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A Neuroscientific Renaissance of Humanistic Psychology

Eugene M. DeRobertis[1]

Abstract

Advances in cognitive neuroscience are creating a significant theoretical rapprochement between neuroscience and humanistic psychology. Since the decade of the brain, there has been a steady increase in neuroscientific research on characteristically humanistic topics such as selfhood, choice, and collaborative meaning making. Moreover, the fundamental postulates of humanistic psychology are playing a central role in a host of contemporary viewpoints within neuroscience. As a result, neuroscience is paving the way for a renewed appreciation of humanistic psychology. The purpose of this article is to provide an overview of the contemporary currents of neuroscientific thought that are most notably supportive of humanistic psychology's general understanding of human existence. The theoretical rapprochement between neuroscience and humanistic psychology suggests that humanistic psychology may benefit from enhancing its developmental and multicultural aspects. Humanistic psychology stands to further benefit from the development of an integrated, distinctly humanistic neuroscience viewpoint.

Keywords

humanism, neuroscience, neurophenomenology, enactive, dynamic systems, holism

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This article focuses on points of convergence between neuroscience and humanistic psychology, broadly conceived. I feel justified in having written the article due to the fact that third force thinkers are both open to the notion of integrating neuroscientific insights into their work *and* suspicious of the excesses sometimes associated with the "mainstream" neuroscientific worldview. Thus, before proceeding with a work on humanistic neuroscience, a word of caution needs to be said.

To be sure, I could not help but approach this article with some degree of trepidation, as there is much potential for what follows to be misconstrued. This article is by no means an attempt to thoroughly "neurolocize," as it were, those approaches to psychology associated with the third force movement. I am acutely aware that this is the trend of the day. There is a pronounced tendency within contemporary psychology to turn all matters of interest into biophysical problems, especially of the neurological variety. Taken at face value, this trend might simply reflect the synthesis of an exciting new area of research, thereby representing nothing more than a normal course of progress within the discipline of psychology as a whole. However, as a sociohistorically and philosophically minded thinker, I cannot help but note that something more is afoot. The mainstream of neuroscientific thought has successfully popularized a new, watered-down and muddled form of Cartesianism. According to this view, all aspects of worldly experience are perpetually suspect and subject to doubt until or unless some internal, neurological activity can be found to both justify and explain away their existence. Through this procedure, the separation of person and world is achieved (as it was for Descartes), but via slightly different means. Descartes's method of radical doubt has been replaced by something far less ambitious and, yet, quite impossible from the standpoint of disciplined theoretic analysis (Martin, 2004).

Psychological issues are all-too-easily seen as "resolvable into" neurological issues in today's world. In one fell swoop, human socialization becomes a mere problematic of mirror neurons. Neurons are anthropomorphized while human beings are depersonalized. *You*, the human being, does nothing. It is neurons "who" somehow traverse the cranium to socialize. Processes of consciousness are held to "accompany" this neurological activity, though the role and status of consciousness is hotly debated. If Edmund Husserl were alive today, he may have referred to this tendency as *neurologism*. In this frame of mind, what follows could be interpreted as saying that the insights of humanistic forms of psychology are really best understood on a neurobiological basis, thereby obviating the need for the theoretical and methodological pluralism that has been developed by third force thinkers over the many years of its existence. This would be a grave *mis*interpretation of this article, and I very much wish to avoid it. I am not proposing some humanistic version of Freud's famous project for a so-called scientific psychology.

My intention in writing this article is not at all to suggest that humanism in psychology is best understood on a neuroscientific basis. Quite the contrary, I believe that neuroscience as a whole should ultimately be understood as falling under the umbrella of what Edmund Husserl (1970) called *humanistic science*. More specifically, I am focusing here on those approaches to contemporary neuroscience that world serve the development of a human science approach to neuroscience (a truly *human* neuroscience, if you will). Further, I am *not* suggesting here that neuroscience as a whole has had a sudden conversion, such that neuroscientists have by and large become humanists. I would wager that most neuroscientists remain habitually blind to the fact that they are advocating a mythical Archimedean point that is ignorant of what Erwin Straus (1982) called "the possessive-relationship": the fact that they are always in the process of creating a construct ("the" objective brain) with their own very personal, fully situated brains (p. 147). I am merely pointing out that there have been some extremely important and subtle developments within neuroscience that make for an unprecedented potential for fruitful dialogue and the future development of third force thought. In fact, I fully expect the neuroscientific faithful to discount this article out of hand or at least minimize the relevance of its contents. To this faithful, the aims of third force psychology are so habitually (and romantically) inclined toward exegesis that we can only be viewed as chasing shadows while they do the "real" work of science. The illogic of their "biologistic" worldview is passed over in silence as insignificant on the basis of a materialistic appeal to the "hard facts." And yet, this illogic remains, stark and steadfast.

Historically, humanistic (i.e., third force or human science) psychologists have looked upon the tendency to explain psychological phenomena in neurological terms as suspect in nature. Humanistic psychologists of various persuasions have been critical of the reductionism of many such explanations. In the distinctly American humanistic literature, brain science was seen as often overlooking the integrity of the experiencing, world-relating individual, thereby valuing organs and anonymous organismic functioning over persons (e.g., Bugental, 1981). As Barnard (2011) expressed it, drawing on Bergsonian philosophy,

> According to Bergson, the fact that there is a correspondence between brain activity and states of consciousness does not indicate that those states were produced by the brain or somehow localized within it. Suppose, for example, that we compare the brain to a television set. There is, apparently, a one-to-one

> relationship between the electrical and mechanical activity of the television set and the programs that are appearing on the screen. But no one ever claims that the program that is appearing on the screen has been *produced* by the television. Instead, a television set receives, limits, directs, and shapes preexisting electromagnetic signals of various frequencies into the programs that we watch on the screen. (p. 144)

European phenomenology critiqued neurological reductionism (considered to be a form of "biologism") by also noting that it explains away and thus invalidates the foundational principles of psychological science (Drummond, 2007, p. 45). As Erwin Straus (1966) put it,

> The neurophysiologist is forced to exempt himself from the rules applied to his objects, men or animals. . . . If the behavior of a subject can be fully explained as manifestations of events within a nervous system, then the behavior of the observer must be submitted to the same process of reduction. But this would eliminate all possibilities of observing and experimenting. (p. 213)

Interestingly, however, decades of ambivalence have been gradually dissolving, and many humanistic psychologists are making fast friends of neuroscience. This makes sense, as neuroscience is increasingly validating humanistic psychological principles.

Midway through the decade of the brain, Dennis (1995) coined the term *humanistic neuroscience*. According to Dennis, neuroscience was becoming "humanistic" due to its particular manner of approaching the study of cognition. Neuroscience had become *cognitive* neuroscience, and had not only helped rescue the human mind from its behaviorist exile, but also begun to neurologically map "distinctly" human mental capacities such as willing and subjective awareness (Dennis, 1995, p. 46). Furthermore, cognitive neuroscience had begun to discover that neurological functioning is highly dependent upon both bottom-up *and* top-down (e.g., contextualized, knowledge-based) processing. As a result of a constant interplay between bottom-up and top-down processes, it was understood that the brain remains dynamic and spontaneously active throughout the lifespan. This new neuroscientific outlook proposed a viable challenge to the materialistic reductionism of old.

The term *humanistic neuroscience* has never garnered any sort of widespread attention within neuroscience or the psychological community at large, though there have been a few exceptions (e.g., Brown, Hedges, & Gantt, 2008; DeRobertis, 2012; Liston, 1996). To be sure, there are many different kinds of neuroscience researchers and many different kinds of neuroscience. Nonetheless, several prominent currents of thought within neuroscience have emerged since the decade of the brain, each of which has provided notable contemporary support for the humanistic worldview in psychology. There is a growing theoretical rapprochement occurring between humanism and neuroscience, constituting a significant theoretical development within the field of psychology. The purpose of this article is to provide a general (i.e., nonexhaustive) overview of these neuroscientific perspectives, and to highlight the ways in which they are providing contemporary support for humanistic psychology's general understanding of human existence.

In order to frame my discussion, I will utilize the five basic postulates of humanistic psychology articulated by Bugental (1964, 1981). These postulates outline the humanistic view of human psychological life. To summarize, the five postulates are as follows: (a) human beings cannot be reduced to a conglomeration of discrete elements or part-functions; (b) human beings exist in a uniquely human, conspicuously interpersonal context; (c) human beings display many levels of awareness and self-awareness; (d) human beings are aware that their choices make a difference in the flow of their experience; and (e) human beings are intentional, creatively seeking meaning, value, and purpose in life. These five postulates will act as subheadings for the discussion to follow.

Human Beings Cannot Be Reduced to a Conglomeration of Discrete Elements or Part-Functions

Humanistic psychology has traditionally maintained a focus on molar and whole person forms of analysis (e.g., phenomenological, idiographic, collaborative, narrative, action-oriented, ethnographic, etc.) as a counterpoint to the atomistic tendency inherent to the discipline at large. Humanistic psychologists do not believe that human psychological life can be adequately comprehended when characterized as the summative result of part-processes (Bugental, 1981). This sentiment is now prominent in several approaches to neuroscience.

Dynamic systems neuroscience provides a clear example of neuroscientific holism. Dynamic systems neuroscience holds that the development and functioning of the brain is the result of diverse *relationships* rather than isolated variables. As Thelen and Smith (1998) noted, dynamic systems thinking places emphasis on "relationships among components as the origins of change, rather than a set of instructions" (p. 571). Neurological development is seen as part and parcel of a genuine unfolding wherein many factors contribute to the emergent formation of the nervous system and the mind.

Paul van Geert and Henderien Steenbeek (2005) noted that dynamic systems thinking has several core features, including *nonlinearity, self-organization, substance-process dialectic, multilayered and multiscaled causality*, and *superposition*. Nonlinearity means that the effects of forces are the result of complex interactions rather than the mere summation of causal variables. In a related fashion, self-organization implies that macroscopic order emerges more or less spontaneously, superseding the order and structure present in its elementary inputs. These ideas lead one away from an exclusive focus on bottom-up neurological explanations. The same can be said for the emphasis on substance-process dialectic, which refers to the fact that physical things and processes are dependent upon one another for their existence, functioning, and structural form. As van Geert and Steenbeek put it:

> Given our human, cognitive structure, it is easier to understand substance than a process explanation and that is why substance explanations are preferred over the more ephemeral process models. The idea of a brain as a physical substance that contains the causes of behavior in some substance format currently receives major scientific interest. The substance aspect is demonstrated by the search for specific, localizable regions or parts of the brain that are responsible for some specific form of cognitive activity, for instance reading or the manipulation of numbers. However interesting such localization studies are, it should be noted that they do not offer an explanation of the reading process or the thinking with numbers (in the popular press, at least, the finding of a "brain site that does it" is often presented as an ultimate explanation of the process at issue). Moreover, the localized regions are "real" only to a certain extent, since they are the result of a considerable amount of averaging over subjects and occasions, in addition to the fact that they refer only to regions of increased activity and not to unique places where the task at issue is performed without the help of less active regions (pp. 7-8).

From a dynamic systems perspective, psychological phenomena are not merely "hard-wired." Rather, they involve contexts and environments that play a role in their apparent diversity. Interactions within environments play a formative role in individual neural fluctuations. Accordingly, multilayered and multiscaled causality imply that many components issue forth from many sources (individual, group, societal, cultural, species-wide) and many time scales (microgenetic, ontogenetic, historical, and evolutionary) in order to determine the functioning of the entire organism, including its nervous system. "The external tools that are created to improve cognition and action are not just external appendages that in themselves do not affect the internal processes they support" (van Geert and Steenbeek, 2005, p. 9). Finally, superposition means that a phenomenon is characterized by multiple seemingly incompatible properties simultaneously. In the context of neurology, van Geert and Steenbeek observed, superposition "often occurs in the context of questions such as 'does the brain explain the mind'" (2005, p. 4). Linear answers to such a question result in oversimplifications that only lead to intensified controversy and debate (e.g., those debates surrounding the mind-body problem, isomorphism, homunculus theorizing, and epiphenomenalism).

In 2005, Marc D. Lewis provided an example of how dynamic systems thinking can be used to draw productive connections between emotion theory and neurobiology. Lewis noted that neural accounts of emotion focus almost exclusively on interacting parts, thus largely ignoring molar units of analysis (i.e., the meaningful wholes that constitute emotional interactions). As Ochsner and Lieberman (2001) observed, neuroscience has traditionally treated emotion as if it were a stimulus property like color or shape rather than as a situation-dependent phenomenon. Moreover, cognitive approaches to emotion, even highly molar theories like the appraisal-based theory of Richard Lazarus (e.g., Lazarus & Smith, 1988), address emotional responses with an outmoded orientation that is computational, mechanical, linear, and thus conspicuously artificial. In line with the dynamic systems principles noted above, Lewis observed that complex cognitive systems *continually* reconfigure themselves in response to ongoing streams of sensory events, making them *inherently* motivational and affective. The neurological correlates of emotion and emotional appraisals really represent emotion-appraisal amalgams or *emotional interpretations that emerge within a context of worldly interaction*. As Lewis (2005) put it,

> A continually updated plan, by which behavior is monitored and controlled, may guide the integration of neural systems mediating emotion and appraisal. This idea links vertical integration within the brain to emerging transactions between the brain and the world. (p. 188)

For Lewis, intentional consciousness structures or "constrains" the activation of the particular psychological and neural constituents "producing" them (p. 174).

More recently, dynamic systems neuroscience has given rise to neurophenomenology. Neurophenomenology is an attempt to integrate dynamical systems principles with phenomenological analyses of experience and experimental results from studies on biological functioning (Gallagher & Zahavi, 2012). Starting with a basic dynamic systems perspective, neruophenomenology holds that "the neural activation that underlies our experience is not localized in a specific brain area, but involves the rapid and transient integration of functionally distinct and widely distributed brain areas" (Gallagher & Zahavi, 2012, p. 38). Further, the sensorimotor coupling of organism and physical environment "modulates (but does not determine) an ongoing [neurological] activity that is configured into meaningful world items in an unceasing flow" (Gallagher & Zahavi, 2012, p. 33). Intentionality, emotional interpretation, experience, information processing, and neurological processes are all given equal footing and viewed as the coordinated manifestations of *a complex psychological whole*. Thus, neurophenomenology perhaps even more vehemently rejects reductionistic, linear, atomistic neurological analysis (Thompson, 2007). This becomes evident in its methodological procedures.

As Gallagher and Zahavi (2012) noted, the experimental control of subjective phenomena is a stumbling block in neuroscience research (and, incidentally, has been an obvious problem in experimental psychology since at least the time of Wilhelm Wundt's attempts at introspection). Experimental neuroscience has "solved" the problem of subjectivity by ignoring or neutralizing it via a method of averaging results across numerous trials and numerous subjects. As an alternative, neurophenomenology attacks the problem of subjectivity head-on by using first-person reports to structurally or organizationally inform data analysis. Rather than amassing mere quantities of data and relying on averaging, neurophenomenologists train subjects in the techniques of phenomenological description so that individual responses can be more meaningfully, precisely, and qualitatively associated with complex, distributed neurological events. This is proposed as a methodological solution for the quantity-quality gap in neuroscience.

Human Beings Exist in a Uniquely Human, Conspicuously Interpersonal Context

If a human being is a functional whole, that whole includes the individual's dynamic and sustained world-relations. Human psychological life is embedded within a world of meaningful human affairs. This worldliness relates to the second postulate of humanistic psychology, which proposes an emphasis on the context of human living. Several kids of neuroscience have addressed this postulate as a focal concern, including social cognitive neuroscience, existential neuroscience, and the closely related areas of neuroanthropology and cultural neuroscience.

Social cognitive neuroscience, for example, insists that neural mechanisms work hand-in-hand with cognitive information processing, behavior, and experience, and *personal and social context* (Ochsner and Lieberman, 2001). As Ochsner and Lieberman (2001) noted, cognition is a gestalt that varies with mood, affect, level of action identification, self- versus other attention, temporal perspective, culture, personality, epistemic motivation, and analytic versus intuitive mental sets. The kind of neural circuitry that is recruited at any given time is a function of the task in question and the overall psychological state of the individual, which are both inextricably related to context.

Cacioppo and Berntson (1992) highlighted the conspicuously interpersonal nature of this context by observing,

> The brain does not exist in isolation but rather is a fundamental but interacting component of a developing or aging individual who is a mere actor in the larger theater of life. This theater is undeniably social, beginning with prenatal care, mother-infant attachment, and early childhood experiences and ending with loneliness or social support and with familial or societal decisions about care for the elderly. (p. 1020)

According to Cacioppo and Berntson (1992), there is a reciprocal influence that occurs between microscopic neurochemical events and macroscopic social events, each occurring at a different *level of organization* in the functioning of the individual person. The notion of levels of organization is offered as an alternative to reductionism, which is an insufficient method of explanation due to the lack of isomorphism across levels of analysis. That is, macroscopic and microscopic events are not perfect analogues to one another, and thus properties of parts do not always reliably predict the manifestations of the whole. To illustrate, the neurochemical factors involved in depression do not exhaustively disambiguate the complex developmental, social, and cultural phenomena that play into the way the condition manifests itself in the lives of individual human beings. It was for this reason that Viktor Frankl (1978) introduced a dimensional-ontological view of psychopathology, wherein a diagnosis such as depression could be seen as deriving from endogenic, psychogenic, sociogenic, and/or noögenic factors. Similarly, Cacioppo and Berntson (1992) noted that a target event at one level of organization might have multiple antecedents on other levels of organization.

Marco Iacoboni (2007) selected the term *existential neuroscience* to refer to his version of social cognitive neuroscience. He called his perspective existential in order to explicitly refute the atomistic manner in which input has been traditionally conceptualized in neuroscience. From an atomistic viewpoint, when information is brought in to neurologic systems for analysis, aspects of the world can be processed independent of each other and independent of their context. In contrast, Iacoboni held that neuroscience has inevitably had to adopt a conceptualization of the brain that "needs a body to exist in a world of shared social norms in which meaning originates from being-in-the-world" (p. 440). As an example, Iacoboni noted that mirror neurons respond in ways that require an understanding of action sharing and interpersonal intimacy in goal-setting. This actional, empathy-based understanding of mirror neural functioning contradicts the image of a lone brain interpreting the world from afar.

To further illustrate, Iacoboni pointed out that there are two classes of visuomotor neurons: mirror neurons and canonical neurons. These neurons share motor properties but differ in terms of sensory properties. Canonical neurons fire at the sight of a graspable object, but not at the sight of an object-directed *action* the way mirror neurons do. Thus, while watching someone grasp a cup, there arises a mysterious absence of firing among canonical neurons. Iacoboni (2007) explained this as follows: "When the cup is going to get grasped by somebody, it is no longer simply a cup, it belongs to the grasping action" (p. 447). Thus, these neurological events do not make sense when looked at in a context-less, worldless way. It requires insight into the meanings of complex social situations. All in all, Iacoboni concluded that the default state of human neurological functioning is *social* functioning:

> The default state of humans is to "think socially," explicitly or implicitly, and the cortical areas mostly engaged with this continuous social thinking are the ones that get de-activated when artificial laboratory tasks with very little ecological validity are used. (p. 449)

Iacoboni's call for a neuroscience that breaks with the tradition of artificialism is perhaps best seen in the neuroanthropological and cultural neuroscientific literature, as these two closely intertwined currents of thought are the most adamant about understanding the real-life social embeddedness of neural functioning. Thus, with his colleagues Elizabeth A. Reynolds Losin and Mirella Dapretto, Iacoboni (2009) noted a need for neuroscientists to study the mirror neuron system *as it functions under differential cultural constraints*. In their words,

> Future neuroscientific studies of imitative learning embedded in ecologically valid cultural contexts are needed to truly elucidate how the previously described neural systems (including those sub serving mental state attribution and reward processes) may function during real-world cultural imitative learning. (Reynolds Losin, Dapretto, & Iacoboni, p. 185)

Neuroanthropology and cultural neuroscience have a long developmental history, beginning with biogenetic structuralism, which emphasized the intra- and interorganismic entrainment of neurocognitive processes (e.g., d'Aquili, Laughlin, & McManus, 1979). As Chiao (2009) noted, cultural neuroscience can also be seen as an extension of probabilistic epigenetic thought and biocultural coconstructivism, both of which note how developmental paths are determined by biological and cultural *interactions*. When seen as culture-dependent, neuroscience becomes notably more holistic and social. As Seligman and Kirmayer (2008) put it:

> Dichotomous paradigms assume, in accordance with the long tradition of mind-body dualism, that there is some great division between brain state and social role—that they reflect separate, unrelated processes. On the contrary, we argue that state and role—our metaphorical understandings and experience of shifts in consciousness—are continuous and mutually reinforcing. (p. 33)

Cultural neuroscience focuses on the bidirectional influence of culture and genes to brain and behavior, as cultural values, practices, and beliefs are seen as shaping brain functioning (Chiao, 2009). As Chiao (2009) put it, cultural neuroscience recognizes a "mutual constitution of genes, brain, mind, and culture" (p. 291). Thus, psychological phenomena are considered the "synergistic product of mental, neural, and genetic events" (p. 289). To illustrate, Chiao noted that the neural substrates of self-knowledge are modulated by the cultural values of individualism and collectivism. Specifically, areas of the medial prefrontal cortex associated with self-evaluation and self-knowledge respond differently according to the degree to which individuals endorse individualistic versus collectivistic values.

Human Beings Are Capable of Many Levels of Awareness and Self-Awareness

At present, it is fashionable to note that Gestalt psychology (the origins of which lie in phenomenology) was a precursor to the appearance of cognitive psychology (e.g., Lahey, 2001). What is less recognized is that the emergence of humanistic psychology was intended, in part, to facilitate a cognitive revolution in phenomenological terms. The third postulate of humanistic psychology was designed to overthrow the behavioral doctrine of the black box and address the need for research in diverse areas of human awareness. This postulate asserts that human experience is complex, graded, and inclusive of manifold levels of awareness ranging from unconscious reactions to consciously recognized senses of self (DeRobertis, 2012). As of late, these topics have become quite fashionable in neuroscience. As Eugene Taylor (2010) put it:

> Within a very short period of time the general focus of neuroscientific inquiry has jumped from dealing exclusively with problems defined by the traditional boundaries of the old disciplinary categories of reductionistic biology, physics, chemistry, and so on, to interdisciplinary studies in the sciences and the training of a new generation of investigators to conduct science in this new context. The most important development to note in this regard is that at the present pace of expansion the outcome of the neuroscience revolution is quite out of the control the original reductionistic mentality that started it and out of which it grew. One sign of this is the return of philosophical discourse in search of a solution to the so-called "hard problem" [of consciousness] (pp. 11–12)

Along similar lines, Evan Thompson (2007) noted:

> The emergence of embodied dynamicism in the 1990s coincided with a revival of scientific and philosophical interest in consciousness, together with a renewed willingness to address the explanatory gap between scientific accounts of cognitive processes and human subjectivity and experience. (p. 12)

The third postulate of humanistic psychology suggests that, in addition to the fact that there are many levels of human functioning, there are also many varieties of awareness ranging from the diffuse and pre-reflective to the highly reflective and narrative. In support of this proposition, Iacoboni (2007) argued against the cognitivist doctrine of internal representation, which implies that subject-object or person-world interactions always occur at one step removed from concrete lifeworld experience. According to Iacoboni, when a person observes a behavior that facilitates cortiospinal excitability, this observation evokes motor potentials at the level of muscle activity and is muscle specific. This implies a direct connectivity of perception with embodied, embedded relating that does not always require the mediating intervening variable of an internal representation. Similar things can be said of the Chameleon effect, as evidenced by phenomena such as social yawning, which is grounded in an empathy-based, prereflective form of neural activation and awareness.

Harry T. Hunt (2007) has addressed the range of human awareness as such by noting, "there is a general continuum of presence and feeling of reality whose neurocognitive manifestations are an enhancement versus diminution of cortical connectivity and EEG coherence" (p. 226). According to Hunt, the continuum of presence involves right parietal areas, which link self and other as cognitive reciprocals and are notable in the neuroanalysis of schizophrenia and meditative and ecstatic states. Specifically, there is a diminution in the former, while there is enhanced connectivity in the latter.

Hunt's analysis implies a continuum of awareness concerning the self that has been discussed at some length by Damasio (1999). Damasio conceptualized self-development as involving gradual increases in the awareness of one's relatively autonomous world-relating. Self-development begins with the direct experience of one's physical continuity in time and space, something analogous to what D. W. Winnicott called going-on-being (Winnicott, 1965). This experience forms a proto-self, which comes to be cortically and subcortically mapped over time, particularly as regards changes that occur in the proto-self as a result of direct interactions with the world. This provides the neurological basis for a core self (Stern, 1985) and acts as a rudimentary foundation for the eventual emergence of a narratively mediated autobiographical self.

To be sure, neuroscientific studies of self began to occur with notable frequency with the onset of the new millennium. Selfhood has been noted to be correlated with the medial prefrontal cortex (Kelley et al., 2002), the right dorsomedial prefrontal cortex (Fossati et al., 2003), the early maturing right hemisphere, particularly the orbitofrontal cortex (Schore, 2002), the inferior parietal cortex and the prefrontal cortex in the right hemisphere (Decety & Chaminade, 2003), and a bihemispheric experience of integration (Siegel, 2001). Allan Schore (2002) and Daniel Siegel (2001), from the perspectives of neuropsychoanalysis and interpersonal neurobiology, respectively, have both observed that the neural correlates of selfhood develop via secure attachments. Specifically, the neurology of selfhood is facilitated via interactions with dedicated caregivers who can provide a model of psychological structure. Such individuals provide a structural foundation for stable self-knowledge, self-awareness, and the integrative processing of self-relevant information pertaining to past, present, and future.

The perspectives of Schore (2002) and Siegel (2001) highlight the socially mediated nature of self-awareness at the level of neurological functioning. Recently, this view has found support in the area of cultural neuroscience, such as the aforementioned work of Chiao (2009) on the neural substrates of self-knowledge. Chiao questioned whether self-construals that activate the anterior rostral portion of the medial prefrontal cortex (MPFC) differ depending upon where one falls along the individualist-collectivist continuum. By comparing American and Japanese participants, Chiao found that collectivist personalities show a greater response for context-dependent (i.e., relational) self-descriptions within the MPFC than their individualist counterparts. Her results supported the notion that self-relevant processing within the MPFC varies as a function of culturally related self-construal. Similarly, Seligman and Kirmayer (2008) have observed that even the way dissociative states are experienced reflects *both* the culturally *and* neurobiologically patterned regulation of attentional mechanisms. As they put it, "Under the guidance of a cognitive expectation or cultural script, individuals can learn to actively inhibit or suppress specific perceptual and cognitive processes" (p. 55).

Human Beings Are Aware That Their Choices Make a Difference in the Flow of Their Experience

Bugental (1981) introduced the fourth postulate of humanistic psychology by noting, "there is no desire here to resume the hoary debate regarding free will versus determinism. Phenomenologically, choice is a given of experience" (p. 12). As a broad generalization, neuroscience authors have not been quite as willing to forgo this debate. For instance, Michael S. Gazzaniga (2004) observed,

> At the conclusion of a conference attended by more than 80 leading scientists who presented their research on how brain enables mind, it because obvious that the central question of cognitive neuroscience remains not only unanswered, but worse: it remains unexamined. . . . Overall, modern studies always seem to leave room for the homunculus, the ghost in the machine, that does all the directing of brain traffic . . . the fact of the matter is, no one knows anything about the "top" in "top-down." This is a major problem of cognitive neuroscience today, and we hope that it will become the subject of research in the near future. There is a universe of knowledge yet untapped." (p. 1214)

Contrary to what one might expect, however, neuroscientists have been quite open to nondeterministic views of human choice. As Freeman (2008) noted, from a nonlinear, dynamic systems view of neuroscience, neural functioning is part of the self-organizing tendencies of the whole organism, which involves "constructive choice" (p. 233). Choice is most closely associated with the orbitofrontal cortex in neuroscientific literature. At the same time, however, choice is considered stochastic and indeterministic, requiring in-depth analyses of different kinds of choices and the distributed neural processes that they recruit (Dolan & Sharot, 2011).

The power of genuine human choice has been discussed in several ways within the ranks of neuroscience. One can find choice implicit in the literature on will, executive and metacognitive functioning, volition, and agency, for example. Dennis (1995) related human willing to the neuroscientific concept of readiness potential:

> New brain mapping and other sophisticated technologies have provided us with a new picture of the functional loci and nature of distinctly human mental operations. By measuring event-related cortical potential preceding voluntary movement, Kornhuber and his associates discovered *Bereitschaftspotential* or readiness potential. With a rather consistent temporal-spatial distribution over the brain, a slowly rising negative potential begins before initiation of the movement, as defined by the first electromyographic response (Deecke,

> Grozinger, & Kornhuber, 1976; Kornhuber, Deecke, Lang, Lang, & Kornhuber; 1989). The readiness potential is the neural representation of the mental act of willing. Its wide extent and gradual buildup suggests that willing is widely dispersed in the brain. (Dennis, 1995, p. 46)

For a time, it was fashionable to cite Benjamin Libet's experiments on readiness potential as a refutation of the freedom of the will (e.g., Libet, Wright, Feinstein, & Pearl, 1979). However, Libet's findings have not only been found to be problematic as a refutation of free will (e.g., Dennett, 1991), they have also been interpreted as presenting evidence *in favor* of the concept (Bertelsen, 2005; Dennis, 1995). Thus, Adina L. Roskies (2010) noted, "Although some researchers contend that neuroscience will undermine our views about free will, to date no results have succeeded in fundamentally disrupting our commonsensical beliefs" (p. 109). Indeed, willing has remained a topic of concern among neuroscientists, some of whom see it as recruiting diverse areas of the brain involved in motor control, coordination, the timing of movements, and executive functioning, especially the prefrontal cortex (Leisman, Machado, Melillo & Mualem, 2012).

Executive functioning involves the ability to monitor and control the information processing necessary to produce voluntary action. Although executive functions involve a network of brain regions, clinical studies have indicated that the frontal lobes are chief contributors (Shallice, 1988; Stuss & Benson, 1986). More recently, Fernandez-Duque, Baird, and Posner (2000) observed that metacognition is closely related to executive functioning, metacognition being the knowledge or cognitive processes that monitor and control cognition. After reviewing a number of brain-imaging studies, the authors identified a circuitry of attentional networks involved in executive and metacognitive functioning emanating from midfrontal areas of the brain active during conflict resolution, error correction, and emotional regulation. Similarly, Roskies (2010) noted that several regions of the frontal cortex figure prominently and repeatedly in studies on volition. Notably, the dorsolateral prefrontal cortex and the presupplementary motor area are activated in many tasks involving choice or decision making.

The term *agency* is used to refer to the *owned* nature of willing in the neuroscientific literature. Experiments on the sense of agency have pointed to the posterior parietal cortex as critical for self-recognition, whereas the activation of the right inferior parietal lobe/temporoparietal junction has been found to correlate with the sense of ownership in action (Farrer, Franck, Georgieff, Frith, Decety, & Jeannerod, 2003; Ruby & Decety, 2001). Still other authors have found that tasks requiring the perception of agency activate the posterior superior temporal cortex, particularly in the right hemisphere (Tankersley, Stowe, & Huettel, 2007).

Human Beings Are Intentional, Creatively Seeking Meaning, Value, and Purpose in Life

The final postulate of humanistic psychology asserts that human beings cannot be adequately understood on a merely reactive basis. Rather, human beings are actively involved in the design of their lives, and the exemplar of this activity is *creativity*, especially as it involves the pursuit of a meaningful life (Bugental, 1981). As regards neurological mapping, Carlsson, Wendt, & Risberg (2000) found that highly creative people show more bilateral frontal activation when engaged in divergent thinking than less creative individuals, especially in the prefrontal cortex (Dietrich, 2004). The limbic regions are considered specialized to carry out "the appraisal of meaning or value of stimuli" (Siegel, 2001, p. 81). Park, Kahnt, Rieskamp, & Heekeren, (2011) found that changes in valuational meaning are associated with modulations in subgenual anterior cingulate cortex-amygdala coupling. However, novel neuroscientific insights regarding this postulate of humanistic psychology go far beyond the mere identification of brain areas associated with creativity and hierarchical meaning generation.

Dynamic systems thinking, for example, gives the creative impetus a heightened overall importance in neuroscience. To illustrate, Thelen & Smith (1994, 2003) have drawn on the work of Gerard M. Edleman in embryology to make a convincing case that human development in general (including neurological development) is *not* the mere byproduct of a genetic program, but rather the result of "improvisation." They compared development with freestyle jazz riffing and asserted that the operative factor in human development is "selection" (Thelen & Smith, 1998). Following the Edleman model, Thelen and Smith noted that one-dimensional genetics cannot account for the development of a three-dimensional organism. Cell growth in the blastula is stochastic, requiring communication between genetic material and cell surroundings via the intermediary of the cell surface. General control parameters are genetically provided, but the time and place that cellular activity takes place ultimately determines where the cell winds up and what it will be doing. This is a kind of blueprint for how a generic organism is transformed into a unique organism (Thelen & Smith, 1994). In contrast to epigenetic processes unfolding autonomously, the final form of the organism and its neurology emerges from time-dependent interactions with a specific environment (Thelen & Smith, 1994, pp. 142-143).

Walter J. Freeman (2008) expanded on this line of thinking by noting that brains operate on their inputs via "creative acts" that generate abstracted forms of knowledge, the meanings of which are relational and context-dependent (p. 214). Rather than being a passive receptacle for information about the world, "knower and reality co-act in a continuous dynamism" wherein the surplus of characteristics inherent to each and every environmental context are interpreted amid the particular appetites and goals of the individual in question (p. 218). The meanings of "stimuli" are preceded and shaped by attentive awareness, which is itself preceded and shaped by the individuals' motives and goals (p. 230). Meaning is a function of the self-organizing activities of the organism in question. The meaning of "external" events corresponds to the attractors of the individual system's dynamic tendencies (Thompson, 2007, p. 27).

The inherently creative, meaning-oriented nature of neural functioning is equally emphasized in enactive and neurophenomenological approaches to neuroscience. As Evan Thompson (2007) noted, the nervous system does not merely process information in the mundane computationalist sense (i.e., like a computer), but is rather actively involved in *the creation of meaning* (p. 13). In his words, "the nervous system is an autonomous dynamic system: It actively generates and maintains its own coherent and meaningful patterns of activity, according to its operation as a circular and reentrant network of interacting neurons" (p. 13). According to the enactive approach, organisms regulate their interactions with the world in such a way as to "transform the world into a place of salience, meaning, and value—into an environment (*umwelt*) in the proper biological sense of the term" (Thompson & Stapleton, 2008, p. 3). To be sure, the environment of which Thompson speaks is not only an umwelt, but also a mitwelt (i.e., a realm of meaningful, value-laden *social* interactions). Worlds are transformed into places of meaning through cooperative, cocreative effort. Thus, Siegel (2001) noted,

> The generally held belief in neural science is that the patterns of neuronal connections determine the ways in which the brain functions and the mind is created. Because experiences with others early in life are so important for human development, I have earlier stated that "Human connections create the neural connections from which the mind emerges" (Siegel, 1999). It is in this manner that interpersonal experiences directly shape the genetically driven unfolding of the human brain. (p. 72)

Concluding Remarks

Contemporary neuroscience is paving the way for a renewed appreciation of humanistic psychology. Since the decade of the brain, there has been a steady increase in neuroscientific research on characteristically humanistic topics such as selfhood, choice, and collaborative meaning making. Moreover, the fundamental postulates of humanistic psychology are playing a central role in a whole host of contemporary viewpoints within neuroscience, including dynamic systems neuroscience, enactive neuroscience and neurophenomenology, social-cognitive and existential neuroscience, neuroanthropology and cultural neuroscience, neuropsychoanalysis, and interpersonal neurobiology.

The theoretical rapprochement that has been developing between neuroscience and humanistic psychology is not without precedent. In addition to the traditions of biogenetic structuralism, epigenetic thought, and biocultural coconstructivism already noted, precursors to the kinds of thinking discussed here can be found in research in the areas of animal awareness, evolutionary epistemology, emergentist mind-brain philosophy and emergent interactionism, hierarchy philosophy, social human agency, folk psychology, cognitive ethology, antireductive physics, and eco-philosophy, for example (Sperry, 1991). St. Thomas Aquinas (Freeman, 2008), William James (Cacioppo and Berntson, 1992), and Erwin Straus (1975) can also be said to have paved the way for the perspectives presented here. However, the growth of neuroscience in a more notably humanistic direction has been occurring with far more vigor since the 1990s. Thus, in this article, I have attempted to highlight the more recent advances involved in this development.

The material presented here not only provides contemporary support for humanistic psychology's general understanding of human existence, it also provides the basis for a revitalized, renewed humanistic worldview. In particular, the current discussion suggests that, with the support of neuroscience, humanistic psychology might enhance its developmental and multicultural aspects. Neuroscientific research indicates that the neurobiological substrate of human personality has a developmental quality about it, forming in accord with the principles of multilayered and multiscaled causality. In terms of layered formative influences on the human personality, the material presented here highlights the powerful role of cultural norms in the cocreative meaning making that is central to the humanistic conception of human psychological life. Culture becomes an integral part of the individual organism as part of a lifespan developmental process that involves many time scales and is highly plastic in nature (Schwartz & Begley, 2002). At present, however, humanistic studies of lifespan development and culture are rare (e.g., DeRobertis, 2012).

Humanistic psychology stands to further benefit from the development of an integrated humanistic neuroscience viewpoint. A promising contribution to such a project is the recently published *Neurophenomenology and Its*

Applications to Psychology (Gordon, 2013), which initiates a dialogue between one of the many movements noted above (neurophenomenology) and humanistic psychology. At present, however, efforts to work toward a distinctly humanistic neuroscience remain uncoordinated on the whole (e.g., Brown, Hedges, & Gantt, 2008; Dennis, 1995; Liston, 1996; Taylor, 2010). The present work could be seen as a prolegomena of sorts, being a broad-based schematic that outlines the major contributors to this project. The traditions of thought noted here might be synthesized for the purposes of developing a particular neuroscientific outlook that represents the depth and breadth of humanistic thought in all of its variety.

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