

# *Neuroscience and Spirituality*

## IMPLICATIONS OF INTERPERSONAL NEUROBIOLOGY FOR A SPIRITUALITY OF COMPASSION

*by Andrea Hollingsworth*

*Abstract.* Interpersonal neurobiology (IPNB) is a burgeoning interdisciplinary field that focuses on ways in which relationships shape and transform the architecture and functioning of the human brain. IPNB points to four specific conditions that appear to encourage the emergence of empathy. Further, these conditions, when gathered together, may constitute the core components of a spirituality of compassion. Following definitions and a discussion of interdisciplinary method, this essay delineates IPNB's main tenets and demonstrates ways in which IPNB sheds light on important aspects of human empathy and compassion. Drawing on this analysis, it introduces the four conditions that encourage the emergence of empathy in individuals and groups and shows why they may be central elements of a spirituality of compassion. A case study, in which the Native American Ojibwe practice of the talking circle is described and assessed through the lens of the IPNB-derived spirituality of compassion, demonstrates the evaluative usefulness of this set of conditions.

*Keywords:* attachment theory; attunement; brain; compassion; empathy; interpersonal neurobiology; mind; mindfulness; Native American; neuroscience; plasticity; psychology; spiritual practices; spirituality

---

In the conclusion of their volume titled *Altruism and Altruistic Love*, editors Stephen G. Post and Lynn G. Underwood spell out what they see as future research needs in the "science of altruism." In the domain of spirituality and religion, they indicate that one set of questions for future research

Andrea Hollingsworth is a Ph.D. student in constructive theology at Loyola University Chicago, Crown Center for Humanities, 6525 North Sheridan Road, Chicago, IL 60626; e-mail ahollin@luc.edu.

[*Zygon*, vol. 43, no. 4 (December 2008)]

© 2008 by the Joint Publication Board of *Zygon*. ISSN 0591-2385

lies at the intersection of spiritual practices and altruistic love: “What specific spiritual practices (e.g., types of prayer, meditation, silence, worship) might help to encourage altruistic love? How do these practices interact with the biological, social, and cultural substrate of the person?” (Post and Underwood 2002, 382)

Since this volume’s release, significant scientific advances have been made that can aid in the search for provisional answers to questions such as these. Interpersonal neurobiology (IPNB), a term coined by UCLA psychiatrist Daniel J. Siegel, is a growing interdisciplinary field that focuses on ways in which relationships fundamentally shape and change the architecture and functioning of the human brain. In this article, I argue that IPNB points to a specific set of scientifically informed conditions that appear to encourage the emergence of empathy and, further, that this set of conditions constitutes the core components of a spirituality of compassion by which specific spiritual practices in diverse faith traditions can be evaluated for their potential to cultivate caring attitudes and actions in selves and societies.

Following introductory discussions on definitional and methodological issues, I present key assumptions in IPNB and demonstrate ways in which IPNB sheds light on important aspects of human empathy and compassion. Drawing on this analysis, I introduce four specific conditions that appear to have profound potential to encourage the emergence of empathy in individuals and groups and suggest that these criteria may function as central elements of a spirituality of compassion. To demonstrate how this set of conditions might function, I offer a case study in which I describe the Native American Ojibwe practice of the “talking circle” and assess it through the lens of my IPNB-derived spirituality of compassion. I conclude by addressing some questions that remain unanswered and by suggesting areas for future research.

#### DEFINITIONS

I judge the following to be the most helpful definitions of *spirituality*, *empathy*, and *compassion*, given the purview and goals of the present study.

*Spirituality.* It is well known that *spirituality* defies definitional consensus. Lucy Bregman has recently argued (2006) that the current abundance of definitions for spirituality renders the concept too ambiguous to be coherent or meaningful. Yet, despite its annoying inexactness, spirituality seems to represent an important, abiding, “multilevel-multidimensional” aspect of human experience that touches on manifold dimensions of life, including the sociocultural, intellectual, emotional, behavioral, neurobiological, and existential (Zinnbauer and Pargament 2005).

I am inclined to favor relational definitions of spirituality, those that tend to the dynamics of our ongoing relationships with ourselves, others, and that which we deem “sacred.” Following F. LeRon Shults and Steven J.

Sandage (2005), I define spirituality as *ways of relating to the sacred*. The phrase *ways of relating* may include an array of relational postures—for example, searching for, abiding within, or hiding from. The term *sacred* may refer to “a divine being, divine object, Ultimate Reality, or Ultimate Truth as perceived by the individual” (Hill et al. 2000, 66), and may also include persons, rituals, objects, narratives, texts, times, and spaces that are “set apart . . . as special, uniquely transcendent, and not ordinary or profane” (Shults and Sandage 2005, 161).

Defining spirituality as ways of relating to the sacred has three main advantages in the context of this article. First, the emphasis on relationality can be used to highlight the ways in which interpersonal relationships and representations of the sacred reciprocally influence each other (Kirkpatrick 2005; Rizzuto 1979; Sorenson 2004). Second, it can support a focus on the dynamism of spirituality—that is, the ongoing transformations in our ways of relating to the sacred throughout life (Shults and Sandage 2005). Third, it is an inclusive and versatile definition and can function descriptively in relation to a wide range of spiritual practices.<sup>1</sup>

*Empathy.* This English word is a translation of the German *Einfühlung*, which means “feeling into.” The idea was first presented in 1873 by Robert Vischer as a term used in aesthetics. In 1903, empathy entered the field of psychology through the work of philosopher Theodore Lipps.

Contemporary definitions of empathy vary according to discipline. I define it as *the capacity to be affected by and share in the state of an other (or others) in such a way that we maintain self-awareness even as we “feel into” the other’s experience*. Like many social-psychological accounts of empathy, my definition provides room for spontaneous response. We are often automatically (and/or unconsciously) “affected by” the states of others. It also echoes the common neurobiological emphasis on concurrent awareness of self and other as integral to empathy. Further, it must be stressed that “sharing in” does not mean fusing with. Rather, in empathy, I allow the other’s experience to become part of my own in such a way that I am neither engulfed by nor cut off from the other; instead, I relate to the other in a self-differentiated<sup>2</sup> manner.

*Compassion.* This term is derived from the Latin *pati*, meaning “to suffer,” and *cum*, meaning “with.” Translated literally, *compassion* means “to suffer with.” As with empathy, definitions of compassion differ according to the contexts, perspectives, and interests of those doing the defining; however, most definitions hew closely to the word’s original etymological meaning.

I define compassion as *being empathically connected with others in their suffering and taking action to ease their distress*. This definition presupposes empathy as I have defined it above; however, it goes beyond empathy in that it involves a component of action, or helping behavior.<sup>3</sup> Compassion

should not be confused with pity, which can imply that the sufferer is inferior to oneself. Rather, compassion is undergirded by a deep sense of respect for the other person. Compassion should not be simply equated with all forms of prosocial action; helping behaviors are sometimes carried out in nonempathic, noncompassionate ways. While gauging human motives is always a thorny undertaking, as a general rule a sense of empathic resonance with the pain of the other—a basic experience of suffering with—should be involved to some degree in those individual and communal expressions of care that we label compassionate.

Putting these definitions together, by *spirituality of compassion* I mean a way of relating to the sacred that cultivates empathic connectedness with others in their suffering and promotes action to ease their distress.

#### A POSTFOUNDATIONALIST INTERDISCIPLINARY APPROACH

I adhere to a postfoundationalist model for cross-disciplinary thinking. This has been articulated in several different ways (Shults 1999; Stenmark 2004; van Huyssteen 1999; 2006). In each of its forms postfoundationalist models emphasize that because all forms of human inquiry (including scientific and spiritual reflection) are irreducibly contextual and social, interdisciplinarity is a practical, embodied skill of particular, historically situated persons-in-relation. Practically speaking, Postfoundationalism asks interdisciplinarians to assume self-aware, critical postures toward patterns in their traditions, beliefs, cultures, practices, and assumptions and to attempt to make sense of those patterns through ongoing interactive dialogue with scholars in other fields.

I take seriously the postfoundationalist imperatives to integrate self-awareness and communal dialogue into the core of interdisciplinary method. For the present study, this means that I remain intentionally conscious of the ways in which my own experience as a person who has received graduate education in both psychotherapy and theology shapes my approach to questions of human nature, compassion, and transformation. In constructing my arguments, I draw not only on scholarly sources but also implicitly from my experiences working with patients in therapeutic settings and from critical self-reflections on those experiences. My thinking has been enriched by innumerable interdisciplinary conversations I have had over the years with therapists, supervisors, and religious scholars. A postfoundationalist approach therefore gives me latitude to intentionally integrate my personal and vocational history, self-consciousness, and relations with others into the heart of my work.

Postfoundationalism affirms that as we attempt to cross the boundaries of our particular disciplines and traditions, specific meeting points for mutual understanding and collaboration can emerge. These “transversal spaces”—a notion originating in the work of Calvin Schrag—are spaces in

which different voices are neither in opposition nor in danger of becoming unified but instead dynamically engaged with one another. Transversality occurs when different disciplinary perspectives can lie across, extend over, intersect, meet, and convey without becoming fused or enmeshed (van Huyssteen 1999, 247). Compassion, I submit, is one such transversal space in which the distinct assumptions and thought patterns of hard science and spiritual practice can meet.

#### BASIC ASSUMPTIONS OF INTERPERSONAL NEUROBIOLOGY

Drawing richly from many different disciplines (including neuroscience, psychiatry, developmental psychology, social psychology, psychoanalysis, family systems theory, ethology, evolutionary theory, comparative anatomy, and genetics), IPNB aims to paint a picture of human experience and the dynamics of change across the lifespan by focusing on ways in which human beings are formed and transformed through relationships.<sup>4</sup> IPNB is especially attentive to the processes by which neural systems shape human patterns of attachment and, correlatively, how those attachment patterns shape neural systems. Louis Cozolino, a psychologist at Pepperdine University and a key figure in this burgeoning field, defines IPNB simply as “the study of how we attach and grow and interconnect throughout life” (2006, 19). Prior to discussing specific ways in which IPNB sheds light on conditions that encourage the emergence of empathy and thereby opens up space in which to propose a scientifically informed spirituality of compassion, it is necessary to outline several of IPNB’s basic assumptions.

*Brain and Mind.* IPNB assumes that interpersonal relationships are the natural habitat of the human brain and mind. Cozolino describes the brain as “an organ of adaptation that builds its structures through interactions with others” (2006, 19). The brain is a dynamic interpersonal system; just as neurons<sup>5</sup> are constituted by their ongoing synaptic connections with other neurons, so too are brains continually being formed and reformed through ongoing interactions with other brains. Because the brain is best described as an open system that undergoes continuous change in relational contexts across the lifespan, the concept of a single brain is a misnomer:

Scientists have had to expand their thinking to grasp this idea: *The individual neuron or a single human brain does not exist in nature.* Without mutually stimulating interactions, people and neurons wither and die. In neurons this process is called *apoptosis*; in humans it is called depression, grief, and suicide. . . . Thus, understanding the brain requires knowledge of the healthy, living brain embedded within a community of other brains. (Cozolino 2006, 11)

Not only the brain’s health and vitality but also its very existence is essentially dependent upon the myriad relational connections that occur across social synapses.

While Cozolino's approach to IPNB focuses on the language of the social brain, Siegel's method is marked by more direct concentration on the language of *mind*, which he defines as "a process that regulates the flow of energy and information" (2007, 5). For Siegel, the human mind is both neurobiological and interpersonal; that is, it involves the flow of energy and information within the body as well as between persons. Because "Energy and information can flow within one brain, or between brains" (Siegel 2006, 248), the mind is said to emerge at the dynamic interface of embodied and relational processes. Thus, whether the language is centered on the human social brain and the social synapses that connect brains (Cozolino) or on the emergent processes of the human mind that include neurobiological and interpersonal dynamics (Siegel), IPNB places relationships at the heart of the human experience of reality.

*Social and Emotional Neurocircuitry.* IPNB assumes that certain brain structures and systems, especially those involving the prefrontal cortex and limbic system, are particularly important for understanding the dynamics of human relationships, neurobiology, and personality development.

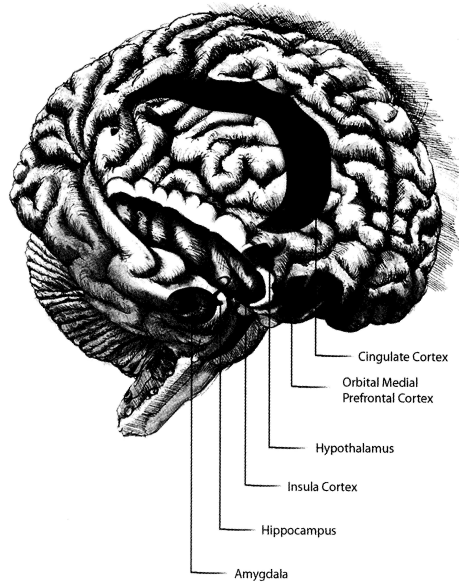
The frontal lobes evolved as humans became primates, and among primate species humans have the most highly developed prefrontal cortices. Located (roughly) behind the forehead and eye area, the prefrontal cortex interacts with other systems of the brain to guide our emotional, social, and moral ways of being in the world.

Prefrontal structures mediate many of the functions often considered unique to *Homo sapiens*, including the ability to regulate body systems, balance emotions, modulate fear, respond flexibly, exhibit insight, feel empathy, experience intuition, and make moral decisions (Siegel 2007, 341–45). "An intact and well-developed prefrontal cortex enables us to maintain a simultaneous sense of self and others that is necessary for interpersonal strategizing and decision making" (Cozolino 2006, 277).

In addition to a general interest in the prefrontal cortex, IPNB focuses on specific cortical and subcortical structures of the brain that are important for understanding social and emotional processes (see Figure 1). Many of these structures are considered part of the limbic system, which is closely linked with the prefrontal cortex and supports a variety of emotional, behavioral, and memory functions. Right hemispheric limbic brain areas are integrally involved in socioemotional processing and self-regulation (Schore 2003a). As we will see, many of the neurological structures and systems that IPNB finds indispensable for understanding human social and emotional life play a central role in the experience and expression of empathy and compassion.

At the same time that IPNB singles out discrete neurological structures and systems, it also attends to the connections between them in order to better understand the dynamic processes by which the brain regulates the

flow of energy and information. The linking up of neural structures and networks in ways that contribute to the establishment of “a functional flow in the states of mind across time” (Siegel 1999, 8) is known as neural integration, and the middle prefrontal cortex generally is seen as the main hub of this process. Greater levels of neural integration are associated with increased capacities to balance emotion, construct coherent life narratives, experience self-awareness, respond adaptively to stress, form meaningful relationships with others, regulate the body, and respond empathically to



**Fig. 1.** Key structures of the social brain. The *cingulate cortex* is associated with long-term emotional bonds, social cooperation, and empathy. The *orbital medial prefrontal cortex* (OMPFC) is responsible for integrating sensory (external) and emotional (internal) information with motivation and reward systems in the guiding of perceptions, actions, and interactions. The *hypothalamus* is involved in linking conscious experience and bodily processes (such as hunger and thirst), and also regulates sexual behavior and aggression. The *insula cortex* appears to mediate a vast range of emotions (from intense disgust to passionate love) and, with the anterior cingulate, allows for awareness of bodily states and reflections on emotional experiences. The *hippocampus* specializes in organizing spatial, sequential, and emotional learning and memory. The *amygdala* plays a central role in fear responses; it specializes in rapidly appraising danger and initiating automatic fight/flight reactions to threat. In addition to these (and other) cortical and subcortical structures, the sensory, motor, and affective systems, as well as the regulatory systems, are central facets of the social brain (Cozolino 2006, 51–57). Figure drawn by Nathan Frizzell. Copyright © 2006 by Louis Cozolino. Reprinted with artist and publisher permission from Cozolino 2006, 53.

others. As we will see, specific conditions appear to encourage the process of neural integration.

*Attachment Theory.* IPNB assumes that attachment theory provides the best available model for analyzing the interaction between relationships and the brain in the unfolding of the human personality. Originating in the 1950s in the work of British psychoanalyst John Bowlby (1982; 1988), attachment theory seeks to understand the human person in the context of his or her ongoing embeddedness in close emotional relationships with significant others.

Attachment theory postulates the existence of an inborn, evolutionarily formed attachment system that enhances infant survival by recruiting relational resources from the primary caregiver in order to successfully regulate anxiety and fear in the face of perceived threat. As the child grows, early relational patterns become internalized dispositions that profoundly and implicitly shape the way the individual relates to others (and to the self) throughout life. In other words, early relationships become hard-wired in the brain and later function as unconscious templates that structure relationships in adult life—for good or ill.

By observing hundreds of primary caregiver-infant dyads in controlled settings, early attachment researchers proposed the existence of secure and insecure bonding styles, or attachment schemas. Secure attachment is promoted by sensitive, consistent, and responsive care from the primary caregiver. A secure attachment bond nurtures infant development by providing a secure base for environmental exploration, a reliable relational context for learning how to adaptively regulate cognitive and affective processes in the face of anxiety, and an orientation to human relationships marked by a balance of separateness and connectedness. Insecure attachment bonds, which are associated with parental neglect and inconsistency, direct the infant's relational development toward either an extreme preoccupation with preserving proximity or toward a determined avoidance of nearness.

Attachment theory provides interpersonal neurobiologists with a theoretical construct to describe how "relationships become biological structure" (Cozolino 2006, 146). Along with gene expression, early communications between the primary caregiver and infant "literally shape the structure of the child's developing brain" (Siegel 1999, 21). In the simplest of interactions between a parental figure and baby, interpersonal experience is being "transduced" into biology. Each instance of attuned<sup>6</sup> communication contributes to the creation of key structures and systems in the baby's rapidly developing brain. The neural circuitries responsible for organizing one's relational behaviors and "stress-coping capacities" throughout life are formed in and through the countless verbal and nonverbal interactions that transpire between a primary caregiver and child during the infant and toddler years (Schore 2003a).



IPNB emphasizes that secure internal working models of attachment are related to greater capacities for self-regulation, empathic attunement with others, self-love, abilities to form coherent life narratives, and expectations of positive outcomes. Insecure attachment schema are associated with difficulties in regulating emotions and impulses, problems in maintaining memory for future consequences, struggles in keeping long-term goals in mind, low problem-solving abilities, high levels of internalized shame, poor memory and planning, incoherent and brief life narratives, and difficulties in empathizing with the needs and perspectives of others. Although attachment patterns are consistent from childhood to adulthood and tend to be transmitted generationally, there is growing evidence that attachment schema can be changed for the better through loving, attuned relationships with others and conscious control of attentional processes.

*Neuroplasticity.* IPNB assumes that neural change occurs throughout the lifespan. Several decades ago, there was general scientific consensus that lower brain and neocortical areas were unchangeable after early child development. Although experiences with attachment figures in infancy and childhood do have a disproportionate effect on the growth and development of neural systems, more recent research suggests that the human brain is endowed with a lifelong ability to restructure itself with each new experience.

Interpersonal neurobiologists thus maintain a constant emphasis on “the change[s] in neural connectivity induced by experience” (Siegel 2006, 250). Because the brain is “not a fully formed structure but . . . a dynamic process undergoing constant development and reconstruction across the lifespan” (Cozolino 2006, 50), interpersonal neurobiologists generally are optimistic about ways in which attuned human relationships can, at any point in the life cycle, function as contexts in which positive neurological changes can unfold in the brain. Although it is possible only to make tentative claims at this point because the extent of the brain’s ongoing plasticity is not definitively known, “Those of us who study interpersonal neurobiology believe that friendships, marriage, psychotherapy—in fact, any meaningful relationship—can reactivate neuroplastic processes and actually change the structure of the brain” (Cozolino 2006, 3).

Neural integration—the process by which the brain comes to regulate the flow of energy and information through efficient interconnections between neural networks and a balance of influences from participating systems—appears to be the manner by which brains change for the better. Along with loving and trusting interpersonal relationships, one of the most important factors in brain integration is the intentional use of executive forms of attention to notice and become attuned with one’s own internal states (fears, memories, anticipations, bodily sensations, and so on). Focused self-awareness—what Siegel calls “intrapersonal attunement” or

“mindfulness”—involves “paying attention, in the present moment, on purpose, without grasping onto judgments” (Siegel 2006, 250).<sup>7</sup> IPNB claims that nonjudgmental self-reflexivity may facilitate integration in the adult brain by changing previously automatic modes of neural firing, thereby allowing new patterns of neural activation to emerge via the processes of synaptogenesis (the creation of new neural synaptic linkages) and neurogenesis (the creation of new brain cells). In other words, employing conscious control of attentional processes with the goal of resonating or attuning with different aspects of the self may stimulate specific areas of the middle prefrontal cortex to become active in ways that encourage integration.

Furthermore, there is evidence that the effects of mindfulness practices on the brain are strikingly similar to those of attuned relationships; the same areas of the prefrontal cortex appear to be strengthened whether one is experiencing empathic connection with oneself or with another human being (Siegel 2007; Lazar et al. 2005). This close neurobiological link between intrapersonal and interpersonal resonance in the cultivation of overall well-being becomes especially important when the focus is narrowed on questions of empathy and compassion.

#### THE NEUROSCIENCE OF EMPATHY AND COMPASSION

It may strike Westerners as somewhat odd to conceive of compassion as a trainable skill. Yet that is precisely the view now emerging in some parts of the neuroscientific community, particularly among researchers whose work focuses on the intersections between meditative traditions, compassion, and brain plasticity (Lutz et al. 2007). Interpersonal neurobiologists also speak of compassion as a skill that can be intentionally built up through the activation of neuroplastic brain processes.

In this section, I discuss several key scientific research developments on human morality, empathy, and compassion from which IPNB draws, implicitly or explicitly, or to which IPNB is related, indirectly or directly.

*Mirror and Resonance Systems.* In the mid-1990s an Italian research team studying the premotor region of a monkey’s cortex found that it had special brain cells that fired not only when the monkey ate a peanut but also when it observed another primate eating a peanut (Gallese et al. 1996). These “mirror neurons” were later discovered in humans (Iacoboni, Koski, et al. 2001; Iacoboni, Woods, et al. 1999), leading some scientists to posit that “the human brain creates representations of others’ minds” (Siegel 2007, 166). Although natural selection may originally have favored mirror systems in primates because they helped in coordinating social behaviors that contributed to group survival (hunting, gathering, and migration), it is thought that, in *Homo sapiens*, “mirror systems and resonance behaviors evolved into our ability to attune to the emotional states of others. They provide us with a visceral-emotional experience of what the other is expe-

riencing, allowing us to know others from the inside out” (Cozolino 2006, 59). The recent discovery of the brain’s mirror circuitry thus has been truly groundbreaking in the search for evolutionary and biological roots of kindness in primates.<sup>8</sup>

Mirror neurons are unique largely because they are located in frontal and parietal cortical regions of the brain (Cozolino 2006, 193). They lie at the intersection of visual, motor, and emotional processing and therefore are able to link observation, feeling, and action. Mirror neurons also play a critical role in the ability to feel the pain of another person and so are at the heart of empathy and compassion (Carr et al. 2003; Gallese 2003). Specific neuronal groups have been found to specialize in and respond to distinct facial expressions, vocal tones, and bodily movements in others. Moreover, empathic understanding of another person’s pain appears to require the ability to reflect on our own internal states and bring them into a “connected-to, but distinct-from” relationship to the pained state of the other (Carr et al. 2003).

To respond to the facial, vocal, and bodily cues from an other, translate those cues into one’s own embodied experience, interpret them with relative accuracy, and initiate an active, intentional response are skills that emerge from the high-level integrative processing functions of the prefrontal cortex.<sup>9</sup> Because of its ability to connect us with the emotional experiences of others and at the same time put us in touch with our own states and give us impetus to act in moral ways, the brain’s mirror system is integral to the experience and expression of compassion.

*Attachment and Altruism.* In the mid-1980s Samuel and Pearl Oliner conducted an in-depth study of Gentile rescuers of Jews during the Holocaust, comparing them with nonrescuers, in order to test their hypothesis that “there may exist something called an ‘altruistic’ personality; that is, a relatively enduring predisposition to act selflessly on behalf of others, which develops early in life” (Oliner and Oliner 1988, 3). Among other things, the Oliners found that rescuers tended to describe their early family relationships with caregivers as close and caring and tended to have parents who used reason rather than physical means for discipline. They also found that rescuers were more likely than nonrescuers to report feeling a poignant, personal sense of empathy for the pain of the Jewish victims. The Oliners see a clear connection between these findings—namely, that from secure attachment relationships in early life “more rescuers learned the satisfactions accruing from personal bonds with others” (Oliner and Oliner 1988, 173) and thus were more likely to be moved by the agony of an other.

The Oliners’ study points to the importance of secure attachment relationships in early life for the formation of compassionate selfhood. In fact, the link between secure attachment relationships and empathic responses to others has been demonstrated in a number of studies (Eisenberg 2002;

Kestenbaum, Farber, and Sroufe 1989; Waters, Wippman, and Sroufe 1979). IPNB's careful consideration of the role of brain development in early life helps make neurobiological sense of this link. How so?

In addition to secure attachment relationships with parents in early life, research reveals that individuals high in empathy-related responding tend to have a greater ability to regulate emotion—that is, to have conscious control over their ability to focus and shift attention and self-soothe when under stress (Eisenberg, Wentzel, and Harris 1998). Correlatively, individuals with insecure attachment relationships with caregivers in infancy/childhood tend to have low empathy (Main and George 1985; Miller and Eisenberg 1988) and are at greater risk for emotional disturbances associated with poor regulatory control (Karr-Morse and Wiley 1997; Perry 1997). IPNB provides a way to bridge these findings and suggest implications for transformation. Because many of the structures of the prefrontal cortex and regulatory system that are associated with high levels of emotion regulation, impulse control, and empathic response take shape in positive relational environments in infancy, it makes sense that secure bonds would promote the growth of such structures (Cozolino 2006; Schore 2003a, b; Siegel 2007). It also makes sense that insecure bonds, trauma, and/or high levels of environmental stress in early life would stunt the growth of those neural structures and systems (Cozolino 2006; Ogden, Minton, and Pain 2006; Schore 2003a; Siegel 1999; van der Hart, Nijenhuis, and Steele 2006), leading to poor affect control and decreased capacities for empathy and compassion. Interpersonal neurobiologists posit that change toward greater abilities to experience and express affect regulation (tending to self) and compassion (tending to others) involves activating neuroplastic processes via conditions that encourage integration.

*The Inverse Relationship between Fear and Compassion.* Another fascinating finding in the Oliners' study concerns the close correlation between fear and nonhelping. In their efforts to understand bystanders' "failure to act" (that is, their nonassistance of Jews in Nazi Europe), they found that "Despite their hostility toward Nazis, the majority of bystanders were overcome by fear, hopelessness, and uncertainty. . . . Asked to describe their lives during the war, their stories are brief and overwhelmingly involved with basic survival" (Oliner and Oliner 1988, 146). This supports the idea that when we feel frightened, the chances that we will reach out and help somebody else, especially someone we consider to be outside our primary group, become quite slim. Moreover, research in "terror management theory" and "mortality salience" indicates that when we sense that our lives are threatened, we are more likely to act in violent or aggressive ways toward persons who do not share our own worldviews (McGregor et al. 1998).

IPNB pays close attention to ways in which the brain's "fear circuitry" shapes and is shaped by both genetic factors and social interactions. Cozolino

notes that the evolutionary processes that have guided the survival and development of our species have rendered the amygdala (the brain structure most directly responsible for fear responses) fully operational even before birth, making fear perhaps the strongest early human emotion (2006, 250). Fear responses in humans are primitive, fast, and powerful; the amygdala appraises inner and outer situations in fractions of a second, initiates fight/flight responses long before conscious awareness, generalizes from specific instances of past learning, and triggers anxiety in response to a vast array of internal and external cues. The amygdala also acts as a social brake, inhibiting contact with unfamiliar others until their safety can be assessed.<sup>10</sup>

If fear hinders compassion, and if our neural circuits are primed to make us frightened much of the time, what explains the fact that we are able to disengage our primal sense of alarm and experience things like trust and compassion? First, it is important to note that fear and empathy may not be mutually exclusive in all cases. A study by Shelley E. Taylor and colleagues (2000) suggests that fight/flight responses may be more common in males and that stress or threat often elicits a tend-and-befriend response in females. Second, the amygdala is kept in check by its reciprocal relationship with the orbital medial prefrontal cortex (OMPFC; see Figure 1), whose job it is to inhibit the amygdala's fear responses based on conscious awareness (Beer et al. 2003). Furthermore, the quality of our early attachments has a direct bearing on our ability to regulate fearful emotions later in life via the OMPFC-amygdala link (Cozolino 2006, 60).

Once more, an IPNB approach reveals that a well-developed prefrontal cortex—so integral to secure relational attachments, self-regulatory abilities, successful fear modulation, and experiences and expressions of empathy—is at the heart of compassion. Because “learning not to fear and learning to love are biologically interwoven” (Cozolino 2006, 314), even if early insecure attachments have biased us toward feeling threatened and self-enclosed much of the time, the brain's ongoing plasticity means that caring relationships (interpersonal attunement) and mindfulness practices (intrapersonal attunement) hold the potential to transform us into less frightened, more compassionate selves (Cozolino 2006, 315; Derryberry and Reed 2002; Siegel 2007, 324).

#### CONDITIONS THAT ENCOURAGE EMPATHY: TOWARD A SPIRITUALITY OF COMPASSION

Having surveyed the main tenets of IPNB, and having looked at some specific ways that an IPNB approach illuminates the neural dynamics of human empathy and compassion, it is now possible to consider implications of these explorations for spirituality and spiritual practices. In this section, I extract from IPNB four basic conditions that appear to encour-

age neural integration, which, as we have seen, is integrally related to the emergence of empathy. I suggest that these conditions, taken together, can form the components of a spirituality of compassion—a way of relating to the sacred that fosters empathic connectedness with others in their suffering and promotes action to ease their distress.

In what follows, I speak of a particular condition first as encouraging the emergence of empathy, and only thereafter as an element of a spirituality of compassion. As discussed in the “definitions” section, compassion presupposes empathy; in order to connect with the suffering of others and act in ways that alleviate their distress, we must first have the capability of sharing in the states of others in self-aware ways. Jumping immediately to compassion without empathy as a preliminary step would not reflect the meaning of the constructs (and the science behind them) accurately.

*1. Interpersonal Attunement.* IPNB suggests that when human brains “feel felt” by other human brains—when they experience a sense of emotional attunement or resonance with another attentive individual—the concurrent activation of neuroplastic processes appears to open up possibilities for transformation toward greater levels of well-being, which includes increased capacities to share in the states of others while maintaining secure, regulated states of self-awareness. Interpersonal attunement is thus the first condition for the emergence of empathy in humans. Over time, secure, attuned attachments with other persons may enable us to love more and fear less, rendering us progressively more capable of sharing in the suffering of others and increasing the likelihood that we will take action to alleviate their misery.

Interpersonal attunement is also the first component of a spirituality of compassion. When our manner of relating to the sacred becomes integrated with nonthreatening, face-to-face, voice-to-voice, body-to-body interactions between others and ourselves, possibilities for qualitative, holistic transformation toward more compassionate ways of being in the world may open up before us. Neurobiologically speaking, this means that the mirror circuitry, which enables us to perceive and re-present the emotional and bodily experiences of the other, is, by way of the insula, altering our own limbic and bodily states moment-by-moment to match what we perceive in the other person. This mirroring is encouraging the development of more integrated circuits across brain regions.

Spiritually speaking, interpersonal attunement means that we are experiencing the encounter with the other as a mediator of the sacred. That is, we sense that the intersubjective reality of the attuned relational interaction is bringing us into contact with that which (in some sense) transcends the ordinary.

*2. Intrapersonal Attunement.* IPNB emphasizes that mindful awareness—intentional, nonjudgmental attentiveness to our own thoughts, feel-

ings, and bodily states in the present moment—holds potential to activate neuroplastic processes, thereby changing previously automatic patterns of fear, inflexibility, and reactivity into newly integrated patterns of calm, adaptability, and balance. Our ability to be mindful in this way seems to be directly related to our ability to experience resonance with others; intrapersonal attunement, therefore, is a second condition for the emergence of empathy in humans. Like secure attachment relationships, repeated experiences of internal resonance via mindfulness practices may expand our capacities for connection with others, guide us toward increased abilities to regulate our emotions, cause us to “feel into” the pain of others with greater depth, and lead us to desire and work toward the alleviation of others’ suffering.

Intrapersonal attunement—which involves noticing, respecting, and loving oneself—is the second component of a spirituality of compassion. For many individuals, becoming aware of the flow of one’s own consciousness (metacognition) is a profoundly spiritual experience. Experiencing the conscious *I* as an observer of our own mental representations and bodily sensations can lead us to affirm ourselves as sacred in some sense. For many, the feeling of freedom that can result from experiencing the self as more than the sum of ever-shifting sensations, emotions, and cognitions can be extraordinarily inspiring and empowering.

Thus, when we bring together IPNB and spirituality, what emerges is that relating to ourselves with care, respect, curiosity, and love appears to be central to the experience of transformation toward well-being, and a vital aspect of what it means to relate to the sacred in ways that foster empathy. Insofar as it is related to our capacity to ascribe worth to and bestow kindness on ourselves, recognize and honor the sacredness of others, connect with them in their suffering, and take action toward the betterment of their lives, this kind of attuned, nonjudgmental self-relationality is a key component in a spirituality of compassion.

*3. Relational Safety.* As discussed above, human fear is swift, primal, powerful, and in many cases inversely related to compassion. Interpersonal relationships marked by conflict, insecurity, and distrust can cause us to feel threatened, emotionally deregulated, and closed off to empathic connection with others. Interpersonal relationships marked by mutuality, security, and fidelity can help us regulate our fear responses and open us up to empathically caring for those around us. IPNB suggests that learning not to fear and learning to love are mutually conditioning neurobiological realities and that relationships of safety and trust are integral to the emergence of both (Cozolino 2002; Siegel 2007; compare Porges 1998).

Because of its ability to free us from fear, open us up to receiving, and encourage neural integration, relational safety is the third condition for the emergence of empathy and the third component of a spirituality of

compassion. Spirituality often involves a deep sense of existential vulnerability, so creating safe relational spaces for communal experiences of the divine is particularly important.<sup>11</sup> Most faith traditions have practices that involve face-to-face encounters with other human beings (instruction, confession, initiation rites, group rituals). Considering IPNB and spirituality together at the intersection of compassion leads to a specific hypothesis: that safe, trust-evoking relational environments for communal spiritual practices are likely to open persons up to each other, themselves, and the sacred in such a way that (scientifically speaking) their neuroplastic processes may be activated in ways that encourage integration and (spiritually speaking) their entire selves may become more receptive to the sacred presence that the rite itself is believed to mediate. As we have seen, IPNB suggests that neuroplastic activation and integration may stimulate the development of brain structures and systems crucial to empathy and compassion. Furthermore, in many faith traditions, openness to the sacred in collective worship contexts is thought to be closely related to becoming a more compassionate person. For these core reasons, conditions of relational safety in communal practices are fundamental to a spirituality of compassion.

4. *Shared Narratives.* Interpersonal neurobiologists point to storytelling as a key means of neural regulation and integration. As the brain evolved in humans, more complex neural systems and networks demanded greater levels of organization. It is hypothesized that the practices of telling and listening to narratives became an evolutionary strategy “contained *within the group mind* (language and culture) that allowed the brain to grow further in size and complexity” (Cozolino 2006, 304). Not surprisingly, research reveals strong links between mental health, emotional regulation, secure attachment, and coherent narratives. “Because narratives require participation of multiple structures throughout the brain, they require us to combine, in conscious memory, our knowledge, sensations, feelings, and behaviors. In bringing together multiple functions from diverse neural networks, narratives provide the brain with a tool for both emotional and neural integration” (Cozolino 2006, 304).

Telling our own story to someone else, or listening to someone narrate his or her story, asks us to be affected by and share in the state of the hearer or speaker in such a way that we hold on to our own perspective even as we attempt to indwell the experience of the other person. Shared narratives, therefore, are the fourth condition for the emergence of empathy in humans and constitute the fourth component of a spirituality of compassion.

Stories are naturally bound up within human spirituality; speaking, reading, and/or hearing sacred narratives from our traditions are at the heart of many of our experiences of the divine. When, through written or oral tradition, sacred stories become integrated in some way into our own sto-



ries, individually or communally, we often have the sense of participating in something greater than ourselves (Griffith and Griffith 2002). The combination, therefore, of neural integration and empathic connection with others and self, and deep personal meaning and transcendent participation, means that storytelling holds potential to raise us to greater levels of concern for the pain of others and motivate us to stand in solidarity with those who are suffering by weaving their stories into the fabric of our own.

#### A CASE STUDY: THE OJIBWE TALKING CIRCLE

A spirituality of compassion consisting of interpersonal attunement, intrapersonal attunement, relational safety, and shared narratives provides a set of criteria by which diverse spiritual practices can be theoretically evaluated for their potential to facilitate compassion in persons and communities. To show this, I now describe the Native American Ojibwe ritual of the talking circle, and briefly discuss it through the lens of my IPNB-derived spirituality of compassion.

The following analysis draws heavily from my firsthand experiences participating in talking circles as a therapist at the Minnesota Indian Women's Resource Center. It is offered as a demonstration of the evaluative theoretical promise in my proposed spirituality of compassion for making nonempirical yet scientifically informed assessments of spiritual practices, with a special eye toward the relative likelihood of the practice encouraging the emergence of compassion among participants.

*Description of the Talking Circle.* The *Anishinaabe*, or Ojibwe people, are native to the Great Lakes regions of North America. Like many indigenous people, they acknowledge the continuity of life and the interrelatedness of all things through the symbol of the circle (Peacock and Wisuri 2002). The Ojibwe are a story people, and talking circles (otherwise called peacemaking circles or healing circles) are deeply rooted in their tradition of passing on their spiritual and cultural heritage through oral practices. The purpose of the talking circle is to create a safe space for small-group interaction in which personal narratives and viewpoints can be communicated in an atmosphere of authenticity and deep compassionate listening that is free from threats of judgment or condemnation (Umbreit 2003).

In talking circles, all participants have the opportunity to speak without interruption. Communication is regulated by the passing of a talking piece—usually an object from nature such as a feather—that holds special and/or sacred significance to the circle facilitator (circle keeper). Only the person with the talking piece is allowed to speak. However, talking is not required; if someone wishes to remain silent, she or he can simply pass the talking piece to the next person.

After participants gather together, the circle keeper begins by leading the group in a sacred cleansing ritual. Following this, the facilitator lists

the ground rules of the talking circle (given below). She or he then opens the conversation by asking a question that invites participants to share personal stories, feelings, and/or thoughts, begins the ritual by speaking first, and passes the talking piece to the person on the left (clockwise). After two or three rounds, there is a time of group dialogue without the talking piece. At the end, the circle keeper makes brief concluding comments and thanks participants for their contributions. Sometimes a closing prayer is offered to honor the Creator/Great Spirit (*Kitche Manitou*).

*The Talking Circle through the Lens of a Spirituality of Compassion.* The Ojibwe talking circle is a spiritual practice that holds great potential to encourage the emergence of empathy and compassion in individuals and communities. It is one example of a spiritual practice that meets the four criteria of the IPNB-informed spirituality of compassion proposed above and may therefore be affirmed as a way of relating to the sacred that fosters empathic connectedness with others in their suffering and promotes action to ease their distress.

The face-to-face, voice-to-voice relational interactions that talking circles create are places where dynamic, resonant, empathic communication can occur. As participants listen attentively to each other—bearing compassionate witness to (and sharing compassionately in) the joys as well as the sufferings of one another's journeys—a sense of healing and peace often emerges in their midst. In these resonant relational spaces, neural integration may occur across participants' brain structures and systems, and *Kitche Manitou* may be sensed as a transformative presence being mediated in and through the interpersonally attuned connections.

As they empathically listen to one another's stories, talking-circle participants are asked to calmly notice their own responses and attend to ways in which others' stories illuminate parts of their own. When the talking piece comes to an individual, he or she attempts to reach inward and speak clearly, spontaneously, and honestly from his or her own memory, feelings, and life journey. This kind of intrapersonal attunement may lead persons to honor the sacred in themselves, cultivate a sense of self-resonance and self-regulation, build up key areas of the prefrontal cortex, support brain integration toward greater levels of well-being, and thus encourage more self-aware, nonanxious, and compassionate ways of being in the world.

A talking circle is a relaxed, relationally safe space. The ground rules for participation include: (1) Listen with respect. (2) Each person gets a chance to talk. (3) One person talks at a time. (4) Speak for yourself and not as the representative of any group. (5) No name-calling or attacking (Umbreit 2003). The talking circle thus becomes a place for openness to oneself, others, nature, and the Creator. Self-revelation, especially around painful topics, can be risked because there is no threat of rejection or assault. Because such protected atmospheres tend to nurture trusting human interac-

tions and deactivate the brain's fear circuitry (which appears to be toxic to neuroplastic processes), neural integration and the emergence of empathy and compassion may become more likely therein.

Sharing in one another's spoken narratives is central to the talking-circle experience and is seen as a key ingredient in the ritual's power to bring peace and healing to relationships with oneself, others, Earth, and *Kitche Manitou*. Respectful, compassionate listening to stories of pain and suffering brings a sense of sacred connection one to another and is experienced as a source of redemptive spiritual and personal transformation. As participants speak their stories aloud and resonate with the stories of others, neuroplastic processes of hemispheric, systemic, and structural integration may be activated, perhaps leading to deeper capacities to be affected by the states of others in self-aware ways and greater inclinations toward actively reaching out to others in distress.

#### CONCLUSION

I have suggested that there are significant implications in IPNB for identifying conditions that foster empathic ways of being in the world, and that those conditions may be gathered together to form the elements of a spirituality of compassion by which particular spiritual practices can be theoretically evaluated for their potential to cultivate compassion in persons and communities.

Certainly, there are questions that remain unanswered. First, given the twenty-first-century reality of depersonalized, technology-dependent communication practices, and the apparent necessity of attuned, face-to-face, voice-to-voice human interactions for brain integration and the growth of empathic capacities, how realistic is it to propose a spirituality of compassion that relies so heavily on direct, embodied, relational encounters? In our globalized and bureaucratized world, compassionate praxis often involves depersonalized, systemically aware actions rather than actual helping-hand behaviors. Compassion in our world requires higher-order empathy; we must find ways to connect with others' pain when we cannot see their faces, hear their voices, speak their languages, or know their names. How can an IPNB-informed spirituality of compassion encourage care in our increasingly alienated world?

There is also the difficulty of discussing constructs such as *well-being*, *transformation*, and *positive change* in normative ways. Who gets to define what growth toward well-being looks like, and what is to say that neural integration necessarily leads to expressions of empathy and compassion that support the flourishing of life? It is conceivable that a member of a small, close terrorist group may describe himself as so attuned with self, others, and God that, in his context, compassion means blowing himself up in a crowded marketplace. How can an IPNB-informed spirituality of

compassion account for his way of experiencing and expressing well-being? Additionally, in light of a recent study suggesting that doctors learn to deactivate empathy responses in their brains so that they can better help their patients who are in pain (Cheng et al. 2007), are there ways in which sharing in the suffering of another may sometimes weaken rather than strengthen one's ability to act in ways that alleviate their distress? It seems important to acknowledge that there are times and places in which an apparently nonempathic or dispassionate response may be the most helpful one.

I do not view these points of ambiguity as detracting from my argument. Rather, I think of them as invitations for future explorations into the implications of IPNB for spirituality, transformation, and compassion. Further research is needed, and not only on the above questions; broadly speaking, we need more empirical studies that shed light on relationships between specific spiritual practices, neurological patterns, attachment schema, and compassionate attitudes and actions. This kind of work will require input and expertise from many different religious, scientific, philosophical, and cultural perspectives. We are thus invited toward ever-greater efforts to attune with ourselves, scholars in our own fields, researchers in other disciplines, and practitioners in diverse cultural and religious traditions in order to continue the complex, arduous, yet rewarding process of uncovering the dynamics of human transformation, and revealing the conditions of the possibility of the emergence of compassion in selves and societies.

#### NOTES

Parts of this article were presented at the joint annual meeting of the Society for the Study of Psychology and Wesleyan Theology and the Wesleyan Philosophical Society at Duke University, March 2008, and the Metanexus Institute Conference in Madrid, Spain, July 2008. I am grateful to Gregory Johanson for introducing me to interpersonal neurobiology. For their very helpful comments on earlier drafts I thank David Hogue, Joan D. Koss-Chioino, John McCarthy, Michael Schuck, LeRon Shults, Ryan Cumming, and Evan Hollingsworth. This article is dedicated to my former clients and colleagues at the Minnesota Indian Women's Resource Center.

1. I define *spiritual practice* as an intentional mode of acting that is thought to mediate our relation(s) to the sacred.

2. Self-differentiation is a hallmark of family systems theory. In essence, it involves the ability to hold onto oneself while also connecting meaningfully with others.

3. My conception of "helping behavior" is broad; while concrete actions such as feeding, clothing, washing, or nursing another person are obvious examples, I also consider the simple act of empathically bearing witness to another's pain a helping action. As Anne Harrington has pointed out, when we worry too much about whether empathy or compassion are translated into actual helping behavior, we often are tempted to overlook opportunities for deeper understandings of the role of compassion in human life (Harrington 2002, 101).

4. Although some references are made in this article to specific scientific studies that inform IPNB, as a general rule I focus on IPNB scholarship, which synthesizes the relevant primary source material. This is because of the vastness and diversity of the literature on which IPNB draws and the overall goal of this article, which is to connect IPNB *itself* with thoughts on spirituality, empathy, and compassion. An implication of this, of course, is that my argument is prone to the critiques to which IPNB is prone. As a fairly new interdisciplinary field,

IPNB has not yet been the subject of significant critical evaluation. This is not likely to remain the case indefinitely; moreover, we can anticipate that criticism will likely come from two different philosophical/methodological perspectives, broadly speaking. First, those who approach the study of the human mind reductionistically may be suspicious of the IPNB concept of “social synapses” (Cozolino 2006, 5), which seems to point toward the idea of extended mind. Reductionists also may be nervous about the notion of “intrapersonal attunement” in which “the mind [uses] the brain to create itself” (Siegel 2007, 32), which appears to suggest a sort of top-down causality that is typical of emergence theories. Second, those who hold to a dualistic anthropology in which body and soul (or the material and the spiritual) are seen as separate, distinct substances may be dissatisfied with IPNB’s focus on the interface between brain functioning and human relationality, to the exclusion of discussions on “immaterial” phenomena. Dualists also may worry about the direct link IPNB makes between neural integration in the human brain and overall well-being. I do not treat these philosophical and methodological issues here, but suffice it to say that most IPNB scholarship to this point seems to presuppose a kind of middle ground between reductionism and dualism.

5. Neurons are cells that transmit signals to one another via chemical messengers. They are the basic unit of the nervous system.

6. Attunement, or resonance, is the ability to feel another person’s emotions. “Feeling felt” is the subjective experience of attuned human interactions (Siegel 1999, 149).

7. Siegel’s definition of mindfulness closely resembles the definition offered by Jon Kabat-Zinn, who is renowned for bringing mindfulness meditation into the mainstream of modern medicine and society. In Kabat-Zinn’s view, “An operational working definition of mindfulness is: the awareness that emerges through paying attention, on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (2003, 145).

8. It is widely accepted in the scientific community that altruism is closely tied to evolutionary dynamics and has aided in the flourishing of our species (De Waal 2005; Ruse 2002; Sober 2002).

9. A wealth of psychiatric and neuroscientific research indicates that prefrontal cortical areas are integrally involved in human empathy, morality, and compassion. Many of these studies focus on the results of damage to prefrontal areas, or abnormalities in prefrontal functioning in individuals who have been diagnosed with social psychiatric disorders (Dolan 2002; King et al. 2006; Koenigs et al. 2007; Müller et al. 2003).

10. There is evidence, in fact, that “the neurobiology of racism . . . [is] related to the fear circuitry of the brain” (Cozolino 2006, 253).

11. I have found the following list of ground rules to be reliable for establishing relational safety in contexts of communal spiritual practices: (1) Presume welcome and extend welcome. (2) Refrain from fixing, saving, or setting straight others in the group. (3) When the interaction gets tricky, turn to inquiry rather than advocacy (wonder about something instead of defending something). (4) Ask open, honest questions. Open questions are ones to which you cannot imagine “the right answer” and which have several possible responses; honest questions are ones that have no hidden agenda. (5) Speak for yourself (this will require listening to yourself). (6) Think of silence as another member of the group. (7) Observe confidentiality regarding material shared in the group (Dahl 2003).

## REFERENCES

- Beer, Jennifer S., Erin A. Heerey, Dacher Keltner, Donatella Scabini, and Robert T. Knight. 2003. “The Regulatory Function of Self-Conscious Emotion: Insights from Patients with Orbitofrontal Damage.” *Journal of Personality and Social Psychology* 85:594–604.
- Bowlby, John. 1982. *Attachment and Loss. Volume 1: Attachment*. 2d ed. New York: Basic Books.
- . 1988. *A Secure Base: Parent-Child Attachments and Healthy Human Development*. New York: Basic Books.
- Bregman, Lucy. 2006. “Spirituality: A Glowing and Useful Term in Search of a Meaning.” *Omega: Journal of Death and Dying* 53 (1/2): 5–26.
- Carr, Laurie, Marco Iacoboni, Marie-Charlotte Dubeau, John C. Mazziotta, and Gian Luigi Lenzi. 2003. “Neural Mechanisms of Empathy in Humans: A Relay from Neural Systems for Imitation to Limbic Areas.” *Proceedings of the National Academy of Sciences* 100:5497–5502.

- Cheng, Yawei, Ching-Po Lin, Ho-Ling Liu, Yuan-Yu Hsu, Kun-Eng Lim, Daisy Hung, and Jean Decety. 2007. "Expertise Modulates the Perception of Pain in Others." *Current Biology* 17:1708–13.
- Cozolino, Louis. 2002. *The Neuroscience of Psychotherapy: Building and Rebuilding the Human Brain*. New York: W. W. Norton.
- . 2006. *The Neuroscience of Human Relationships: Attachment and the Developing Social Brain*. New York: W. W. Norton.
- Dahl, Carla M. 2003. "Guidelines for Group Interaction in Marriage and Family Therapy Courses and Formation Experiences." St. Paul, Minn.: Bethel Seminary.
- Derryberry, Douglass, and Marjorie A. Reed. 2002. "Anxiety-Related Attentional Biases and Their Regulation by Attentional Control." *Journal of Abnormal Psychology* 111:225–36.
- De Waal, Frans. 2005. *Our Inner Ape: A Leading Primatologist Explains Why We Are Who We Are*. New York: Riverhead.
- Dolan, Mairead. 2002. "What Neuroimaging Tells Us about Psychopathic Disorders." *Hospital Medicine* 63:337–40.
- Eisenberg, Nancy. 2002. "Empathy-Related Emotional Responses, Altruism, and Their Socialization." In *Visions of Compassion: Western Scientists and Tibetan Buddhists Examine Human Nature*, ed. Richard J. Davidson and Anne Harrington, 131–64. Oxford: Oxford Univ. Press.
- Eisenberg, Nancy, Michelle N. Wentzel, and Jerry D. Harris. 1998. "The Role of Emotionality and Regulation in Empathy-Related Responding." *School Psychology Review* 27:506–21.
- Gallese, Vittorio. 2003. "The Roots of Empathy: The Shared Manifold Hypothesis and the Neural Basis of Intersubjectivity." *Psychopathology* 36:171–80.
- Gallese, Vittorio, Luciano Fadiga, Leonardo Fogassi, and Giacomo Rizzolatti. 1996. "Action Recognition in the Premotor Cortex." *Brain* 119:593–609.
- Griffith, James L., and Melissa Elliott Griffith. 2002. *Encountering the Sacred in Psychotherapy: How to Talk with People about Their Spiritual Lives*. New York: Guilford.
- Harrington, Anne, et al. 2002. "Dialogues, Part I: Fundamental Questions." In *Visions of Compassion: Western Scientists and Tibetan Buddhists Examine Human Nature*, ed. Richard J. Davidson and Anne Harrington, 81–103. Oxford: Oxford Univ. Press.
- Hill, Peter C., Kenneth I. Pargament, Ralph W. Hood Jr., Michael E. McCullough, James P. Swyers, David B. Larson, and Brian J. Zinnbauer. 2000. "Conceptualizing Religion and Spirituality: Points of Commonality, Points of Departure." *Journal for the Theory of Social Behaviour* 30:51–77.
- Iacoboni, Marco, Lisa M. Koski, Marcel Brass, Harold Bekkering, Roger P. Woods, Marie-Charlotte Dubeau, John C. Mazziotta, and Giacomo Rizzolatti. 2001. "Reafferent Copies of Imitated Actions in the Right Superior Temporal Cortex." *Proceedings of the National Academy of Sciences* 98 (24): 13995–99.
- Iacoboni, Marco, Roger P. Woods, Marcel Brass, Harold Bekkering, John C. Mazziotta, and Giacomo Rizzolatti. 1999. "Cortical Mechanisms of Human Imitation." *Science* 286 (5449): 2526–28.
- Kabat-Zinn, Jon. 2003. "Mindfulness-Based Interventions in Context: Past, Present, and Future." *Clinical Psychology: Science and Practice* 10:144–56.
- Karr-Morse, Robin, and Meredith S. Wiley. 1997. *Ghosts from the Nursery: Tracing the Roots of Violence*. New York: Atlantic Monthly Press.
- Kerr, Michel E., and Murray Bowen. 1998. *Family Evaluation: An Approach Based on Bowen Theory*. New York: W. W. Norton.
- Kestenbaum, Roberta, Ellen A. Farber, and Alan L. Sroufe. 1989. "Individual Differences in Empathy Among Preschoolers: Relation to Attachment History." *New Directions in Child Development* 44:51–64.
- Kirkpatrick, Lee A. 2005. *Attachment, Evolution, and the Psychology of Religion*. New York: Guilford.
- Koenigs, Michael, Liane Young, Ralph Adolphs, Daniel Tranel, Fiery Cushman, Marc Hauser, and Antonio Damasio. 2007. "Damage to the Prefrontal Cortex Increases Utilitarian Moral Judgments." *Nature* 446:908–11.
- Lazar, Sara W., Catherine E. Kerr, Rachel H. Wasserman, Jeremy R. Gray, Douglass N. Greve, Michael T. Treadway, et al. 2005. "Meditation Experience Is Associated with Increased Cortical Thickness." *Neuroreport* 16:1893–97.

- Lutz, Antoine, John D. Dunne, and Richard J. Davidson. 2007. "Meditation and the Neuroscience of Consciousness: An Introduction." In *The Cambridge Handbook of Consciousness*, ed. Philip David Zelazo, Morris Moscovitch, and Evan Thompson, 499–554. Cambridge: Cambridge Univ. Press.
- Main, Mary, and Carol George. 1985. "Responses of Abused and Disadvantaged Toddlers to Distress in Agemates: A Study in the Day Care Setting." *Developmental Psychology* 21:407–12.
- McGregor, Holly A., Joel D. Lieberman, Jeff Greenberg, Sheldon Solomon, Jamie Arndt, Linda Simon, and Tom Pyszczynski. 1998. "Terror Management and Aggression: Evidence That Mortality Salience Motivates Aggression against Worldview-Threatening Others." *Journal of Personality and Social Psychology* 74:590–605.
- Miller, Paul A., and Nancy Eisenberg. 1988. "The Relation of Empathy to Aggression and Externalizing/Antisocial Behavior." *Psychological Bulletin* 103:324–44.
- Müller, Jürgen L., Monika Sommer, Vereno Wagner, Kirsten Lange, Heidrun Taschler, Christian H. Röder., et al. 2003. "Abnormalities in Emotion Processing within Cortical and Subcortical Regions in Criminal Psychopaths: Evidence from a Functional Magnetic Resonance Imaging Study Using Pictures with Emotional Content." *Biological Psychiatry* 54:152–62.
- Ogden, Pat, Kekuni Minton, and Clare Pain. 2006. *Trauma and the Body: A Sensorimotor Approach to Psychotherapy*. New York: W. W. Norton.
- Oliner, Samuel P., and Pearl M. Oliner. 1988. *The Altruistic Personality: Rescuers of Jews in Nazi Europe*. New York: Free Press.
- Peacock, Thomas, and Marlene Wisuri. 2002. *Ojibwe Waasa Inaabidaa: We Look in All Directions*. Afton, Minn.: Afton Historical Society Press.
- Perry, Bruce D. 1997. "Incubated in Terror: Neurodevelopmental Factors in the 'Cycle of Violence.'" In *Children in a Violent Society*, ed. J. Osofsky, 124–49. New York: Guilford.
- Porges, Stephen W. 1998. "Love: An Emergent Property of the Mammalian Autonomic Nervous System." *Psychoneuroendocrinology* 23:837–61.
- Post, Stephen G., and Lynn G. Underwood. 2002. "Concluding Summary: Future Research Needs on Altruism and Altruistic Love." In *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*, ed. Stephen G. Post, Lynn G. Underwood, Jeffrey P. Schloss, and William B. Hurlbut, 379–86. Oxford: Oxford Univ. Press.
- Rizzuto, Ana-Maria. 1979. *The Birth of the Living God: A Psychoanalytic Study*. Chicago: Univ. of Chicago Press.
- Ruse, Michael. 2002. "A Darwinian Naturalist's Perspective on Altruism." In *Altruism and Altruistic Love: Science, Philosophy, and Religion in Dialogue*, ed. Stephen G. Post, Lynn G. Underwood, Jeffrey P. Schloss, and William B. Hurlbut, 151–67. Oxford: Oxford Univ. Press.
- Schore, Allan N. 2003a. *Affect Dysregulation and Disorders of the Self*. New York: W. W. Norton.
- . 2003b. *Affect Regulation and the Repair of the Self*. New York: W. W. Norton.
- Shults, F. LeRon. 1999. *The Postfoundationalist Task of Theology: Wolfhart Pannenberg and the New Theological Rationality*. Grand Rapids, Mich.: Eerdmans.
- Shults, F. LeRon, and Steven J. Sandage. 2005. *Transforming Spirituality: Integrating Theology and Psychology*. Grand Rapids, Mich.: Baker Academic.
- Siegel, Daniel J. 1999. *The Developing Mind: How Relationships and the Brain Interact to Shape Who We Are*. New York: Guilford.
- . 2006. "An Interpersonal Neurobiology Approach to Psychotherapy." *Psychiatric Annals* 36:248–56.
- . 2007. *The Mindful Brain: Reflection and Attunement in the Cultivation of Well-Being*. New York: W. W. Norton.
- Siegel, Daniel J., and Mary Hartzell. 2003. *Parenting from the Inside Out: How a Deeper Self-Understanding Can Help You Raise Children Who Thrive*. New York: Penguin.
- Sober, Elliot. 2002. "Kindness and Cruelty in Evolution." In *Visions of Compassion: Western Scientists and Tibetan Buddhists Examine Human Nature*, ed. Richard J. Davidson and Anne Harrington, 46–65. Oxford: Oxford Univ. Press.
- Sorenson, Randall Lehmann. 2004. *Minding Spirituality*. Hillsdale, N.J.: Analytic Press.
- Stenmark, Mikael. 2004. *How to Relate Science and Religion: A Multidimensional Model*. Grand Rapids, Mich.: Eerdmans.

- Taylor, Shelley E., Laura Cousino Klein, Brian P. Lewis, Tara L. Gruenewald, Regan A. R. Gurung, and John A. Updegraff. 2000. "Biobehavioral Responses to Stress in Females: Tend-and-Befriend, not Fight-or-Flight." *Psychological Review* 107:411–29.
- Umbreit, Mark. 2003. "Talking Circles." Center for Restorative Justice and Peacemaking, Univ. of Minnesota. [http://rjp.umn.edu/Copy\\_of\\_Restorative\\_Justice\\_Principles.html](http://rjp.umn.edu/Copy_of_Restorative_Justice_Principles.html).
- van der Hart, Onno, Ellert R. S. Nijenhuis, and Kathy Steele. 2006. *The Haunted Self: Structural Dissociation and the Treatment of Chronic Traumatization*. New York: W. W. Norton.
- van Huyssteen, J. Wentzel. 1999. *The Shaping of Rationality: Toward Interdisciplinarity in Theology and Science*. Grand Rapids, Mich.: Eerdmans.
- . 2006. *Alone in the World? Human Uniqueness in Science and Theology*. The Gifford Lectures, Univ. of Edinburgh, Spring, 2004. Grand Rapids, Mich.: Eerdmans.
- Waters, Everett, Judith Wippman, and Alan L. Sroufe. 1979. "Attachment, Positive Affect, and Competence in the Peer Group: Two Studies in Construct Validation." *Child Development* 50: 821–29.
- Zinnbauer, Brian J., and Kenneth I. Pargament. 2005. "Religiousness and Spirituality." In *Handbook of the Psychology of Religion and Spirituality*, ed. Raymond F. Paloutzian and Crystal L. Park, 21–42. New York: Guilford.



Copyright of *Zygon: Journal of Religion & Science* is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.