics to facilitate gene expression. This book also gives self-care suggestions for those who want to put theory into practice in their personal lives. From highly theoretical color diagrams on the temporal gene expression mapping of central nervous system development to self-help suggestions on how to orchestrate our days to optimize our own genetic regeneration, Rossi moves from the theoretical to the therapeutic to the practical with the ease of a man of vision who also has a personal interest in the daily steps that optimize longevity and graceful aging.

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### HOW THE WORLD COMES TOGETHER

*The essential functions of incoming signals are to trellis, shape, and otherwise sculpt the intrinsic activity to yield a survival-facilitating, me-in-the-world representational scheme.*

— Churland & Llinás

***Sensory Integration: Theory and Practice*** by Anne G. Fisher, Elizabeth A. Murray, & Anita C. Bundy (Eds). F.A. Davis Company, 1991.

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Sensory integration theorists ask the following question: How do we know reality? We now move out of the microscopic genomic level to a larger order of magnitude in order to consider how the external world is actually represented in the brain. As we saw in Part I, each and every perception of the world around us is actively constructed from the building blocks of individual sensory cues such as edges, contours, line orientation, color, form, pitch, volume, and movement. Sensory experiences include touch, movement, body awareness, sight, sound, and the pull of gravity as well as motor planning and the ability to adapt to incoming sensations. Each perception is processed in a separate region of the brain and, by the process of *reentry*, interfaces with all other regions to form a composite picture of who we are physically, where we are in space, and what is going on around us. Sensory integration is the critical brain function that produces this composite picture and provides the crucial foundation for complex learning and behavior. Given the absence of a computer-like central processor in the brain, it is believed that reentry could be the unique, single most important feature of higher brain organization, the vital component of integrated, complex cognitive tasks. If reentrant interactions are blocked, entire sections of consciousness disappear.

#### ***Jean Ayres and the Science of Coherence***

Understanding the therapeutic importance of sensory integration comes from the work of Jean Ayres, an occupational therapist who was interested in the way in which disorders of sensory processing and motor planning interfere with life function and learning. Ayres died in 1988, and this book, published in 1991

honors her work. Directly or indirectly, Sensory Integration has had an effect on somatic psychology. We include it in our review because it offers a marvelously inclusive and specific introduction to this particularly important aspect of working with the nervous system. Ayres' research, theory, and intervention strategies are anchored in the fields of neuropsychology, neurology, physiology, child development, and psychology. As somatic practitioners working with the nervous system, a closer look at the important information this approach has to offer is helpful to better recognize difficulties in our adult patients who bear the imprint of undiagnosed sensory integration problems.

For most of us, effective sensory integration occurs automatically, unconsciously, and without effort, developing in the course of ordinary childhood activities. But for some, sensory integration does not develop as efficiently as it should. When the process is disordered, a number of troubles in learning, development, or behavior may become evident: The integration process can be inefficient and the resulting sensory dysfunctions demand various degrees of effort and attention that put undue stress on daily functioning. How much a person efforts to compensate for their sensory dysfunction often remains in the sphere of their own private anguish. It is therefore essential to recognize that sensory integration plays an important role in child development and that the result affects the adult's adaptive capacities. Awareness of a patient's sensory integration history can give us important clues to his or her sense of the world and self. It can be a valuable guide in making therapeutic experiences available that are specific to that patient's needs for growth and maturation.

A basic tenet of sensory integration holds that because mind and brain-body are interrelated, meaningful activity that promotes the health and development of one does so for the other. Ayres brought to the forefront an awareness of the fact that sensory integrative dysfunction can have far-reaching effects that interfere with academic learning, social skills, and self-esteem and lead to problems that affect a person's relationship with self and the world: over- or undersensitivity to touch, movement, sights, or sounds; delays in speech, motor skills, or academic achievement; physical clumsiness or carelessness; social and/or emotional problems such as poor self-concept; unusually high or low activity level; lack of self control, impulsivity and distractibility; inability to unwind or self-calm; and difficulty making transitions from one situation to another. Sensory information that remains in dissociated fragments may cause consciousness itself to shrink or split. Sensory integrative problems are not confined to children with learning disabilities; they affect all age groups and all intellectual levels and socioeconomic groups. Underlying sensory dysfunction may be caused by the following problems:

- *Premature birth.* With a higher rate of survival than ever before, premature infants enter the world with fragile, easily overstimulated nervous systems and multiple medical complications. Caregivers need to learn how to avoid overstimulation and give premature infants the sensory nourishment required for optimal development.

- *Autism and other developmental disorders.* The hallmark of autism is severe difficulty with sensory processing. Autistic children seek out unusual quantities of certain types of sensations and are hypersensitive to others. Autism is infrequent, but traits similar to autism are often seen in children and adults with sensory processing disorders. Ayres showed that improving sensory processing leads these individuals to more productive contacts with their environment and the people in it.
- *Learning disabilities, delinquency, and substance abuse.* As many as 30% of school-age children are estimated to have learning disabilities. Most of these children, although normal in intelligence, are likely to have underlying problems with sensory integration. Numerous studies indicate that repeated school failure opens the door to self-destructive activities and that these children are at risk for later delinquency, criminality, alcoholism, and drug abuse. Interventions that take into account possible problems with sensory integration may interrupt the vicious cycle of failure and prevent serious social problems later in life.
- *Stress-related disorders.* Difficulties with sensory integration that begin in childhood are often not outgrown. Adults who suffer from sensory inefficiencies cannot perform optimally in the workplace and therefore suffer from accumulated stress. There is mounting evidence that stressed adults are more prone to child abuse, violence in the home, and problems that pass from generation to generation. Recognition of the sensory processing component of these problems contributes an important element in aiding people to achieve greater satisfaction in their home life and competence in their work.
- *Brain injury.* Brain trauma caused by an accident or stroke can have profound effects on sensory functioning.

Sensory integration has developed a standardized protocol\* to evaluate sensory responses and diagnose disorders. Standardized testing consists of structured observations of responses to sensory stimulation, posture, balance, coordination, and eye movements. Meaningful play is the primary treatment medium and in sensory integration therapy, patients are guided through selected activities that help them organize successful responses based on their motivation and point in development. Intended for both entry-level and advanced practitioners, the authors give us insight into the behaviors that issue from abnormalities in sensory integration. They present an in-depth discussion of the clinical picture; hypothesize about the neurological basis that underlies the behavioral deficits seen in clients with sensory dysfunction; provide the philosophical, ethical, and practical background to interpret the results of an evaluation; and implement a comprehensive treatment. The occupational therapists who authored this book have brought together a rich array of sensory bridges to help those who experience difficulty with sensory processing and impaired motor planning that affect their social skills.

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\*Test standards are available from *Sensory Integration International*, PO Box 5339, Torrance, California 90510-5339.

## CONCLUSION

*Consciousness is like a sense organ perceiving inwardly.*

— *Marc Solms*

The trend in the current literature is clearly moving toward developing an increasing awareness of micro-processes, toward relating to ever smaller increments of our experience. The authors reviewed emphasize the importance of increasing our capacity to pay attention to, penetrate, and affect smaller units of ourselves. They also point to the fact that this would not be possible without allowing the nonverbal and implicit reality of our bodily experience to have an equal voice with the verbal and the explicit.

As the principles of neuroscience create a new scientific lens through which to look at the brain–body, the biological reality of inner life is coming into focus. One could argue that the field of work that addresses the body–mind is thousands of years old. Bringing awareness to the subtleties of bodily processes as they emerge, cultivating consciousness in order to contact the sources of inner knowledge, the secrets of creativity, intuitive wisdom, and healing constitute the core of yoga and meditation and other disciplines that are older and more extensive than the fields of psychology or neuroscience. Yet, as the “new kid on the block,” neuroscience anticipates that its biological analysis may possibly unveil the secrets of the human mind. It is quite possible that, in a way that speaks to our modern sensibility, it will.

Neuroscience and psychology, and I will add somatic psychology, can now meet at the convergence of objective scientific data and the subjective experience of self, embodied self, and self-in-relationship. It is becoming apparent that in the convergence of these disciplines, no one field takes precedence over the other. It is my belief that the long tradition of somatic psychology and its clinical importance now stand poised to find their rightful status in relation to neuroscience and psychology. For their part, psychoanalysis and psychotherapy seek to help the brain organize its internal representations so that we can experience a harmonious resonance between self and reality. For its part, somatic psychotherapy employs the body’s natural regulatory mechanisms to support the brain’s relationship to and interpretation of its own sensory experience. It contributes unique approaches to encourage new neurological connections, organize and facilitate neural interconnectivity, elicit dormant impulses, nurture neurological deficits, and stabilize activation. Somatic practices are offering integrated, neurobiologically sound theoretical frameworks and clinical applications. There is every indication that serious research opportunities will become available to further grow and validate our field’s important contribution.

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