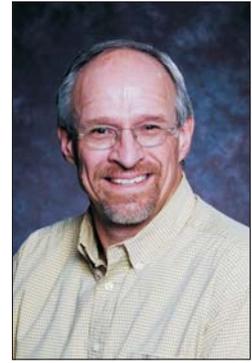


Minding Emotions: The Embodied Nature of Emotional Self-Regulation

Paul Moes



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This article addresses concerns that the “nonreductive physicalism” (NRP) approach to understanding human nature may lead to a new form of determinism. The principal thesis of the article is that we can retain the idea of willful and responsible action even within the NRP perspective. Three additional positions are advanced: (1) Emotional processes are an essential part of our willful nature; (2) Emotions participate in the emergent nature of thought that leads to the quality of “souliness”; and (3) We can self-regulate our emotions, even within a seemingly “closed” physical system. The article draws from current psychological theories as well as a number of studies in neuropsychology to support these positions.

The client undergoing psychotherapy declares, “I can’t help feeling angry.” Are such emotions outside a person’s control, or is it possible for persons to regulate their own behavior—including their emotions? This seemingly simple question and its seemingly obvious answer has become less obvious as mainstream psychology and neuroscience have moved away from a dualist position toward a more unified or monistic view of body, mind, and soul.

A dualist account that separates bodily actions from an immaterial mind and/or soul provides a relatively simple account for how emotions might be controlled. Rene Descartes viewed the processes of reason and will as the exclusive purview of the mind-soul. Emotions were viewed as being part of both body and soul. Primitive emotions, such as fear and anger, were reflexive or mechanical responses to sensory stimulation; more noble emotions, such as contentment and courage, were the willful acts of the soul, and could override or regulate more primitive responses.¹ Therefore, not only was soul separable

from body, but mental activity was divided into higher (i.e., controlling and willful) and lower (i.e., mechanical and passive) components.

However, a view of persons that stresses nonreductive physicalism (NRP)—which I embrace—posits that we are embodied persons, and that no immaterial mind or soul can exist without some form or substance. NRP also assumes that there is no central focal point for “a will” but that many mental processes emerge to form unified thoughts and actions. Finally, as Nancey Murphy suggests, NRP maintains the essential nature of our

‘higher’ capacities that we think of as being essential for our humanness: rationality, emotion, morality,

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free will, and, most important, the capacity to be in relationship with God.²

One difficulty in moving away from a dualistic account of human nature is that it creates a new concern when considering the regulation of emotions. One might ask in response to NRP, “How could a system that possesses no ‘central control unit’ (i.e., a ‘soulful will’) regulate the very elements that constitute that system?”

There have been philosophical and theological challenges to the idea of NRP which others have addressed in a variety of sources.³ The focus of the present article is to address the concern that NRP may lead to a form of Christian determinism, and to discuss the related issues raised by James Stump of “supervenience (and emergence) relation, and downward causation.”⁴ Indeed, *if* we are mere passive products of our material substance in interaction with a changing environment, then such a view would, in my estimation, constitute a serious concern for any Christian adopting an NRP position. The principal thesis of this article is that we can retain the idea of self-regulation and willful action even within an NRP perspective. These willful tendencies arise not from an immaterial soul, but from the nonreducible emergent properties of a living person within a social context. While no empirical study can confirm or disconfirm this position, I will present research evidence and theoretical positions from psychology and neuroscience that make the possibility of willful self-regulation tenable and plausible within an NRP framework.

In addition to this primary thesis, I hope to accomplish three additional goals. The first goal is to show that emotional processes are an essential part of our relational nature. Christian neuroscientist Warren Brown has argued that “soulfulness” is not a thing but a quality that “arises out of personal relatedness, and that personal relatedness is an emergent property of human cognition.”⁵ Therefore, our emotional qualities are integral to that emergent nature of thought. These emotions are not simply fixed mental or biological elements existing in a biological space, but they are, as Alan J. Torrance has suggested, “incomplete [processes] until they meet with a response from the other” [person].⁶ Similar to the position taken by Warren Brown,⁷ Torrance argues that humans are constituted by their relations to other

persons. Recent research examining the emotional interaction between parent and infant, and the subsequent impact on neural development, will provide a vivid illustration of the idea that emotions are relational in nature and involve fluid mental processes within an agent responding to an ever-changing world.

A second goal is to provide illustrations for the way in which emotions participate in the emergent nature of thought that can lead to the quality of “soulfulness.” Our subjective experience, along with cultural assumptions infused with Cartesian dualism, produces the impression that emotions are very distinct bodily elements that come entirely from within the individual. They also appear to be fixed, primitive, irrational, untrustworthy, and in need of downward control from some “higher unit.” Even past physicalist accounts of neural organization often fall into a new form of dualist thinking by attributing willfulness exclusively to the higher, rational cortex, and placing the inferior emotional processes in the lower brain regions.

By demonstrating how emotions participate fully in the unity of mental phenomena, and that neither reason nor emotions rule some entity called “the will,” I hope to show that it is the dynamic union of our mental activity that gives rise to our willful actions, and that emotions should not be relegated to a lower status. Case studies of individuals with brain damage or developmental disabilities, along with research on the normal interaction of emotional and cognitive brain “modules,” will be used to demonstrate the need for persons to merge these streams of thought for their very survival in negotiating a social environment. In addition, Piaget’s concept of “groupement” — a unified interpersonal perspective — will be used to illustrate how emotional and cognitive modules are able to merge diverse perspectives of reality into a single stream. I also hope to show that this union of emotional and cognitive streams is built into the fabric of our neurological functions. Thus, as many philosophers and psychologists have suggested, we are inherently motivated to be “meaning-seeking” creatures. Such creatures not only attempt to categorize, problem solve, and form mental schemas,⁸ they are also motivated to form an emotional/evaluative understanding of events.

Finally, consistent with Malcolm Jeeves' view that some form of top-down causation is a necessary condition of NRP⁹—and essential to my primary thesis that we can regulate our own emotions—an additional goal of this article is to show that these unified emotional/cognitive processes can provide a top-down regulation of future behavior. Once we develop these emotionally informed mental schemas, we can use these streams to down-regulate future emotional responses, personal ethical decisions, and the selection of appropriate behavior. Therefore, positive emotional self-regulation—as well as appropriate moral decision making—is possible only by persons who have had healthy relational experiences, have informed their cognitive processes with emotional valuations, and have exercised and tested these streams with genuine involvement in moral issues. These streams become ever more powerful—either for good or ill—when we exercise them enough to become nearly automatic “goal pursuits” regulating the responses we make.

The Relational Nature of Emotion

The work of developmental psychologist Allan Schore provides an illustrative example of the relational nature of emotions and how emotional development is entirely dependent on healthy human relationships and interpersonal experiences.¹⁰ In a sense, he is describing how we develop emotional soulfulness through a very intimate relationship with our parents.

Schore summarizes a fascinating series of studies focusing on the intricate interplay that occurs between an infant and his or her mother. Careful analysis using stop-action photography of facial expression from the mother and the infant, along with measurement of internal physiological and neurological responses, has been able to show the way in which appropriate social-emotional responsiveness becomes intricately tied to brain development. The research focuses special attention on the medial orbitofrontal¹¹ areas of the frontal lobe. These key areas receive rich information from the amygdala¹² and other limbic system structures, which convey information from body systems informing other limbic system structures about bodily conditions. In addition, this area receives information about facial expressions from posterior cortical areas such

as the parietal, temporal, and occipital lobes. This “appraisal system” helps the frontal lobe to assign value to incoming information, based on past experience and genetic instructions. The mother's emotional expressions are first mirrored reflexively by the infant and gradually become more internally regulated as the mother and infant continue to engage in mutual gaze. As the infant begins to store these interchanges in his or her memory, the child becomes ever more capable of responding to the emotional cues of the mother. As social interaction becomes more complex, the mother provides cues about other aspects of the environment, as to what is important, valued, approachable, or to be avoided.

Schore suggests that this social interchange is vital for emotional self-regulation later in life:

... the establishment of an attachment bond of emotional communication with the mother ... enables the child to receive the mother's affective appraisals of objects in the nonmaternal environment in late infancy. These interactively transmitted, affectively charged external appraisals provide the developing individual with the requisite experiences that ultimately allow for the organization, in the second year, of brain networks that can generate internal evaluations of the personal significance of what is happening in an encounter with the environment and can elicit emotions to actual or expected changes in events that are important to the individual.¹³

Therefore, the ability to develop self-regulated emotional responses can only occur in interaction with a responsive caregiver. In fact, there is good evidence that infants deprived of this type of intense social interaction over a substantial period of time develop very deficient emotional, social, and even moral self-regulation that may be very difficult to reverse.¹⁴ So whereas the brain may possess a self-organizing property, this property is not expressed unless a person is interacting with the environment. But *emotional* organization may be unique, in contrast to cognitive organization, since the former process seems to occur “only in the context of a relationship with another brain.”¹⁵ In other words, cognitive development may occur by an individual interacting with *both* objects and persons, but early emotional development seems to be peculiarly tied to social experience. Indeed, Diamond, Balvin, and Diamond have called the

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mother an “auxiliary cortex” in that her experience with emotional self-regulation can be modeled, and this helps to mold the early infant experience of emotional understanding.¹⁶

Emotion-Cognition Emergence: Illustrative Clinical Cases

To underscore the importance of emotions in the emergent property of mind, three clinical cases of brain damage—one, very unusual; the other two, painfully typical—provide clear evidence that emotions are essential elements in our normal mental life. As described earlier, the Cartesian view of emotions—along with many physicalist approaches—has relegated emotions to an inferior position in the hierarchy of mental processes. These cases underscore the necessity of emotionally informed thinking for our everyday functioning.

The first case is the unusual case of Capgras’ syndrome described by neurologist V. S. Ramachandran.¹⁷ Arthur, a thirty-year-old male, sustained a significant head injury from a car accident. While he recovered many of the sensory and motor losses experienced shortly after the accident, one puzzling difficulty remained—he believed that his parents were not really who they said they were; he believed they were, in fact, imposters, masquerading as his parents. He was still able to recognize all familiar objects, including his parents, and his unusual delusion was not associated with casual friends or with other objects—it occurred mostly in relation to his parents. Ramachandran believes that Arthur’s problem resulted from damage to communication systems between the visual cortex that recognizes familiar objects and people, and parts of the emotionally responsive limbic system, in particular, the amygdala. Therefore, the patient has visual, but not emotional, recognition, resulting in a blunted emotional response to the people he recognizes as his parents. Because he does not have the typical emotional experience that people have when seeing their parents, he concludes that they only *look* like his parents; thus they must be imposters.¹⁸ Most likely the emotional memories associated with his parents were formed through the types of early interactions described by Schore.

What this unusual case illustrates is the importance of emotional input for a full comprehension of

our environment. The notion that we can perceive and negotiate a complex environment without access to emotional input is an unfortunate legacy of the Cartesian dualism of reason and emotions. The case also underscores the importance of having a fully functioning neurological system for a complete understanding of issues that we consider most human and personal.

Other illustrations of the need for emotion/rationality interaction come from cases of frontal lobe damage. While many clinicians have described intriguing cases, a case provided by neuropsychologist Jenni Ogden is quite typical.¹⁹ Phillipa was an intelligent, positive, well-mannered, thirty-five-year-old wife, and mother of two children. She had a university degree in English literature and was employed as a primary school teacher. Following an assault, which resulted in severe damage to her frontal lobes (particularly the right and medial orbitofrontal²⁰ areas), Phillipa experienced a profound change in personality and emotional responsiveness. The most easily observed change in her behavior was a marked disinhibition of her emotions and behavior. Whereas she had previously been mild mannered and positive in her outlook, she now became impolite, unruly, and lacking in consideration of others. Many capacities, such as language comprehension, visual perception, and movement, remained unchanged, but her emotional life was markedly different. She would often use coarse language when visitors came to see her, and she seemed indifferent to admonitions from others to stop.

Phillipa’s case further demonstrates the importance of emotional input for social interaction and cognitive understanding. It is not that Phillipa is incapable of learning or appreciating the cognitive aspects of social rules, or that she does not have any creative capacity, it is that she has become emotionally disconnected from these events. So, for Phillipa, external events do not trigger the normal internal signals (at least as processed at the cortical level) as part of a feedback system telling us that our actions may be inappropriate, that we should alter our strategy, or that we should consider an alternative understanding of a situation. In sum, without an appreciation for the emotional feedback from others, and the internal emotional consequences of our actions, we fail to make reasonable and responsible judgments concerning the world.

One last case comes from neurologist and storyteller Oliver Sacks. He describes a patient with frontal lobe damage and a corresponding emotional change as follows:

... [He] would read the daily papers conscientiously, taking in everything, but with an uncaring, indifferent eye. Surrounded by all the emotions, the drama, of others in the hospital ... he himself remained entirely unmoved, seemingly incapable of feeling. He retained the forms of his previous civility, his courtesy, but we had a sense that these were no longer animated by any real feeling.²¹

Do these cases suggest that emotions, in fact, rule over cognitive or perceptual decision making? No, we should avoid the temptation of simply reversing the typical reason-over-emotion hierarchy, since these cases seem to suggest that emotions and reason are of equal value. These two elements seem to form an integrated or unified dynamic that can direct behavior.

Emotion-Cognition Emergence: Piaget's Notion of Groupement

While the evidence from developmental research and cases of brain damage underscores the essential nature of emotional input for complex behavior, these illustrations do not address how reason and emotions come to interact or emerge into a whole that we call "a willful mind." To further explore this dimension, I am drawing from the notion of "groupement" first described by the famous Swiss developmental psychologist, Jean Piaget. While not originally applied to the development of emotionally informed concepts that I am proposing in this article, Piaget's notion has broad utility in describing the development of higher-order abstractions from lower-order information. These higher-order abstractions can then be used "off-line," as Brown has described elsewhere, in directing future behavior.²²

Bradley paraphrases Piaget's definition of groupement as

the final form of logic in a system of operations that generates a stable order of human actions ... It provides the means to get from mental images of virtual actions to effective intentional action in the material world.²³

Piaget felt that human mental processes such as schemata and groupement are parallel to mathematical principles. For example, the mathematical formula, $A + (-A) = 0$, is a corollary to the idea that objects or their representations have constancy and that there is reversibility to concepts. He felt that children gradually acquire these more abstract concepts through interaction with the world, but more importantly through interaction with *people*. So by age six or seven, children understand the schema of constancy, i.e., an object retains its mass, despite a change in shape. The child also begins to learn that if he has a sibling, that the sibling has him or her as a sibling (i.e., reversibility)—something a typical three-year-old does not understand. The notion of groupement not only captures some presumed final state of affairs (i.e., a cognitive abstraction or schema), but also the process and conditions through which that abstraction occurs. The abstraction is accomplished through the interaction *with significant others* whereby the child comes to a more complete understanding of the concept than would be possible from a single perspective. The process is considered complete when the child no longer requires additional input or interaction to form a complete working model that appears to accurately represent the process or situation.

Psychologist E. C. Tolman proposed something similar with his notion of cognitive maps in which spatial representation becomes abstracted from individual experiences, so that the representation no longer matches the separate representations of each trial or moment but has become consolidated into a complete picture.²⁴ In other words, concepts achieving groupement are greater than the sum of the parts. However, groupement is also a social concept in that it always involves development through shared and compared ideas, and is now held in common by group members. For example, groupement might also include a musical score (e.g., a musical piece in a minor key) which has properties that are independent of individual elements and is not only understood but *valued* by a group of people. Other examples might include an intricate group of plays in football that all team members have helped to develop and now understand and value, or roles from a theatrical script enhanced by diverse perspectives that become mutually shared.

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Piaget suggested that three elements are required for groupement: a commonly shared symbol or language system, a way to maintain commonly understood propositions (i.e., memory systems), and reciprocity of thought. The interaction of individuals breaks down “autistic” (i.e., individual) and egocentric thought. The introduction of new perspectives and ideas provides the opportunity for individuals to compare the current state of their perspective with alternative views, thus joining new and old perspectives into unique or creative concepts. Bradley suggests that Piaget’s analysis is consistent with Searle’s notion²⁵ that “genuine cooperative behavior” is the basis for a nonreductionist order of social life that he calls “collective intentionality.”²⁶ In other words, Searle argues that individual intentionality is derived from the sense of sharing in the group’s collective values. Bradley also argues that Schore’s description of the early social-emotional exchanges between infant and parent provides for “the requisite neurological organization for the development of a psychologically stable and effective social self.”²⁷ Bradley concludes by suggesting that “cooperation also is the basis for purposeful social action and hence the source of the active agent in the psychosocial life.”²⁸

This cooperative interaction that occurs in what Piaget called the “collective,” along with the resulting shared concepts and values, is also consistent with the recurring theme in this article, that persons are constituted by relationships. Most of our uniquely human qualities appear to develop through the variety of social and environmental interactions that we experience. But this still begs the question of whether an individual’s mental activities possess a unique self-organizing and self-directing capacity that can exist once the person has experienced the shared interaction with others. While I do not have a complete answer to that question, I would like to use groupement as a metaphor for what may happen intra-psychically as well as inter-psychically.

Emotion-Cognition Emergence: The Example of Hemisphere Specialization

To illustrate further how thought might become emergent through the process of groupement, I will apply this notion to the interaction of emotional and

cognitive modules found in the left and right hemisphere. The left hemisphere is known for superior processing and control over certain language functions and for more detailed analysis of visual and auditory information.²⁹ The right hemisphere is often characterized as having superior spatial processing, better analysis of larger aspects of stimuli (e.g., a whole face), and greater responsiveness to emotional information—along with greater control over emotional expression. However, as with many generalizations, the details of left-right differences are more complex than I have just presented. Such brain modules generally show a more-or-less continuum of function rather than an all-or-none specialization. In addition, contrary to the belief that each brain area can perform a variety of functions independently of other components, these specialized units are also highly interdependent with other modules for their operation.

For example, Richard Davidson and colleagues³⁰ have suggested that whereas the posterior visual-perceptual regions of the right hemisphere are probably more attuned to face and voice emotional expression of all types, the left hemisphere contributes a good deal of processing power to positive emotional expressions.³¹ In other words, the left hemisphere may be slightly more responsive to positive emotional expression; the right hemisphere, more responsive to negative emotions, such as anger, anxiety, and depression. Davidson summarizes these differences by calling the left hemisphere, the “approach” hemisphere; the right hemisphere, the “avoidance” hemisphere. Therefore, the left signals that a stimulus has positive “valence” or value; the right signals that a stimulus is dangerous, or may cause distress or difficulty, and should be avoided. This left-right difference is most pronounced when comparing the activity of the left and right frontal lobes in the expression of emotion. For example, greater electrical activity in the left frontal lobes has been associated with children who are more extroverted and more likely to approach novel situations, and who have a more positive or optimistic outlook.³² Children or adults with less left frontal activity tend to be more withdrawn, shy, anxious, or even depressed.

Another recent research review described a series of studies that demonstrate how the left and right hemispheres interact in response to emotional and

cognitive changes.³³ This review showed that the activation of left hemisphere cognitive (i.e., language) components and emotional modules can modulate right hemisphere emotional components—and vice versa. Therefore, these left-right hemisphere perspectives become unified into a cohesive perspective that is ultimately shared by both, in other words, an “inter-module groupement.”

An additional illustration of the value of this intermodule perspective sharing is evident in individuals with the neurological condition called Agenesis of the Corpus Callosum (AgCC). In this congenital condition, the corpus callosum, which is a neurological communication bridge between the left and right hemisphere, fails to develop.³⁴ A series of studies by Brown and colleagues has shown that some of these individuals can have reasonably normal intellectual functioning³⁵ and few other neurological difficulties, but that they still experience difficulty in a variety of social and emotional domains.³⁶ One could consider this condition as a natural neurological laboratory for what happens to emergent thought when the specialized modules and perspectives of the left and right hemisphere are unable to interact.

Imagine, if you will, that the specialized cognitive and emotional modules of the left and right hemisphere are analogous to the “collective” described by Piaget. This neurological equivalent of a community meets all of Piaget’s requirements for the collective; it has a shared symbol system, a conservation of valid propositions and obligations, and uses reciprocity of thought among the “individuals” involved. When the elements of this system are allowed to communicate freely and share slightly different perspectives from a common overall value system, they can arrive at a more dynamic, fully informed perspective that best matches the situation. While each component may maintain differing perspectives and specializations, they would also experience a commonality of understanding that would be shared among the elements. This final understanding would be richer and more complete than any element alone. Focusing specifically on emotional modules, a well-balanced and fully functioning emotional system involves not only the activation or inhibition of various emotional circuits, but the *coming together* of those circuits. In other words, a full appreciation of emotional experience

and a balanced emotional response require a groupement of cognitive and emotional modules from several brain areas, including modules distributed between the left and right hemispheres.

The condition of AgCC may then illustrate what might be missing in the development of emotional comprehension when all the processing modules are intact but cannot communicate or come together. Based on studies by Brown and colleagues, examining only those individuals who have AgCC and few other difficulties, these individuals have difficulty in perceiving complex humor,³⁷ other forms of non-literal language (e.g., proverbs and idioms), and prosody (i.e., emotional tone).³⁸ In addition, they are generally socially naive, lack self-awareness and social understanding, and have difficulty verbalizing emotions.³⁹ While some of these difficulties may relate directly to a straightforward inability to transfer specific information from the more emotional right hemisphere to the more verbal left hemisphere, there may also be subtle difficulties due to the loss of dynamic interchange between cognitive-emotional modules in each hemisphere. If the more negative emotional modules cannot interact with the “approach” modules, as well as the sites for executive decision making, individuals with AgCC may not only lack specific concrete information, but they may lack a “gestalt” or completeness of emotional understanding that comes from comparing, testing, and combining emotional cues. Brown and colleagues put forth this perspective when they summarize various explanations for the humor deficits experienced by individuals with AgCC:

An alternative model [in contrast to a less dynamic model] would focus on the absence of rapid and efficient bi-directional interactions that would allow for the formation of wider processing networks necessary to imagine, construct, and ultimately reconstruct coherent alternative scenarios for the recognition of the humorous outcomes.⁴⁰

While individuals with AgCC can be taught specific responses to concrete situations and can learn to identify specific emotional cues, they may forever lack a deeper level of abstraction related to emotional processing.

Where are such deep-level abstractions stored or controlled within the brain? Brown has argued that

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there is no unique final control center that is needed for this deeper level of abstraction. Rather, it is controlled by the interaction and interplay of modules found in several locations. Each of these modules then come to possess a portion of the total perspective, but each requires continued input from other modules to form a complete picture. Therefore, neither whole brain responses nor individual modular responses truly capture the nature of mental phenomena. It appears that we require both outer (i.e., interpersonal) and inner (i.e., intermodular) “collectives” in order to form a cohesive mental stream.

Emotion-Cognition Emergence: Additional Brain Research

Admittedly, the evidence for this groupement derived from brain inter-module interaction is indirect at best. The model presented is not designed to suggest the final word on the issue, but to present a possibility, or a way of thinking, about how such higher-level abstraction may occur. While not providing the necessary and sufficient evidence for the existence of intermodule groupement, two elegant studies examining brain activity and emotion regulation provide additional research detail concerning possible mechanisms for the interplay of mental/brain modules and the process of emotional self-regulation.

A review of several studies concerning implicit (i.e., unconscious) attitudes by Stanley, Phelps, and Banaji illustrates the interplay between brain modules as individuals regulate their own emotional response to individuals of another race.⁴¹ One study they described was particularly instructive in showing this interplay.⁴² These researchers first assessed explicit (i.e., conscious or self-aware) racial attitudes by gauging the amount of executive (i.e., self-control) effort that individuals used to reduce anti-Black implicit attitudes during an interracial interaction. These researchers then scanned and analyzed brain activity using functional magnetic resonance imaging (fMRI) while the participants viewed black or white faces. They found that the amygdala (known to be involved in assessing threat) was more active for other-race faces than for same-race faces, but that this activity was reduced when two other areas were activated. One area, the dorsolateral prefrontal cortex (dlPFC),⁴³ is known to be involved in cognitive

assessment of social goals as well as the regulation of emotional centers. A second area, the anterior cingulate cortex (ACC),⁴⁴ is thought to be involved in the detection of discrepancies between cognitive or social goals, and emotional reactions (in addition to functions described previously). Thus, the ACC detects that the emotional reaction (i.e., prejudicial response) of the amygdala does not match with the social or cognitive goals held by the dlPFC. These areas then work in concert to reduce the activity and negative emotional reaction of the amygdala. A particularly interesting finding from the study was that the more capable individuals were in regulating their own racial attitudes—as measured at the outset of the study—the more active were the regulatory areas of the dlPFC and ACC. Thus, individuals who learn to control emotional responses in life demonstrate this control through specific brain areas.

Another superior study by Ochsner and colleagues goes even further in showing how the “conjoining” of various cognitive-emotional brain modules can lead to better self-regulation of emotions and behavior.⁴⁵ These researchers were able to use fMRI to observe specific brain activation changes as individuals engaged in emotional self-regulation. They started with a baseline condition during which individuals were instructed to simply attend to a variety of emotionally disturbing pictures. When participants attended to these images, they showed increased activation of the right amygdala and the left orbitofrontal regions. The right amygdala is known to be especially involved in “preattentive detection and recognition” of threatening or disturbing images or thoughts.⁴⁶ The amygdala also arouses behavioral response systems and memory systems for the generation of action and for the activation of declarative or conscious memory. The orbitofrontal region has been known to be involved in “representing the pleasant or unpleasant affective value of a stimulus in a flexible format that is sensitive to momentary changes in social and motivational context.”⁴⁷ The activation of the left orbitofrontal area is most likely associated with signaling to the normally positive-responding left hemisphere that a threatening stimulus is present, resulting in reduced activation of other left frontal areas.

When participants were asked to engage in cognitive reappraisal of the negative images (e.g., explaining the situation in less threatening terms), they were

able to reduce their subjective emotional response to the images, which corresponded to a significantly altered brain activation. The dorsal medial and lateral prefrontal cortex⁴⁸ became more active—especially on the left side—while the orbitofrontal cortex and amygdala nucleus showed reduced activation. In addition, increased activation of the right anterior cingulate cortex⁴⁹ was associated with decreasing fear or anxiety. The dorsal lateral prefrontal cortex has been shown previously to be involved in generating a cognitive strategy for coping with a situation and regulating working (i.e., active) memory. The dorsal medial prefrontal cortex is associated with reevaluation of the relationship between externally prompted conditions and internal evaluations coming from the lateral area. For example, this region is particularly active when individuals engage in generating attributions (i.e., explanations) for their own emotional states or the emotional states of others.⁵⁰ The anterior cingulate is particularly important for monitoring conflicts between “bottom-up” activation of arousing events and “top-down” reappraisals of the situation.

So which of these areas is controlling the other? Given that activation of dorsal prefrontal areas is associated with the down-regulation of orbitofrontal and amygdala regions, it would be tempting to conclude that ultimate control rests with these areas. The authors of this study suggest a different way of thinking about the self-regulation process:

On our view, the cognitive processes supporting reappraisal, *as well as* the emotional processes supporting context-sensitive evaluation, *may both exert* regulatory effects, albeit in different ways. Whereas the evaluation processes supported by [orbitofrontal cortex] may support the selection of appropriate, and the transient suppression of inappropriate, affective responses, the reappraisal processes supported by lateral and medial prefrontal regions may be important for modulating these evaluation processes themselves. By down-regulating *multiple types of evaluation* processes, reappraisal may shift from an emotional to an unemotional mode of stimulus analysis.⁵¹ [Emphasis added]

In essence, they are suggesting that one brain module does not simply control another module. Rather, each area contributes a cognitive or emotional perspective that is joined together, resulting in a “joint self-regula-

tion.” This appears analogous to the “groupement” or final shared perspective described earlier. However, in this case, it is brain modules that defer or voluntarily give control to another module. This form of interchange is only possible following a lifetime of interaction with other complex modules—other human beings—through significant relationships.

Constraints and Contours for Emotionally Informed Schemas

What can we conclude from the arguments presented thus far? I believe the arguments and evidence provide compelling support for the fact that emotions are essential in our relatedness, that emotions merge with cognition, and that brain modules interact to direct complex behavior. However, these examples do not provide irrefutable evidence for the notion that we can self-regulate emotions or that self-regulation is at all possible within an NRP framework. One could still argue that emotionally informed schemas depend on random interactions with the world. It is also still possible that the affective schemas we develop are constrained entirely by our genetic or biological composition—causing some individuals to come to certain final perspectives and others to come to a completely different point of view.

Although a full response to these questions is beyond the scope of this article—and very likely beyond my capacity to grasp the answers—I would like to present some guiding assumptions that might help our thinking about these issues. First of all, while there appear to be biological constraints on the complexity and quality of emotionally laden schemas, there is little evidence that biology constrains the ultimate choice of what we value—at least for more complex forms of social decision making. On the other hand, there appears to be good indirect evidence that we possess a biologically grounded motivational process that pushes us to develop emotionally informed schemas. In other words, all individuals have a pre-existing and built-in tendency that *initiates* emotional and moral action, but does not dictate the outcome. This is consistent with many philosophers and psychologists who have argued that we are “meaning-seeking” creatures. In their book entitled *Why God Won't Go Away: Brain Science and the Biology of Belief*, Newberg, d'Aquili, and Rause have suggested that survival pressures have

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endowed individuals with a fundamental motivation to seek greater meaning for their existence.⁵² They provide historical-cultural evidence as well as recent neuroscience studies to support their claim. Although space does not permit a full critique of their thesis, I believe that they have struck upon a plausible possibility—that seeking meaning and attempting to find some greater purpose, value, and place in the world could, indeed, be built into the fabric of our mental processes. In other words, this motivation is not only the result of some learned tendency to seek meaning, but is pushed by some inherent predisposition.

While our biological tendencies along with our social/moral cultural systems may help to initiate and possibly direct the development of emotionally informed schemas, these processes become “guidance systems” for future behavior. So while we continue to be guided by external events, we are increasingly capable of responding to situations based on internalized guiding principles. Once we establish these emotionally informed schemas, we can direct, in a top-down fashion, future situations that we encounter. This direction setting could be viewed either as a constraint or as a positive force, depending on the context or the value placed on the emotionally informed schemas. Certainly, adults desire for young people to develop an appropriate internalized set of perspectives and values which can guide them through a maze of complex issues. This guidance system then operates in an “off-line” fashion that can consciously or unconsciously maintain their “goal pursuits.”

As emotionally informed schemas become more and more practiced, I believe they also become increasingly unconscious, and once we walk a certain path we will have increasing difficulty in deviating from that path. In other words, we start out in life pushed by broad internal forces, then we develop internal guidance systems which are exercised willfully, but eventually we become more and more constrained by our own actions and repeated thoughts. As the early American psychologist William James suggested:

The hell to be endured hereafter, of which theology tells, is not worse than the hell we make for ourselves in this world by habitually fashioning our characters in the wrong way. Could the young but realize how soon they will

become mere walking bundles of habits, they would give more heed to their conduct while in the plastic state. We are spinning our own fates, good or evil, and never to be undone. Every smallest stroke of virtue or of vice leaves its never so little scar.⁵³

Conclusions and Contemplations

The descriptions of the modular and interacting nature of brain function certainly do not provide sufficient empirical support for a nonreductive physicalist approach to mind. However, I believe that this view of mental activity provides an essential element in arguing the *possibility* of a closed, but self-directing, system, and helps to address a concern raised by those who favor a more dualist view. An illustration of this objection was raised by C. Stephen Evans who recently challenged the position of nonreductive physicalism by proposing a thoughtful alternative—what he calls a “minimal dualism.” Part of his objection to the NRP view is that understanding the relationship between mental processes and brain function is not aided by understanding the specifics of how the brain works. In responding to the descriptions of brain injury provided by Malcolm Jeeves, Evans questions Jeeves’ conclusion that such examples of localized damage and the resulting behavioral problems represent any challenge to dualism. Evans states,

Is it a problem that the causal effects should be a product of specific regions of the brain? Why should the fact that the source of the effects are localized regions of the brain, rather than the brain as a whole, be a problem for the dualist? It is hard for me to see why dualism should be thought to entail that the causal dependence of the mind on the brain should stem from holistic states of the brain rather than more localized happenings.⁵⁴

While Evans is certainly correct that the existence of specialized brain regions do not necessarily create a problem for dualism, I believe that having a modular (i.e., localized) but interacting system is essential for the NRP position. In other words, the evidence and analogies provided so far do not refute dualism so much as they provide a means for the NRP position to envision self-directed behavior within a closed physical system. Since the research does not support

the existence of a final “homunculus” (i.e., brain module) directing an emotional or cognitive free choice, how can a seemingly closed system, as posited by the NRP approach, yield such a choice? Michael Gazzaniga, who has pioneered many studies concerning consciousness and brain function, answers this question by arguing that the existence and interaction of “semi-independent brain modules” are critical both to the development of self-directed mental activity and for the application of top-down management of our behavior.⁵⁵ This view is illustrated by research showing the dynamic ways by which modules interact, but even more so by the ways in which individuals experience difficulties when modules cannot interact (e.g., cases of AgCC).

This perspective of NRP that maintains the “free agency” of humans also does not deny the constraints placed on us within a physical system. Certainly, genetic, biological, cultural, and behavioral mechanisms will constrain or direct the choices we make, the emotional valence we attach to events, the moral tendencies we have, and ultimately, the meaning that each of us achieves. However, it is important to keep in mind that God can certainly direct all of these processes through everyday experiences, or by whatever means God would choose. As an adherent to covenant theology, I believe that Scripture is clear on the importance of biological connections, social relationships, training, and habits that we experience or possess in developing an understanding of God. Therefore, it is often through our mundane experiences, our relationships and our choices—all of which exist within a physical context—that God directs our lives.

However, I also believe that once we have experienced all of these influences and have achieved an abstracted set of principles or worldviews, we are then responsible agents capable of directing our future values and views. I know of no compelling philosophical or biological necessity that limits persons who possess interacting brain modules, with a unified abstraction of emotional-cognitive principles, in the context of a socially integrated and dynamic system, from freely directing the development of their future value systems and from directing future behavior. Therefore, whether guided by an immaterial soul, or comprised solely of substance, we will still stand as responsible individuals before a God who will call us to account for our decisions

and actions. Since I know that I personally will be found lacking in those actions, I am grateful that God provided a divine, yet embodied, substitute for my justification. □

Notes

- ¹Rene Descartes, “The Passions of the Soul,” in *The Philosophical Works of Descartes*, ed. E.S. Haldane and G. R. Ross (Cambridge, MA: The University Press, 1968), 331–54.
- ²Nancey Murphy, “Human Nature: Historical, Scientific, and Religious Issues,” in *Whatever Happened to the Soul? Scientific and Theological Portraits of Human Nature*, ed. W. S. Brown, N. Murphy, and H. N. Maloney (Minneapolis, MN: Fortress Press, 1998), 1–29.
- ³C. Stephen Evans, “Separable Souls: Dualism, Selfhood, and the Possibility of Life after Death,” *Christian Scholar’s Review* 34 (2005): 327–40; James B. Stump, “Non-Reductive Physicalism—A Dissenting Voice,” *Christian Scholar’s Review* 36 (2006): 63–76.
- ⁴Stump, “Non-Reductive Physicalism—A Dissenting Voice,” 63.
- ⁵Warren S. Brown, “Neurobiological Embodiment of Spirituality and Soul,” in *From Cells to Souls – and Beyond: Changing Portraits of Human Nature*, ed. M.A. Jeeves (Grand Rapids, MI: William B. Eerdmans Publishing Co., 2004), 101.
- ⁶Alan J. Torrance, “What Is a Person?” in *From Cells to Souls – and Beyond*, ed. Jeeves, 202.
- ⁷Brown, “Neurobiological Embodiment of Spirituality and Soul.”
- ⁸Schemas refer to cognitive structures or frameworks of thought that organize and help us interpret new information.
- ⁹Malcolm A. Jeeves, “Brain, Mind, and Behavior,” in *Whatever Happened to the Soul?* ed. Brown, Murphy, and Maloney, 73–97.
- ¹⁰Allan N. Schore, “The Experience-Dependent Maturation of an Evaluative System in the Cortex,” in *Brain and Values: Is a Biological Science of Values Possible*, ed. K. H. Pribram (London: Lawrence Erlbaum Associates, 1998), 337–58.
- ¹¹The orbitofrontal cortex is located on the ventral or “bottom” surface of the frontal lobes—just above the eye “orbits.” The medial or middle portion is often particularly important for emotional-cognitive regulation. This specific portion lies at the bottom of the frontal lobe, but also curves up the middle surface along the space that divides the cerebral hemispheres.
- ¹²The amygdala actually consists of two sets of nuclei (clusters of cell bodies)—one set in each brain hemisphere. The amygdala nuclei lie embedded deep within the left and right temporal lobes (located near ears) of each hemisphere. These clusters of cells communicate richly with the temporal lobes (to the side) and the frontal lobes (forward), as well as with many parts of the limbic system—an interconnecting circle of subcortical structures involved in emotion and motivation.
- ¹³Schore, “The Experience-Dependent Maturation of an Evaluative System in the Cortex,” 338.
- ¹⁴R. Karen, “Investing in Children and Society: What We’ve Learned from Seven Decades of Attachment Research,”

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Commission on Children at Risk, *Working Paper 7* (New York: Institute for American Values, Vol. 8, 2002).

- ¹⁵Schore, "The Experience-Dependent Maturation of an Evaluative System in the Cortex," 339.
- ¹⁶S. Diamond, R. Balvin, and F. Diamond, *Inhibition and Choice* (New York: Harper and Row, 1963).
- ¹⁷V. S. Ramachandran and S. Blakeslee, *Phantoms in the Brain: Probing the Mysteries of the Human Mind* (New York: William Morrow and Company, 1998).
- ¹⁸Interestingly, Arthur did not experience this delusion when listening to his parents on the phone. Presumably, his auditory perception areas did connect with his emotional processing areas, so his emotional recognition was normal for purely auditory perception.
- ¹⁹Jenni Ogden, *Fractured Minds: A Case-Study Approach to Clinical Neuropsychology* (New York: Oxford University Press, 1996).
- ²⁰Medial refers to the midline close to the area between the two hemispheres. The term "orbital" refers to the eyes, so medial orbitofrontal refers to the middle area in the frontal lobes just above the eye "sockets." This area is known to be involved in regulating emotions and associating emotion with "reason."
- ²¹Oliver Sacks, *Musicophilia: Tales of Music and the Brain* (New York: Random House, Inc., 2007), 334.
- ²²Brown, "Neurobiological Embodiment of Spirituality and Soul," 58.
- ²³Raymond T. Bradley, "Values, Agency and the Theory of Quantum Vacuum Interaction" in *Brain and Values: Is a Biological Science of Values Possible*, ed. K. H. Pribram (London: Lawrence Erlbaum Associates, 1998), 478.
- ²⁴Frank A. Logan and Douglas P. Ferraro, *Systematic Analysis of Learning and Motivation* (New York: John Wiley & Sons, 1978).
- ²⁵John R. Searle, *The Construction of Social Reality* (New York: The Free Press, 1995).
- ²⁶Bradley, "Values, Agency and the Theory of Quantum Vacuum Interaction," 479.
- ²⁷Ibid.
- ²⁸Ibid., 480.
- ²⁹Bryan Kolb and Ian Q. Whishaw, *Fundamentals of Human Neuropsychology* (New York: W. H. Freeman and Company, 1990).
- ³⁰R. J. Davidson, P. Ekman, W. V. Friesen, C. D. Saron, and J. A. Senulis, "Approach-Withdrawal and Cerebral Asymmetry: Emotional Expression and Brain Physiology I," *Journal of Personality and Social Psychology* 58 (1990): 330-41.
- ³¹For a more recent study confirming this finding using fMRI, see G. P. Lee, K. J. Meador, D. W. Loring, J. D. Allison, W. S. Brown, L. K. Paul, J. J. Pillai, and T. B. Lavin, "Neural Substrates of Emotion as Revealed by Functional Magnetic Resonance Imaging," *Cognitive and Behavioral Neurology* 17 (2004): 9-17.
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- ³⁶L. K. Paul, B. Schieffer, and W. S. Brown, "Social Processing Deficits in Agenesis of the Corpus Callosum: Narratives from the Thematic Apperception Test," *Archives of Clinical Neuropsychology* 19 (2004): 215-25.
- ³⁷W. S. Brown, L. K. Paul, M. Symington, and R. Dietrich, "Comprehension of Humor in Primary Agenesis of the Corpus Callosum," *Neuropsychologia* 43 (2005): 906-16.
- ³⁸Brown, Symington, Van Lancker, Dietrich, and Paul, "Paralinguistic Processing in Children with Callosal Agenesis," 135-9; L. K. Paul, D. Van Lancker-Sidtis, B. Schieffer, R. Dietrich, and W. S. Brown, "Communicative Deficits in Agenesis of the Corpus Callosum: Nonliteral Language and Affective Prosody," *Brain and Language* 85 (2003): 313-24.
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- ⁴¹D. Stanley, E. Phelps, and M. Banaji, "The Neural Basis of Implicit Attitudes," *Current Directions in Psychological Science* 17 (2008): 164-70.
- ⁴²J. A. Richardson, A. A. Baird, H. L. Gordon, T. G. Heather-ton, C. L. Wyland, S. Trawalter, and J. N. Shelton, "An fMRI Investigation of the Impact of Interracial Contact on Executive Function," *Nature Neuroscience* 6 (2003): 1323-8.
- ⁴³The term dorsolateral refers to the "top" (dorsal) and "side" (lateral) part of the frontal lobe. Prefrontal refers to an area in front of those parts devoted to movement.
- ⁴⁴The anterior cingulate cortex lies along the medial (middle) aspect of the two hemispheres. It is considered part of the limbic system (emotional/motivational control), but is also closely tied to the medial orbitofrontal area. The anterior part refers to the front one-third of the cingulated cortex. The ACC is known to be involved, not only in positive emotional states, but also in moral decision making and making personal judgments.
- ⁴⁵Ochsner, Bunge, Gross, and Gabrieli, "Rethinking Feelings: An fMRI Study of the Cognitive Regulation of Emotion," 1215-29.
- ⁴⁶A. K. Anderson and E. A. Phelps, "Lesions of the Human Amygdala Impair Enhanced Perception of Emotionally Salient Events," *Nature* 411 (2001): 305-9.
- ⁴⁷Ochsner, Bunge, Gross, and Gabrieli, "Rethinking Feelings: An fMRI Study of the Cognitive Regulation of Emotion," 1216.

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⁴⁹The anterior cingulate is part of the cortical surface that lies along the middle surface area along the deep gap between the left and right hemispheres. The anterior portion includes the front one-third of the cingulate.

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⁵⁴C. Stephen Evans, "Separable Souls: Dualism, Selfhood, and the Possibility of Life after Death," *Christian Scholar's Review* 34 (2005): 334.

⁵⁵M. S. Gazzaniga, "Cerebral Specialization and Interhemispheric Communication: Does the Corpus Callosum Enable the Human Condition?" *Brain* 123 (2000): 1293-326.

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Robert Boyle, *Certain Physiological Essays* (1661)

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