Neurobiological Foundations for EMDR Practice
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To my family,
the source of my purpose, pride, joy, and inspiration.
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Preface

Henry David Thoreau wrote, “Do not worry if you have built your castles in the air. They are where they should be. Now put the foundations under them.” This notion of dreaming and then following your imaginings has been the impetus for this book, an undertaking dedicated to constructing a neurobiological foundation for eye movement desensitization and reprocessing (EMDR) practice and research by integrating various research bases that have not, as yet, found themselves equally and comprehensively addressed in a published work. Twenty years of EMDR practice has made it undeniably apparent that in order to truly understand, practice, and research this astonishing and mysterious form of psychotherapy, one needs to be aware of and appreciate the neural mechanisms underlying consciousness and information processing, human development and attachment, disorders of information processing that manifest in the majority of the psychopathology treated by clinicians, trauma and dissociation, and the relationship of stress and trauma on immune function and health.

Given that EMDR is so profoundly guided by an information-processing model, it is crucial to examine how it measures up to researched neurobiological models of consciousness and information processing. The more that this model is seen to be consistent with neurobiological research (illustrated in later chapters), the more the model will be bolstered and grounded.

The best way to generate truly comprehensive neurobiological theoretical models of EMDR, which provide the best blueprints for research, is through a comprehensive consideration and understanding of the neural underpinnings of information processing. If we can ask how EMDR’s sensory stimulation and treatment protocol impact the central neural circuitry of information processing and facilitate its repair, we can generate detailed theories that are more amenable to research.

For centuries, society has recoiled from the notion that trauma and neglect are pervasive. A great deal of confusion exists in both our society and our profession regarding trauma, the extent and pervasiveness of familial neglect, and the nature of dissociative processes. Rather than understanding that our history as a human race is profoundly traumatic, we choose to believe
that we have survived and adapted. We apply the same lack of vision to our children, believing that come what may, they are resilient.

Within our various professions, academicians at the most prestigious universities tell us that traumatic and dissociative disorders are the creations of suggestive therapists and false memory syndromes. We in the traumatology community try to shed light on this darkness, but psychological and phenomenological explanations are insufficient. It is only through a neurobiological understanding that our ideas will be given the utmost credibility. We must, with respect to our practice, be able to understand and also illustrate clearly to others that the unusual and often bizarre symptoms that we label as traumatic and dissociative disorders are the outcomes of dysregulated, evolutionarily based, neural action systems that are completely predicated by the nature of the attachment between infants and their caretakers. This can be accomplished only by a neurobiological foundation that informs our understanding of human development, attachment, disorders of attachment, and information processing.

Finally, given the myriad manifestations of somatic symptoms and medical illnesses that many of our patients present with, understanding the relationship between stress, trauma, and immune function is imperative. It is crucial that we understand and are able to differentiate somatic or somatoform symptoms from the immunoinflammatory illnesses, which are now referred to as medically unexplained symptoms, such as fibromyalgia, systemic lupus erythematosus, reflex sympathetic dystrophy, Hashimoto thyroiditis, Graves’ disease, chronic fatigue syndrome, and others, which will be detailed in this book.

Understanding these illnesses and their differentiation from other somatoform symptoms has its greatest import with respect to treatment implications. Somatic symptoms, often conceptualized as manifestations of trauma in the body, are often effectively targeted and treated with EMDR, as part of a comprehensive and phased trauma treatment. However, patients presenting with psychological difficulties (whether or not trauma related) and medically unexplained symptoms must also be referred for treatment to endocrinologists, oncologists, or immunologists in order to attempt to reestablish the hyperimmune function in these patients, which is apparently causal with respect to their illnesses.

It is my hope that the information presented in this writing will be received as informative and clearly integrated, while the presentation of the subject matter provides for an ease of understanding.
First and foremost, I would like to begin by saluting and thanking Francine Shapiro for lighting and spreading the flame of eye movement desensitization and reprocessing (EMDR), a fire at which we and our patients have warmed ourselves and, thereby, grown.

I would also like to express my enormous admiration and gratitude to Robbie Dunton, Francine Shapiro’s right hand from the beginning, throughout the development of EMDR, and in the founding and continuance of the EMDR Institute.

To Sheri Sussman, executive editor at Springer Publishing, I would like to express my admiration and immense gratitude for her colossal assistance in the organization and editing of this book.

My profound thanks go to Tom Jennings for his invaluable assistance with major portions of the manuscript.

I would also like to thank my wife, Sherrill, and daughter, Danielle, for their vital creative assistance with portions of this book.

Finally, I would like to honor the spirit of my father, Berthold Bergmann, a dedicated physician whose lifelong amazement at the wonders of physiology and neurobiology infuse every aspect of my professional curiosity and every page of this book.
CHAPTER 1

Introduction

The human mind is difficult to investigate, but the biological foundations of the mind, especially consciousness, are generally regarded as the most daunting. Antonio Damasio (1999) has argued that if elucidating the nature of the mind is the last frontier of the life sciences, consciousness often seems like the last mystery in the illumination of the mind. He notes,

The matter of mind, in general, and of consciousness in particular, allows humans to exercise to the vanishing point, the desire for understanding and the appetite for wonderment at their own nature that Aristotle recognized as so distinctively human. What could be more difficult to know than to know how we know? What could be more dizzying than to realize that it is our having consciousness which makes possible and even inevitable our questions about consciousness? (p. 4)

Echoing this sentiment, Alan Hobson (2009) opines that “consciousness, we are relieved to admit, is finally a bona fide subject of inquiry. Let us take the first obvious step and teach it to study itself” (p. xi).

For Rodolfo Llinas (2001), consciousness is a function of mindness, driving him to ask,

Why is mindness so mysterious to us? Why has it always been this way? The processes that generate such states as thinking, consciousness, and dreaming are foreign to us, I fancy, because they always seem to be generated with no apparent relation to the external world. They seem impalpably internal. (p. 4)

Similarly, Alan Hobson (2009) observes,

The brain still tends to keep most of its activity out of consciousness, but what it excludes or admits is governed more by rules of activation, neuro-modulation, input–output gating than by the predominance of repression. The unconscious is now seen as a useful lookup system for the conscious brain rather than a seething source of devils aiming at the disruption of consciousness. Consciousness itself is, thus, a tool for the investigation of itself as well as for the study of that part of the unconscious that is dynamically repressed. (p. xi)
Throughout his writings, Sigmund Freud articulated his ideas through the organizing concepts of the “self” and the “object.” For Freud, the people interacting with the self were the objects of the self’s drives and desires. Ironically, neuroscientists today tend to view consciousness, from its basic levels to its utmost complexity, as the integrated neural function that brings together the object and the self.

Accordingly, Damasio (1999) opines,

At its elemental and most basic level, consciousness lets us recognize an irresistible urge to stay alive and experience a concern for the self. At its most profound and elaborate level, consciousness helps us develop a concern for other selves and improve the art of life. (p. 5)

Evolution, over these millions of years has given rise to our complex brain and, somehow, through the interactions among its 100 billion neurons, connected by trillions of synapses, our conscious experience of the world and of ourselves emerges.

Like it or not, consciousness is the pivotal biological function that allows us to know sorrow and joy, suffering and pleasure, embarrassment and pride, and grief and reunion. Damasio (1999) muses, “Do not blame Eve for knowing; blame consciousness, and thank it, too” (p. 4).

CONSCIOUSNESS AND EMDR

Consciousness and EMDR have been intimately related, albeit under a different name. Whereas the field of neurobiology has utilized the term consciousness to denote the processes of sensation, perception, learning, cognition, emotion, somatosensory integration, and memory; the discipline of psychology has chosen to use the term information processing. Accordingly, they will be used interchangeably. If we tend to favor the term consciousness in this book, it is only because it feels more human.

Throughout the past 20 years, EMDR has evolved into a therapeutic approach guided by the adaptive information processing (AIP) model (Shapiro, 2001). In 1990, the name change from eye movement desensitization to eye movement desensitization and reprocessing heralded a change in orientation from the initial behavioral formulation of simple desensitization of anxiety to a more integrated information processing paradigm. This evolution ushered in the accelerated information processing model, which illustrated a clinically grounded understanding of the underlying principles that govern perception and the integration of new information within cognitive, memorial, and emotional frameworks (Shapiro, 1995). In 2001, this continued evolution brought us the aforementioned adaptive information processing model. Regarding these models, Francine Shapiro (2001) has argued that “their utility lies in their ability not only to explain, but to predict clinical outcomes” (p. 14).
As we shall see, as this book develops, consciousness and EMDR are inex-tricably intertwined, giving us an information processing paradigm that provides an integrated approach that can incorporate and interpret key aspects of such diverse modalities as psychodynamic, behavioral, cognitive, gestalt, ego-state, and body-oriented therapies. If the neurobiology of consciousness enables our understanding of the neural interrelationship between self and object, EMDR has given us both tools and mysteries to solve in the repair of the self and its relation to its objects.

THE PROGRESS OF SCIENCE

Reflecting on the foregoing, it becomes apparent that the understanding of the human mind in biological terms has emerged as one of the most important challenges for science in the 21st century. Our goal in this endeavor has been to understand the biological underpinnings of sensation, perception, cognition, learning, memory, emotion, and sensory integration.

The progress that researchers have made in the field of neuroscience, unthinkable even a few decades ago, has made possible our present understanding. The discovery of the structure of DNA in 1953 revolutionized biology, giving it a foundational framework for comprehending the mechanisms underlying the gene’s ability to control the functioning of cells. This breakthrough led to a basic understanding of gene regulation and gene-related cell function, propelling an understanding of the science of biology to a level rivaling that of physics and chemistry.

Imbued with this knowledge, biology turned its focus to its loftiest goal, the understanding of the biological nature of the human mind. This endeavor, once considered to be prescientific and impossible, has achieved great momentum and growth. Ironically, these new insights did not come from the disciplines traditionally concerned with mind, from philosophy or psychology. Instead, they evolved from the merger of these disciplines with the biology of the brain, a new synthesis made possible by the remarkable achievements in molecular biology. The result has been a new science of mind, a science that has harnessed the power of molecular biology to examine the great remaining mysteries of life.

MIND AND BRAIN

This new science is grounded by five principles. First, mind and brain are inseparable. The brain is a multifaceted biological organ of vast computational abilities that constructs our sensory experiences, regulates our thoughts and emotions, and mediates our actions. Our brain is responsible not only for motor behaviors such as running and eating but also for the complex and
multifaceted acts considered quintessentially human, such as thinking, speaking, and creating works of art.

Second, each mental function in the brain, from the simplest reflexes to the most creative acts in language, music, and art, is carried out by specialized neural circuits throughout different regions of the brain. It has been noted by many in the neuroscience community that it is preferable to use the term biology of mind to refer to the set of mental operations carried out by these specialized neural circuits rather than biology of the mind, which can be seen to inaccurately connote that there is a unique or singular place, a single location in the brain, that carries out mental operations.

Third, all of these circuits are composed of the same elementary signaling units, the neuron. Fourth, these neural circuits use specific molecules to generate signals within and between nerve cells. Finally, the specific signaling molecules have been conserved and retained through millions of years of evolution. Some of them were present in the cells of our most ancient ancestors and can be found today in our most distant and primitive evolutionary relatives.

Hence, we gain from this new knowledge regarding the science of mind not only insights into ourselves—how we perceive, learn, remember, feel, and act—but also a new viewpoint of ourselves within the context of biological evolution. Accordingly, this allows us to appreciate that the human mind evolved from molecules used by our most primitive ancestors and that the extraordinary conservation of the molecular mechanisms that regulate life’s various processes also applies to our mental life.

In a similar vein, the search for EMDR’s mechanisms of action began in the early 1990s, initially proceeding slowly and tentatively. As we entered the new millennium, the pace quickened. Theoretically driven speculative models, grounded in empirical findings from related neurobiological research bases, became more detailed and prevalent. In parallel, neurobiological studies became increasingly widespread, utilizing psychophysiological and neuroimaging examinations of EMDR treatment.

In the past decade, it has become increasingly apparent that people lacking a background in science are as enthusiastic to learn about this new knowledge regarding the science of mind and consciousness as scientists are to explain it.

SCIENTIFIC GROWTH OF EMDR

A similar phenomenon can be seen in the EMDR world. In the beginning, few were interested in the neurobiology of EMDR. A talk speculating on EMDR’s neural mechanisms would attract 30 people, on a good day. As in other aspects of neuroscience, this interest has exploded. Hundreds are now in attendance at EMDR workshops currently held worldwide, solely focused on the topic of the neurobiology of EMDR. Hence, these occurrences have made it apparent
that nonscientists are prepared to make the effort to understand the key issues of brain science if scientists are willing to make the effort to explain them.

**OUTLINE OF THE BOOK**

Thus, this book is written both technically and as an introduction to the neural underpinnings of consciousness and EMDR. These knowledge bases have emerged from theories and observations and have evolved into the experimental science of today. Pertinent neuroscience research relative to our understanding of consciousness, information processing, and traumatic disorders of consciousness will be reviewed and examined.

The reader will first be presented with basic research in the neurosciences relevant to online/wakeful information processing, which includes sensation, perception, somatosensory integration, cognition, memory, emotion, language, and motricity (motor function). In addition, offline/sleep information processing will be examined with respect to slow-wave sleep and cognitive memorial processing as well as REM/dream sleep and its function in emotional and semantic memory processing.

The second section will examine the neuroscience research relevant to disorders of consciousness, which includes (in brief) anesthesia, coma, and other neurological disorders. Major focus will be given to the disorders of type I posttraumatic stress disorder (PTSD), complex PTSD/dissociative disorders, and personality disorders.

The reader, in the third section, will be presented with an examination of neuroscience research relevant to chronic trauma and autoimmune function. Particularly, a number of medical illnesses, collectively known as medically unexplained symptoms, will be examined, which include fibromyalgia, chronic fatigue syndrome, reflex sympathetic dystrophy, systemic lupus erythematosus, and rheumatoid arthritis. These disorders will be examined from the perspective of autoimmune hyperactivity resulting from the unusual neuroendocrine profile of persons with PTSD.

The fourth and final section will examine the foregoing material with respect to the adaptive information processing model. Treatment implications vis-à-vis the various types of PTSD and the presentations of medically unexplained symptoms will be explored in detail.

To the reader who is fluent in this material, it will become immediately apparent that my thinking has been greatly influenced by the works of Antonio Damasio, Rodolfo Llinas, Jaak Panksepp, and Allan Schore. Their empirical and descriptive writings have enabled me to extract form out of the empirical chaos that has engulfed the study of consciousness and information processing.