Overcoming Neuroscience's Lingering Dualism in Cognition and Learning via Emotion: Freedom, Phenomenology, and Affective Neuroscience

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Last year at the annual meeting of Philosophy of Education Society, I argued that for neuroscience to benefit education, it needs to be framed by a philosophical model of mind-brain relations called radical embodiment.[1] That model brought together mind, brain, body, and environment, sketching out cognition as embodied sensorimotor coupling with the world. The essay was meant as a critique of the mind-body dualism that typically frames neuroscience and education research, centering on neural architecture (body) and cognitive processing (mind). However, despite radical embodiment's more holistic and complex construal of the relations between mind, brain, body, and world, my account was incomplete. In particular, as someone pointed out then, I neglected to include affect and emotion. This made me realize that my account retained a lingering mind-body dualism, moving too quickly from the sensorimotor to the cognitive. The emotions need to play a more central role in a radical embodiment model if it is to overcome more completely that dualism and provide a more adequate setting for neuroscience in its application to education.

In this essay I address that lack.[2] I argue for the place and importance of affect and emotion in an embodied account of cognition. Although my approach remains framed by an embodiment model, my assumption is that a more adequate account of cognition and learning, shaped by neuroscience, requires giving a fundamental role to the affective dimension. By fundamental I mean that it must have a place in its own right, and not be reduced to either the cognitive (mind) or the somatic (body). In this essay, I draw on phenomenology, philosophy of biology, and affective neuroscience to give an account of the nature of emotion in organismal life, one that does not as easily fall back into an inadequate dualism. From affective neuroscience I obtain an account of basic emotions; from philosophy of biology I borrow the idea of detachment; and from phenomenology I draw the idea of humans as affectively experiencing subjects.

The place and ontological status of the emotions in neuroscience and neuroeducation research has been ambiguous at best. On the one hand, emotions have often been reduced to physiological and behavioral responses of the body, and thus denied feeling status. On the other hand, they typically have been theorized as products of cognition, as resulting from cognitive appraisals. In either case, emotions are denied their own fundamental ontological status. In practice this means that some affects are reduced to somatic processes, such as the biofeedback of homeo-regulatory processes of hunger and thirst, whereas others are construed as a function of cognition, such as fear and anger. The latter approach especially grips mainstream neuroscience, according to neuroscientist Jaak Panksepp: "The traditional cognitive neuroscience view suggests that affects reflect the ability of neocortical processes."[3] On this view,

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the most recent neural layer, the neocortex, creates the felt emotions as functions of cognitive appraisal of environmental situations. A person is said to feel fear after cognitively determining that a situation is dangerous; the felt affects are cognitively constructed top-down and have no reality on their own.

This view lingers even in Antonio Damasio's groundbreaking work. His project is to show that the emotions are central to cognition, and that cognition is flawed without emotionality, an important corrective for traditional Cartesian dualism.[4] Damasio rightly rejects traditional cognitive science's denigration of the emotions to a superfluous role in cognition. However, his sophisticated work remains influenced by the idea that cognition forms the felt character of the emotions. In particular, he understands emotionality through a model he calls the somatic marker hypothesis.[5] In this model, somatic processes influence the prefrontal cortex, which are then experienced as affect markers in consciousness. In his words, "Consciousness allows feelings to be known and thus promotes the impact of emotion internally, allows emotion to permeate the thought process through the agency of feeling."[6] Damasio is suggesting that emotions are not felt in themselves — we are not consciously aware of them — but are first of all somatic regulatory behaviors geared to survival. Only when there are trigger events in the neocortex — and thus in consciousness — do they have a felt character and rise to our awareness. In other words, in his theory, somatic bioregulatory processes give rise to mental representations in the neocortex, and these representations express themselves as felt emotions.[7] Hence emotions are somatic markers in the mind of otherwise unfelt body states.

Mary Immordino-Yang's application to education of Damasio's neuroscientific insights about emotions shows this approach. She argues helpfully that without consideration of emotions, our construal of cognition in education is inadequate. Immordino-Yang states, "[recent neuroscientific] research collectively suggests that emotions, such as anger, fear, happiness and sadness, are cognitive and physiological processes that involve both the body and mind."[8] Emotions play a crucial role in problem solving and other cognitive decisions. However, because she follows Damasio so closely, Immordino-Yang retains his lingering mind-body dualism. For her, emotions remain a combination of cognitive and physiological processes, rather than something different from either of them, with an independent, fundamental ontological status of their own.

Damasio's model of the emotions is inadequate, for it keeps them as a function of cognition and grounds their felt origins in the neocortex. Phenomenologically they are construed as having no ontological status of their own. Jaak Panksepp and his associate Lucy Biven have conclusively shown, however, that this is empirically not accurate and conceptually problematic.[9] They argue that the basic mind-body dualism is inadequate for understanding affects, including emotions. We cannot understand affects if, in our explanations, we reduce them to the mind's cognitive processes or the body's homeostatic physiology. Damasio's somatic marker hypothesis is inadequate because it continues to think of emotions as derived phenomena. Matthew Ratcliffe argues that Damasio's position ends up making feeling into a mental representation rather than an original way of bodily experiencing the world.[10]

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Ratcliffe suggests that Damasio ends up with a position similar to philosopher Robert Solomon, for whom emotions "are conscious judgments rather than non-conscious bioregulatory processes or conscious *feelings*."[11] He observes that for Solomon, emotions are complex cognitive states over which we have rational control, while for Damasio they are representations of bodily feelings and processes. The problem with both positions is that they end up situating felt emotions in cognition. Following Heidegger, Ratcliffe argues that affect has its own ontological status, suggesting that we need to get beyond the dualist frame if we want to understand the emotions as independent affects through which we connect to the world. This also means that Immordino-Yang's suggestions for education and learning are problematic for similar reasons. An adequate understanding of the nature and role of emotions in the radical embodiment model, and also for education and learning, must get beyond Damasio's and Immodino-Yang's lingering dualism. We must understand the emotions in their own right. And, as I argue later, it is this particular status that breaks the lingering dualism.

To develop this alternative, I turn first to a neuroscientific account of the emotions developed by Jaak Panksepp, a pioneer in the emerging field of affective neuroscience.[12] He argues that affective systems arose quite early in the evolution of animal life on earth. Evidence of this can be seen in the layering of human and other mammalian brain structures — the deeper the structure in the brain, the more ancient its evolutionary development. In humans, the neuroanatomy associated with the emotions is located along networks spanning three layers of the brain, which Panksepp names the reptilian (basal ganglia), limbic (old mammalian, visceral), and neocortical (neo-mammalian). Our reptilian brain is located in the deepest recesses of the head, in the brain stem just above the backbone, sitting atop the spinal cord. Panksepp relates that this part of the brain centrally grounds a number of processes, not only basic motor plans such as whole-body movements, but also already primitive felt emotions. The limbic system is a neurological network layered directly above the reptilian brain. Panksepp notes that it grounds what we might more readily call social emotions, namely feelings we associate with maternal care, social bonding, separation distress, and rough-and-tumble play. Also located here are neural networks associated with emotional responses to external events, as well as innate motivational systems. Finally, layered over the limbic system and located closest to the surface of our skulls is the neocortex. This network of neuron systems is most often connected to declarative knowledge, reasoning, and information derived from senses such as sight, touch, and sound. It too has an important role to play in emotions but is not their originary location.

Panksepp distinguishes between three types of affects: those arising from homeostatic monitoring, such as feeling hungry or thirsty; those arising from the senses, such as the qualities associated with hearing or seeing; and those we more typically call emotions, such as felt anger or fear as well as felt shame and empathy. Panksepp lists seven discrete primal emotional systems: lust, fear, rage, play, grief, care, and seeking.[13] Others such as jealousy, shame, guilt, and empathy are what he calls mixed emotions rather than basic or primal. I will use the term "emotions" to

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refer to his seven basic ones, and the term "affect" either as a synonym for emotion or to refer more broadly to all three types of feelings. Each of the seven basic emotions has distinct experienced affects and behavior tendencies, and each is correlated with distinct neural networks and neurochemistries. Moreover, he argues, these primal emotions are pre-cognitive. Emotions can and do operate independently of the neocortex. Here he departs from many neuroscientists and philosophers, including Damasio's somatic marker hypothesis and Robert Solomon's conscious judgments accounts, who both hold that emotions are felt responses constituted by cognitive appraisals of something (for example) dangerous or desirable. Panksepp argues it is not the case that emotions only become experientially present as a function of cognitively interpreted settings. He cites numerous empirical studies suggesting that many types of animals have similar emotional responses. And he draws on studies of humans with neocortical lesions as well as animals who have had their cortex removed, which show that emotions such as fear, lust, and rage remain robustly intact. He concludes that basic emotions are ancient systems that stand in their own right as forms of awareness — subjective feelings. Panksepp's affective neuroscience gives us a basis for claiming that emotions have a fundamental ontological status, distinct from both the purely cognitive and the purely biological. But it does not give us an account of what they are or their place in a radical embodiment model.

For that, we need to connect Panksepp's account of emotions to an idea developed by philosopher Lenny Moss. His term "detachment" names the relative independence of an organism from its environment. He uses it to mark internal degrees of freedom, that is, an organism's internally generated ability to resist the causal forces of its surroundings impinging on it.[14] This is not a measure of genetic determination, namely, resistance to outside forces as a function of genetically determined structures. Moss argues that organisms with increased detachment are less tied to single-response behaviors, but show an increase in the repertoire of possible responses to environmental situations, something that shows clearly in humans. Moss and his research associate Vida Pavesich state, "The flexibility of genetic as well as other resources means that humans are not tethered to one response pattern. Human activity is multiply contingent, which is to say that the organism can and must develop highly mediated relationships with its environment."[15] They are correlating more flexibility in response to the environment with less genetic determination of specific behaviors. More flexibility, in turn, is itself associated with increases in the mediated character of the relationship to the environment. Mediated relationships can be construed as a set of buffers that supply the action space for flexibility.

In order to understand this more clearly, Moss suggests it is profitable to construe increases in detachment in the context of evolutionary history. He doesn't mean primarily the traces of past influences on the present, but an evidential record of an organism being able to withstand certain environmental forces. In Moss's words, "To have a history requires the ability of an entity to buffer itself against random perturbations, or perhaps even to set its own agenda as to how it will receive and respond to stimuli from without."[16] Moss is saying that an organism's system of buffers can be construed as an historical record evidenced in the system's structure.

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Over evolutionary time, the systems that constitute the organism can be construed as a fund of historically generated effective buffers that successfully responded to previous environmental forces. Increases in the repertoire of buffering mediations means increased detachment.

Emotional systems are one such set of primal buffers in humans. Emotions can be thought of as a historical record of a system of buffers that developed over time, constituting a marked increase in detachment for those that acquired them. Panksepp holds that the seven primal emotions constitute current traces of past evolutionary development that gave survival advantages. In particular, "Affects probably emerged in brain evolution to help animals anticipate various survival needs and thus prepare for them in advance. In other words, affects reflect ancestral memories — neuromental heuristics that enhance life-sustaining decision-making."[17] There are two aspects worth noting here. First, he is arguing that it is fruitful to view affects as memories. These structured patterns of neural firings are historical traces of situated responses to environmental triggers, which became permanently wired into the brain's neural networks. As memories, they rise to awareness when triggered. Second, he is suggesting a central feature of affects is their anticipatory character. These ancient neural systems function as forward-looking heuristics through which an organism can anticipate events. Such anticipations enhance survival by constituting the organism's ability to make quick judgments about possible coming dangers and opportunities earlier than would have been possible without them.[18]

This anticipation gives the organism an increase in detachment, that is, inner freedom from environmental forces. Panksepp states, "Higher animals are not simply passive reflex machines responding to environmental stimuli in stereotyped ways; rather, they are spontaneously active, spontaneously flexible generators of adaptive behavior guided by an apparently conscious appreciation of events."[19] Panksepp is suggesting that organisms with primal emotions exhibit behavioral flexibility. He argues that this comes about through neuron circuits arranged hierarchically, with more global routines for a behavior governing a variety of subroutines, creating a repertoire of possible responses. These constitute an intrinsic internal freedom, giving the organism flexibility in coordinating sensory feedback and motor strategies. The repertoires of possible actions constitute a reservoir from which to draw, rather than merely reflexively operating lock-and-step with the environment. Systems of emotion constitute more global routines. As buffers, they constitute a degree of internal freedom for the organism. Put in Moss's philosophical terms, Panksepp is arguing that humans — and other mammals and complex animals more generally — are marked by significant measures of detachment, having marked degrees of internal freedom that buffer them from their environments. And those buffers are historical records — ancestral memories — of evolutionary development over time.

Increases in detachment introduce something novel into organismal life — normativity. Primal affective processes are responses to an environmental situation in which something is construed to be at stake. To borrow a term from philosopher Joseph Rouse, this is the realm of the normative, that is, awareness of one's surroundings in terms of something that matters.[20] This is not yet Solomon's idea of cognitive

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judgment, but normativity does connect closely to organismal flourishing. Moss and Pavesich argue that human flourishing is materially embedded, already embodied in the repertoire of skills brought to bear when something is at stake. In their words, "the skills that enable humans to flourish are always already skills that are responsive to the particularly acute needs of humans for compensation."[21] Flourishing is a function of embodied sensorimotor coupling with the world. Affects bring such sensorimotor coupling into the realm of the normative. Affects constitute an ancient repertoire of sensorimotor responses to acute needs with respect to the precariousness of living in our environment. As such, they contribute to human flourishing, independent of cognition, beyond mere bodily responses, through positively or negatively valenced subjective feelings.

I'd like to place Panksepp's account of the emotions phenomenologically. Within the phenomenological tradition, Ratcliffe explains, "bodily feelings are at the same time our sense of belonging to a world."[22] From a phenomenological perspective, then, the first-person subjective experience of emotionality is simultaneously a connection to the world. The two cannot be divorced. To model this phenomenological "sense of belonging to the world" constituted by our felt emotions, I favor what I call a radical embodiment approach. An embodied model construes the interconnections as a self-organizing system in its interaction with the world. In this interaction, we can distinguish "three permanent and intertwined modes of bodily activity: (a) self-regulation, (b) sensorimotor coupling, and (c) intersubjective interaction."[23] This model gives the emotions their ontological due, placing them directly within the systematic interconnections of mind, brain, and body in relation to the world.[24] First-person experience — affect — is crucial in each of these. Emotional feelings are neither something epiphenomenal of bodily behavior nor a function of cognition. Rather, phenomenologically, felt emotional experiences are central to the very dynamics of our sense of belonging to the world, be that homeostatic self-regulation, sensorimotor coupling, or intersubjective interactions in the world. Panksepp's account of emotions makes clear that prior to cognition, each of these ways of relating to the world is already "affectively charged."[25] In fact, Giovanna Colombetti and Evan Thompson reverse the relation to cognition: "Cognition is phenomenologically embodied, because cognition — as a subjectively experienced mental activity — involves one's experience of oneself as a bodily subject situated in the world."[26] That is, central to the radical embodiment model, drawn from the phenomenological tradition, and specifically from Merleau-Ponty, is that the body is itself a subjectively lived body, what we might call bodiliness. Emotions are central to the primal subjectivity of the lived character of the body, arising long before cognitive consciousness arrived on the scene.

Phenomenologically, the subjectively felt emotions are central to making our way about in the world, as Solomon has also argued. But rather than construing them as cognitive judgments, I argue that the feeling character of our emotions is inseparable from our bodiliness. They are foundational to our experience of ourselves as lived bodies, our sense of bodily-being-in-the world. Rather than estranging us from the world, our emotions connect us to the world in particular ways. These are normative

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connections; emotions constitute our deepest ways of belonging to the world in ways that matter. Fear is that subjective feeling that constitutes the world as threatening. Grief is that affect in which we sense a loss of a crucial intersubjective relation. Seeking is that felt experience in which the world affords us a generalized positive expectation. Care is that positive affect of felt responsibility to nurture another who is not able to care for the self. All of these are means of belonging to the world in ways that something is at stake for us. The emotionality — the felt experience — is not neutral, but constitutes a relation to the world in terms of something that matters. Emotionality is our first level of normativity, prior to cognitive appraisal.

Normativity is a function of freedom. Pure cause and effect are not normative. Rather, normativity arises in the context of a certain level of detachment. The possibility of generating action from within, not causally in lockstep with the environment, is needed for something to matter to the organism. The emotions are central to human flourishing precisely because they are buffers that constitute a level of freedom. Without that freedom, it would not make sense to say something is at stake in the relation to the world.

One positively valenced, normativity-charged affect is the ancient emotion Panksepp calls *seeking*. This is not a homeostatic or sensory affect, but fundamentally an emotional one. The felt affect of seeking is the positive expectancy, if not euphoria, of anticipated discovery. The positive feelings are generated internally by ancient neural structures of the brain stem when stimulated by certain inputs. It is "aroused by all novel events, which means that it is aroused for a short time by a large number of changes in the environment."[27] The emotion of seeking is not directed to particular objects as such, but to novelty and unfamiliarity in the environment. It shows itself behaviorally in active exploration of and generalized curiosity about the surrounding world. As such, it "is a system that urges us to actively — proactively — engage with the world in order to find the resources that we need to thrive as well as to avoid dangers and threats."[28] The proactive character is anticipatory, directed toward something possible that is not yet present. Although it is likely that early in evolutionary history it was directed to non-present physical resources, its proactive searching is actually very general in humans. The arousal of this most ancient of emotions, seeking, is most likely employed by the other emotions as well as higher-level cognitive processes.

In particular, the arousal associated with seeking also energizes cognition. It thus has a central role in what educators have typically called the learning that occurs in schooling. Panksepp and Biven argue, "We learn best when our interests — our SEEKING — has been aroused."[29] They are pointing out that learning is facilitated by the positive feelings of anticipatory seeking. Central to learning is the arousal of the seeking system that constitutes a positive eagerness associated with open-ended exploration of the world. Such exploration can involve multiple senses and motor activities. For example, it might involve visually exploring the surroundings within one's field of vision, walking around to explore the environment, touching things to find out about them, and attending to sounds and smells that are present in one's world. Such open-ended exploration releases endogenous opiates and dopamine in

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the brain, constituting the good feelings, if not euphoria, associated with expectancy. These positively valenced feelings create positive feedback that prolongs the exploration. As such, the seeking affect exemplifies the phenomenon of detachment. If an organism were merely reactive to its environment, and only initiated actions in response to conditions in its environment, its totality of actions would be limited by the (perceived) environmental forces and conditions. Active exploration without any particular object is internally generated, and the repertoire of actions is spontaneous. Seeking thus shows a marked degree of freedom, where the actions are internally generated, precipitated by perceived novelty in the environment. It sustains the possibility of active exploration, initiated by the organism itself rather than purely a function of environmental conditions. Active exploratory behavior is different in kind from responsive behavior in that it involves internal freedom. Central to it as freedom is the felt eagerness to actively explore and the positive feeling such explorations engender. Seeking is a foundational experience of ourselves as lived bodies, our sense of bodily-being-in-the world. Rather than estranging us from the world, seeking connects us to the world in a normative way. These connections matter: something is at stake for us in our embodied interaction with the world. A subjective feeling is constitutive of the seeking action, where something is felt to be at stake in the eagerness of the exploration. What might typically be called curiosity has at its core this bodily-based normativity.

It is this normativity that is foundational to cognitive learning. The human flourishing associated with the act of learning involves the seeking emotion of something that matters. For the seeking affect, that "something" isn't triggered by a particular known object or predetermined end, but by experienced novelty in the world. Newness matters. This is a core normativity for the human flourishing associated with cognitive learning. What animates learning from within is the arousal of the positive eagerness that arises in open-ended exploration of the environment. This means that the emotional core of cognitive learning involves the buffers of internally generated action rather than externally controlled behavior. The neoliberal shift in schooling would do well to attend to this. The ancestral memories that constitute the basic emotions are reminding us of something school reformers are in danger of forgetting. Perhaps their own seeking systems have gone awry.

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