

Brain Matters: An Argument for Neuropragmatism and Schooling

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As Tibor Solymosi recently pointed out, there appear to be “neurophiles” who are proclaiming neuroscience as so wonderfully revolutionary as to make it on par with steam engines, electricity, and iPads.¹ On this view, we only stand to benefit from the work of neuroscientists who unlock the puzzles of the human brain. Zack Lynch proclaims, “neurosociety’s’ ... arrival is both inevitable and already in progress.... It will be nothing less than the birth of a new civilization.”² Once we piece together how alleles, synapses, and frontal cortexes function, in other words, we can solve the mysteries Tom Wolfe once noted as “the riddle of the human mind and the riddle of what happens to the human mind when it comes to know itself absolutely.”³ For education, “Mind-Brain Education” (MBE) advocates are already publishing research that trumpets which brain functions are most important for success in school, how to identify the parts of the brain “responsible” for those functions, and what models and strategies exist for “maximizing” brain control for increased success in learning.⁴

I argue, akin to Richard Quantz, that the foregoing ideas represent a kind “puzzlemastering,” appealing to an ideal that reflects what John Dewey criticized as the quest for certainty.⁵ The concern here is that the puzzlemaster approach to inquiry is one where the pieces of puzzles are tried and tried until the puzzle appears to fit together and is complete. Our job as humans, like our job as teachers and students, is to fit pre-existing blocks into their respective holes (or “discover” how the pieces of the puzzle fit together). Accordingly, the “answers” to neuroscientific questions already exist. We simply need to find them through methods of, say, brain imaging. Neuroscience is not unique in this sort of reductionism, but what is unique is the relatively recent trend in philosophy to use John Dewey to reconstruct neuroscientific inquiry as a form of pragmatism aimed toward integrated and transactive inquiry: neuropragmatism.⁶

Dewey’s reconstruction borrowed from Darwin’s effort to navigate and explain the shifting world of “body” that was historically set against the permanent world of “mind.” As Solymosi puts it,

Reconstruction ... brings the problems of philosophy back down to earth. No longer should philosophers be distracted by questions divorced from the lived and living world. Instead of trying to escape such a world by finding some metaphysical or epistemological principle that holds always and forever, pragmatism seeks to turn the attention and energy of philosophers to the less permanent and less stable world of humans in nature. The redirection of effort is central to Dewey’s main tools of reconstruction: situatedness, continuity, and experience as organic-environmental transactions.⁷

This essay provides historical background to substantiate the claim that neuroscience in education is currently largely divorced from philosophy and history, preferring to focus absorbedly on microbiology, nanotechnology, and cognitive psychology. While biological, technical, and cognitive elements may be necessary

conditions for positive growth in humanity, they are not sufficient. What is needed is a form of pragmatism — neuropragmatism — to counter reductionism and provide warranted justification for reimagining human potential. My claim is not that neuropragmatism is “the” answer to the conundrum of scientism, but a legitimate adaptation and extension of classical pragmatism and neopragmatism that meets the specifics and the spirit of Deweyan inquiry — and one that has serious implications for teaching, learning, and schooling.

CLASSICAL PRAGMATISM, NEOPRAGMATISM, AND NEUROPRAGMATISM:
A BRIEF OVERVIEW

At the risk of oversimplification, the development of classical pragmatism from Dewey’s time to the present reveals important shifts in thinking that allow us to imagine neuropragmatism. Classical pragmatism was, positively, an outgrowth of Darwin and, negatively, a reaction against analytic philosophy. I view Dewey’s mature thought as transactional realism and believe, with David Hildebrand, that neopragmatists like Richard Rorty and Hilary Putnam, while offering significant interpretations of pragmatism, get key parts of Dewey’s metaphysics and epistemology wrong.⁸ This is important for the larger topic because emphasizing the centrality of facts versus the implosion of the fact/value dualism matters to the causal, primal, correlative, and integrative arguments involving brain, mind, and inquiry.

What Rorty and Putnam advanced was arguably anti-scientific, where science is understood in Dewey’s terms as integrative and cohesive inquiry between and among theory and application. Dewey argued that “what ‘science’ means is simply the most authentic knowledge of nature, man [sic], and society that is possible at any given time by means of the methods and techniques then and there available.”⁹ The core of the Rorty-Putnam debates over science, essentially pitting realism against antirealism, centered on linguistics, at least for Rorty. As Rorty noted, “I linguisticize ... in order to read [philosophers] as prophets of the utopia in which all metaphysical problems have been dissolved, and religion and science have yielded their place to poetry.”¹⁰ Rorty interprets Dewey’s logic, his theory of inquiry, as merely a method.¹¹ He’s wrong.

Dewey calls science “the perfected outcome of learning — its consummation. What is known, in a given case, is what is sure, certain, settled, disposed of; that which we think *with* rather than that which we think about. In its honorable sense, knowledge is distinguished from opinion, guesswork, speculation, and mere tradition.”¹² Significantly, Dewey adds “But experience makes us aware that there is a difference between intellectual certainty of *subject matter* and *our* certainty.”¹³ His point is to caution us on two fronts. Firstly, we should not take science to be such a universalized worldview — nor a reified (overgeneralized) method — that we forget context. Secondly, we should not throw out a naturalistic empiricist interpretation of science-in-common-life. Yes, Dewey wants us to get away from superstition and mere opinion. So do neuroscientists. Yes, Dewey wants us to employ scientific method. So do neuroscientists. The difference is that Dewey goes on to make an important stipulation: “On the other hand, the fact that science marks the perfecting of knowing in highly specialized conditions of technique renders its results, taken

by themselves, remote from ordinary experience — a quality of aloofness that is properly designated by the term abstract.”¹⁴ In other words, science as laboratory experiment yields “scientific” results, but the connection between science and the context of everyday life is where Dewey wants science to go — and *not* via the imposition of science *onto* everyday life.

Putnam, contrary to Rorty’s relativist extension of pragmatism, takes classical pragmatism’s merging of truth and verification — that is, inquiry — as a move away from what he saw as an important goal: the “tenselessly” true. Putnam’s neopragmatism wants to find a middle ground between metaphysical realism — objectivity and correspondent truth — and the total rejection of truth. He does this, in short, by providing “idealized justification.” In his book *Reality with a Human Face*, Putnam navigates shared territory with Rorty:

[I am] willing to think of reference as internal to “texts” (or theories), *provided* we recognize that there are better and worse “texts.” “Better” and “worse” may themselves depend on our historical situation and our purposes; there is no notion of a God’s-Eye View of Truth here. But the notion of a right (or at least “better”) answer to a question is subject to two constraints: (1) *Rightness is not subjective*. What is better and worse to say about most questions of real human concern is not just a matter of *opinion*.... (2) *Rightness and justification*.... My own view is that truth is to be identified with idealized justification, rather than with justification-on-present-evidence. “Truth” in this sense is as context sensitive as *we are*.¹⁵

This extended quote provides at least two insights. Firstly, in his effort to block the slide to relativism, Putnam inserts his tool of “idealized justification.” For a classical pragmatist, the move is confusing, if not unnecessary altogether. As Hildebrand notes, “as long as inquiry is done with care, there is no reason that ‘present evidence’ could not provide a satisfactory answer — one we might even call ‘better’ or ‘right.’”¹⁶ If correspondence theories of truth are to be rejected, as any pragmatist would have to maintain, why bother with what is arguably a mitigated correspondence theory? I suspect that Putnam’s debates with Rorty made him overzealous in his rejection of relativism — but Dewey was not a relativist, he was a fallibilist. Providing warrant for claims to “truth” is part and parcel of his theory of inquiry. Though potentially temporal, facts are still facts, until they no longer are. We “know” that if we step off a ladder, we will fall at a rate of 32.2 feet per second, squared. While true, and knowable, such a truth is not universal as it is possible that gravity (as a rate of acceleration) may change by .001 ft/s² (or some other variation) in a thousand or a million years. Consider Dewey’s clarification: “The ‘truth’ of any present proposition is, by definition, subject to the outcome of continued inquiries; *its* ‘truth,’ if the word must be used, is provisional; as *near* the truth as inquiry has *as yet* come, a matter determined *not* by a guess at some future belief but by the care and pains with which inquiry has been conducted up to the present time.”¹⁷

Secondly, Putnam hints at a central epistemological problem within the nexus of disciplines in the Mind-Brain Education (MBE) movement. That is, when Putnam asserts that truth “is as context sensitive as *we are*,”¹⁸ he is trying to distinguish his theory of truth as very distinct from Rorty, but also distinct from Dewey. He is delineating his epistemology. Where Dewey understands “pure” and “applied” science as interdependent, Putnam sees Dewey as separating science from ethics.

Regarding Dewey's *Logic: The Theory of Inquiry*, Putnam writes, "What Dewey's argument does show is that there is a certain overlap between scientific values and ethical values; but even where they overlap, these values remain different. Scientific values are not simply instrumental ... but they are relativized to a context — the context of knowledge acquisition — and knowledge acquisition itself is something that can be criticized ethically."¹⁹ Putnam is making a categorical mistake in that while he rightly subjects science to ethical examination, he seems to think that Dewey would have seen scientific values set in contrast to ethical or aesthetic ones. For Dewey, the contrast is part of the problem. While Putnam is no positivist, the effort to separate scientific values from other values mistakes what Dewey vigorously championed as the continuity between and among scientific and ethical inquiry.

We have, then, the merging of the fact/value dualism in order to establish what counts as knowledge in scientific inquiry. This is an important bridge to neuroscientific research and what counts as research in education in the twenty-first century. In short, the neopragmatists are helpful, even when they are wrong, for they provide arguments that enable us to more clearly understand classical pragmatism and its potential for becoming neuropragmatism. Where Rorty relativized to language and poetry, Putnam tried to hold to a weak correspondence theory of truth and a robust understanding of knowledge as the "end product" of inquiry. Neuroscientists working in education are far more likely to cohere with Putnam's accounts, even if they do not use the language of neopragmatism. What, then, are the terms they use and what are the metaphysical and epistemological assumptions they make when they define neuroscience and neuroscientific inquiry in application to education?

SKETCHING NEUROSCIENCE, NEUROPSYCHOLOGY, AND MIND-BRAIN EDUCATION

For the sake of brevity, I am using a collection of essays from neuroscientists and "educational neuroscientists" to represent the general — and not wholly unified — field of neuroscience applied to schooling. While there are some clear differences among the scientists, there are many similarities that, by using their own definitions about what they do and why they think neuroscience is so important for education, I can capture as an accurate reflection of the field (as opposed to advancing a straw [wo]man argument). There are promises and perils, of course, but the goal in this section of the essay is to correctly represent the field in order to raise questions about how it might be aided (or replaced?) by the relatively new area of neuropragmatism.

Neuroscience is the study of the anatomy, physiology, biochemistry, and/or molecular biology of nerves and nervous system tissue. Some of the focus of neuroscience is on understanding the evolution of the organ. From archipallium or reptilian brains to neomammalian ones, some neuroscientists try to understand the development of the brain over many thousands of years.²⁰ Other neuroscientists are interested in the "micro" elements that make up the brain, like axon terminals, dendritic spines, and myelin sheaths. This sort of study is about the elements that make up the brain and provide its functionality. The primary question here is, "how does the brain work?" Relatedly, other neuroscientists focus on issues like brain trauma, autism, and dyslexia. Largely empirical, neuroscience is the grounding

some psychologists use to develop “models” to address issues like attention deficit disorders and behavior disorders. The links to pedagogy should be apparent. If not, a quick review of the increasing number of centers or institutes that focus on neuroscience reveals a clear bent toward psychology and, by some extension, pedagogy.

Georgetown University’s Center for the Study of Learning (CSL) is typical of institutes and centers that focus on neuroscience and education. It claims to

conduct research that will shed light on the causes and effects of learning disorders, so that better programs for diagnosis and treatment can be developed. CSL’s researchers have identified some of the important neurophysiological mechanisms of reading acquisition, disorders of reading and its remediation. Our mission is to use neuroscience research to help identify avenues for effective education and remediation for a variety of cognitive skills.²¹

At Simon Fraser University, Stephen Campbell runs an educational neuroscience laboratory called ENGRAMMETRON. His goal is to “bring to bear as much observational control of the learning process as possible.”²² He does this by using electroencephalograms (EEGs), electrocardiograms (EKGs), electrooculograms (EOGs), and electromyograms (EMGs). In much of the justification for his work, he highlights the centrality of rigor and science as the basis for solving learning problems.

Campbell’s concern for rigor is shared by Kathryn Patton, also at Simon Fraser. Her assertion is that the “neuromyths that have crept into pedagogy must be replaced by an applied neuroscience, primarily concerned with educational practice both informed by educational neuroscience *and* informing research in neuroscience and neuropsychology ... [that is,] neuropedagogy.”²³ Patton’s project is linking empirical science to practical issues in classrooms. Her concern is apparently shared by one of the founders of neuropedagogy, Kurt Fischer. His work at Harvard University, around 1999, established course work that became known as Mind-Brain Education. MBE is, according to Zachary Stein and Kurt Fischer, “poised to usher in a new era in both the science of learning and scientifically based educational reforms.”²⁴

While Stein and Fischer concede that there are significant complexities facing the “new field,”²⁵ they nonetheless advance a particular form of research and a particular view of science that necessarily qualifies what it means to learn. Repeatedly, terms like “rigorous science,” “research grounded in science,” and the oft-cited acronym STEM (Science, Technology, Engineering, and Mathematics) reinforce a particular vision of what the field can do to help children in schools — whether they are labeled as atypical or not. Cognitive psychology *qua* cognitive neuroscience provides the foundation for much of the work in this field.

Linking this overview to neopragmatism and neuroscience in education, Mind-Brain Educators (MBEs) want nothing to do with Rorty. “Poetry” may be nice, but it informs the “neuromyths” that MBEs believe to be a central problem in education. We should get away from speculative ideas about what works in schools and develop models that are scientifically proven to work. In this sense, Putnam’s neopragmatism, while not the same as what MBEs argue, is similar in a key regard and emphasis: pure versus practical knowledge/scientific facts versus ethical values. Where Putnam sees a dichotomy, so do MBEs. Both regard truth as a findable “end.” Both place

more privilege on scientific fact than on values. Both elevate expertise over ordinary experience. Like Rorty's premature announcement that epistemology is dead, Putnam and MBEs appear to err in embracing the (false) dualism.

Dewey is important here because, as Jim Garrison notes, affect and cognition are part and parcel of being human.²⁶ Larry Hickman writes that "Dewey simply bypassed the chasm this [science versus ethics] debate has opened. He proposed that the two sides — the one that emphasizes facts and the one that emphasizes values — are at bottom connected as *phases* or *moments* within inquiry."²⁷ Where neuroscience attempts to identify clusters of neurons, neuropragmatists, following Dewey, seek to understand the transactional continuity of the cluster of neurons in a brain in a nervous system in an organism in an environment. Implications for teaching and learning are outlined below, but, in brief, run parallel: identifying student "learning styles," or "proving" "what works" or identifying "best practices" become isolated "strategies" that discount teachers and students because the contexts of both groups are marginalized or ignored in favor of (over) generalizability of what are deemed or vaunted as "scientific facts." Neuropragmatism does not reject science; it understands that science and neuroscience are valuable elements within a larger theory of inquiry. Schools should be seen and understood, on the neuropragmatist view, as spaces for transactional inquiry wherein students and teachers in varying classrooms investigate the variety of problems that reflect their interests within and surrounding their school, town, state, country, and globe. In short, we should privilege pragmatic generativity over scientific and psychologicistic imposition.²⁸

NEUROPRAGMATISM AND EDUCATION

Given that neuropragmatism is defined by multi-layered and multi-faceted inquiry that requires mind and body, like human will and dopamine, in transactional relationship with changing contexts, how might neuropragmatism best be illustrated? Far from novel, I use food as the illustration of evolutionary utility that develops and changes over time due to social and cultural development. Where food is initially seen, reductively, as a basic biological requirement, it morphs in meaning and grows in scale and importance. The corollary for schools is basic content, whether reading, writing, or ciphering. Yet, for the neuropragmatist, content, like food, is mistakenly understood in its most rudimentary way. Firstly, I consider food; then, I contemplate possible connections to school as a means of both clarifying and applying neuropragmatism to education.

In strict evolutionary terms, sustenance is a requirement for existence. Food is necessary to be and continue being. Species adapt, or become extinct, given the ecological reality or context in which they eat (or starve). The immediacy of food, as with a rabbit or deer chewing on whatever it can find, is part of the evolutionary narrative. With humans, however, food becomes more than sustenance, more than merely evolutionary biological processes of ingesting and digesting. Still evolutionary, food is selected. Food is prepared. Food is cooked. Food is used for celebrations and sacrifices. Food is eaten in social and ecological contexts that necessarily merge the biology and sociology of human being and human becoming.²⁹

In this connected, not reductionistic and dualistic, understanding of food and human growth, we see the primacy of inquiry. Solymosi explains:

Through inquiry — at first as trial-and-error, later as experimental science — digestion and cognition are extended beyond the gut and the brain, respectively, into the environment. Seen as systems of environmental transaction, digestion and cognition gain significance as they are able to contribute to growth. The evolution of cooking and agriculture illustrate how something that happens (metabolic processes) becomes selected for in more effective ways to the point at which the selection is not simply natural but artificial as well, i.e., done for desired reasons, or, ends-in-view as Dewey would put it.³⁰

All of this is simply to restate the “nested” nature of conjoined mind/body with (and within) environment. Neurotransmitters and alleles in the brain, brains in heads of humans, humans in family and social spheres, sociality contextualized ecologically, environments in flux, and all of this in continuity and transaction distinguishes neuropragmatism from traditional neuroscience and MBE. Where the latter two isolate, neuropragmatism enjoins. Even when traditional neuroscience rejects Cartesian materialism, there still is primacy placed on laboratory observations to show or prove what must be done in spaces and places far away from the laboratory. Neuropragmatism repositions laboratory work as vital, but only if transactionally emergent from contextual realities. This is why, in 1927 (well before neuroscience was neuroscience), Dewey noted that “the question of the integration of mind-body in action is the most practical of all questions we can ask civilization.”³¹

For schooling and issues of teaching and learning, the parallels are similar. The truism that students and teachers in classrooms are not divorced from the school and society they inhabit (or from the various topics of inquiry) becomes meaningful only when generative of inquiry. If they are to be neuropragmatic in the Deweyan sense, schools integrate mind and brain, individual and group, context and interests and in ways that do not privilege reductionism. This, it seems to me, is the biggest pitfall of MBE and most traditional schooling: the risk is in subordinating teachers and students to “best practices,” “proven methods,” and “brain-based pedagogy” that assume they already have the answer to the puzzle of human minds.

1. Tibor Solymosi, “A Reconstruction of Freedom in the Age of Neuroscience: A View from Neuropragmatism,” *Contemporary Pragmatism* 8, no. 1 (2011): 153–171. See also Charles R. Carlson, “John Dewey’s Ecological Naturalism as a Critique of Genetic Reductionism” (paper presented at Annual Meeting of the Society for the Advancement of American Philosophy, in Cheney, Wash., March, 2011.)

2. Zack Lynch and Bryon Laursen, *The Neuro Revolution: How Brain Science Is Changing Our World* (New York: St. Martin’s Griffin, 2010), 11.

3. Tom Wolfe, quoted in Lone Frank, *Mindfield: How Brain Science Is Changing Our World* (Oxford: Oneworld, 2009), 10. For the discerning reader, yes, the subtitles of both books are exactly the same.

4. See, for example, Kimberly G. Noble, Nim Tottenham, and B.J. Casey, “Neuroscience Perspectives on Disparities in School Readiness and Cognitive Achievement,” *The Future of Children* 15, no. 1 (2005): 71–89. See also, Lay Leng Yeap, “Hemisphericity and Student Achievement,” *International Journal of Neuroscience* 48, no. 3/4 (1989): 225–232; and Helen Abadzi, *Efficient Learning for the Poor: Insights from the Frontier of Cognitive Neuroscience* (Washington, DC: The World Bank, 2006). Other recent work includes an entire edition of *Educational Philosophy and Theory* 43, no. 1 (2011), in which the various authors make their cases for the legitimacy of the field of MBE. Many of the articles

are thoughtful reflections and some raise significant questions, but none uses neuropragmatism or Dewey.

5. See Richard A. Quantz with Terry O'Conner and Peter Magolda, *Rituals and Student Identity in Education: Ritual Critique for a New Pedagogy* (New York: Palgrave Macmillan, 2011), esp. 115ff; and John Dewey, *The Quest for Certainty* (New York: Minton, Balch and Company, 1929).

6. See, for example, John R. Shook, "Conference on Neuroscience and Pragmatism: Productive Prospects," *Philosophy, Ethics, and Humanities in Medicine* 6, no. 14 (2011): 1–4. The work of Richard Dawkins, Daniel Dennett, and Paul and Patricia Churchland stands in contrast to the reductionism I am charging much of neuroscience with (particularly as it has been taken up for teaching and learning), but these figures still represent a kind of "first-wave" neuropragmatism in that they concentrate on neutrality as fundamental. See Patricia Smith Churchland, *Brain-Wise: Studies in Neurophilosophy* (Cambridge, MA: MIT Press, 2002); Richard Dawkins, *A Devil's Chaplin: Reflections on Hope, Lies, Science, and Love* (New York: Houghton Mifflin, 2003); Daniel Dennett, *Sweet Dreams* (Cambridge, MA: MIT Press, 2005); Daniel Dennett, *Kinds of Minds: Toward an Understanding of Consciousness* (New York: Basic Books, 1996); and Paul Churchland, *A Neurocomputational Perspective: The Nature of Mind and the Structure of Science* (Cambridge, MA: MIT Press, 1989).

7. Solymosi, "A Reconstruction of Freedom in the Age of Neuroscience," 156. For a different historical context, see Jonathan Weidenbaum, "The Philosopher and the Neuroscientist: Dewey, Harris, and the Nature of Religious Experiences," *Journal of Liberal Religion* 8, no. 1 (2008): 1–14.

8. David L. Hildebrand, *Beyond Realism and Anti-Realism: John Dewey and the Neopragmatists* (Nashville, TN: Vanderbilt University Press, 2003).

9. John Dewey, "The Determination of Ultimate Values or Aims through Antecedent or A Priori Speculation or through Pragmatic or Empirical Inquiry," in *John Dewey: The Later Works, 1925–1953*, vol. 13, ed. Jo Ann Boydston (Carbondale, IL: Southern Illinois University Press, 2008), 258.

10. Richard Rorty, "Response to Hartshorne," in *Rorty and Pragmatism: The Philosopher Responds to His Critics*, ed. Herman Saatkamp (Nashville, TN: Vanderbilt University Press, 1995), 35.

11. As Hildebrand notes, "Rorty is inspired . . . against science and toward literature," in *Beyond Realism and Anti-Realism*, 100. See also Michael Eldridge, *Transforming Experience: John Dewey's Cultural Instrumentalism* (Nashville, TN: Vanderbilt University Press, 1998), 13–14.

12. John Dewey, *Democracy and Education* (New York: Free Press, 1916), 188.

13. *Ibid.*

14. *Ibid.*, 189–190.

15. Hilary Putnam, *Realism with a Human Face*, ed. James Conant (Cambridge, MA: Harvard University Press, 1990), 114–115.

16. Hildebrand, *Beyond Realism and Anti-Realism*, 134.

17. John Dewey, *Human Nature and Conduct*, vol. 14, in *John Dewey: The Middle Works* (Carbondale, IL: Southern Illinois University Press, 1985), 57 (emphases in original).

18. Putnam, *Reality with a Human Face*, 115 (emphasis in original).

19. Hilary Putnam, *Words and Life* (Cambridge, MA: Harvard University Press, 1994), 174.

20. See, for example, Paul D. MacLean, *Triune Brain in Evolution: Role in Paleocerebral Functions* (New York: Kluwer, 1991).

21. Center for the Study of Learning, Georgetown University, <http://csl.georgetown.edu/>.

22. Stephen R. Campbell, "Educational Neuroscience: Motivations, Methodology, and Implications," *Educational Philosophy and Theory* 43, no. 1 (2011): 13.

23. Kathryn E. Patton, "The Somatic Appraisal Model of Affect: Paradigm for Educational Neuroscience and Neuropedagogy," *Educational Philosophy and Theory* 43, no. 1 (2011): 87. See also Sergio Della Sala and Mike Anderson, eds., *Neuroscience in Education: The Good, The Bad, and The Ugly* (Oxford: Oxford University Press, 2012).

24. See Zachary Stein and Kurt W. Fisher, "Directions for Mind, Brain, and Education: Methods, Models, and Morality," *Educational Philosophy and Theory* 43, no.1 (2011): 57.

25. Some of the issues identified include whether to follow a medical model (diagnoses) or whether there is a common lexicon for the field.
26. Jim Garrison, "A Pragmatist Approach to Emotional Expression and the Construction of Gender Identity," in *Reconstructing Democracy, Recontextualizing Dewey: Pragmatism and Interactive Constructivism in the Twenty-first Century*, ed. Jim Garrison (Albany, NY: SUNY Press, 2008): 157–184, esp. 161ff.
27. Larry Hickman, *Pragmatism and Post-Postmodernism: Lessons from John Dewey* (New York: Fordham University Press, 2007), 158 (emphasis in original).
28. Dewey makes this point clearly and symbolically in *Sources of a Science of Education* (New York: Horace Liveright, 1929).
29. This point is far from novel and is more thoroughly explored by the following: Tibor Solymosi, "Neuropragmatism, Old and New," *Phenomenology and the Cognitive Sciences* 10, no. 3 (2011): 347–368; Daniel Dennett, *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (New York: Simon and Schuster, 1995); Michael L. Power and Jay Schulkin, *The Evolution of Obesity* (Baltimore, MD: The Johns Hopkins University Press, 2009); and Jerome Popp, *Evolution's First Philosopher: John Dewey and the Continuity of Nature* (Albany, NY: SUNY Press, 2007). Given the word limit for this essay, I am severely summarizing the point.
30. Solymosi, "Neuropragmatism, Old and New," 362.
31. John Dewey, "Body and Mind," in *The Later Works of John Dewey*, vol. 3, ed. Jo Ann Boydson (Carbondale, IL: Southern Illinois University, 1988), 29–30.