

Wisdom as Seen Through Scientific Lenses: A Selective Survey of Research in Psychology and the Neurosciences

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This essay summarizes representative work in treatments of wisdom in Psychology and the neurosciences. It concludes with suggestions for how this work might cohere with and be enriched by engaging the work of Michael Polanyi.

Introduction

Interest in a more systematic and extended investigation of the virtues is a topic that has surged in theological and philosophical circles over the past three decades, but has not made much of a splash in the sciences, except arguably for the relatively new area of positive psychology.¹ This school of psychology traces its origins to a 1998 address to the American Psychological Association by Martin Seligman. Much like the humanistic psychologists of the 1960s and 70s, positive psychology intends to focus on human flourishing rather than the pathology that has occupied psychology through most of its history. Unlike the older humanistic psychology, positive psychology endeavors to analyze empirically the strengths and traits of persons and institutions that seem to foster richer, more meaningful lives.²

In this review essay, for the sake of brevity and illustrative purposes, rather than investigate the range of work done in positive psychology, I focus on the virtue of wisdom, the study of which has been stimulated in part by the work in positive psychology. My goal here is to summarize some recent representative work in scientific understandings of wisdom by first examining treatments of wisdom in psychology, followed by treatments of wisdom in the neurosciences. I conclude with some suggestions for how this work might cohere with and be enriched by Michael Polanyi's insights.

Wisdom Among the Psychologists

Many psychologists have been studying wisdom for over twenty years now and have published several collections of essays.³ Perusal of the tables of contents of these volumes indicates that the investigation has been commendably wide in scope. Essays distinguish between philosophical and religious treatments of wisdom, explore historical and cross-cultural perspectives on wisdom, investigate connections between wisdom and personality traits such as intelligence, self-identity, and creativity, as well as present experimental research on many topics such as the relationship between age and wisdom.

In this literature, psychologists often distinguish between implicit and explicit theories of wisdom. Some psychologists seek to derive descriptions of wisdom and/or wise persons by examining ideas about wisdom that are imbedded in folk wisdom, common sense, and cultural-historical or philosophical treatments of wisdom. Other

psychologists develop explicit theories of wisdom by articulating models of this virtue that can then be empirically investigated.⁴ Of the varied explicit theories of wisdom that have been proposed, three overlapping models have emerged as dominant theoretical accounts.

The first, the Berlin Model, is associated with Paul Baltes and Ursula Staudinger at the Max Planck Institute for Human Development in Berlin. This model defines wisdom as expertise in “the fundamental pragmatics of life,” by which the authors mean matters related to the conduct of life and the construction of meaning for life in various contexts, whether education, family, work, friendship, or the common good. Developing this expertise requires engaging an open and ill-defined body of knowledge, wrestling with the differences in values held by different people, and managing uncertainty. As with expertise in any area of life, two different types of basic knowledge are required: factual and procedural. Factual knowledge, for Baltes and Staudinger, refers to knowledge about topics such as human nature and development, social norms, etc. Procedural knowledge involves knowledge of how to accomplish a task, such as weighing life goals, or planning.⁵

Wisdom, according to this model, develops over time in an intense, motivated process of learning guided by tutors as one masters critical life experiences that can be cognitive, motivational, social, interpersonal, and/or spiritual in nature. The fact that wisdom develops over time is corroborated by a study that concludes that wisdom-related knowledge and judgment develop to adult levels during late-adolescence and early adulthood (early 20’s).⁶ This does not mean, however, that age necessarily leads to wisdom. As the old adage says, old age sometimes just leads to old age.⁷

The second (Yale) model of wisdom is associated with Robert J. Sternberg, who describes wisdom as skill in applying tacit knowledge to the task of achieving the common good.⁸ This task requires achieving a complex balance at two levels, the human and the environmental. At the human level, wisdom requires balancing intrapersonal, interpersonal, and extrapersonal interests. At the environmental level, those human interests have to be directed to a course of action that best balances the options of adapting to existing environments, modifying those environments, or moving to new environments.

Sternberg identifies six components of wisdom so understood: knowledge (understanding of presuppositions, meaning, and limits), discernment, a judicial thinking style that probes beneath surface appearances to discover how and why things happen as they do, tolerance of ambiguity, motivation to understand, and appreciation for the limits and possibilities of action in a specific context. Of these components, Sternberg stresses the importance of tacit knowledge, i.e., knowledge that is procedural, in that it represents “knowing how” more than “knowing that.” Moreover, this knowledge is acquired without the direct help of others and is thus more “caught than taught.”

The third model of wisdom is that of Scott Brown, who discusses six interdependent dimensions of wisdom and the conditions necessary for growth in wisdom. The six dimensions are: self-knowledge, an understanding of others, judgment (here understood as acute perception and discernment), life knowledge, life skills, and a willingness to learn. The conditions that foster or impede the development of wisdom are one’s willingness to learn, the range and depth of one’s experiences with others, and one’s general environment.⁹

While there are some clear differences between these models in terminology and emphasis, it is worth noting that they are not mutually exclusive. In one way or another, they all realize that wisdom is developed over time, that it requires motivation, entails perceptivity, draws from both factual and procedural knowledge, and

requires a willingness to live with ambiguity. I therefore take it that they reflect an emerging consensus in the psychological literature.

Wisdom Among the Neuroscientists

Insights into the neurobiology of wisdom typically come from three sources, taken alone or in combination. The first is biology in general, which informs us of the process of brain development. A second source is that of brain scans (typically using fMRI technology) that show which parts of the brain are active while people engage in various tasks. The third source is work with people who have some kind of brain injury. Insights can be summarized succinctly under three points: what we are learning about brain development, what we are learning about specialization in the brain, and what we are learning about brain plasticity.

Brain development proceeds in three stages, the first of which consists of the formation of neurons, axons, dendrites, and synapses and extends from birth to roughly age 30.¹⁰ Myelin also begins to coat the axons, thereby facilitating the transmission of electrical signals across the brain; this process continues until about age 30. Also at this time, enduring connections are made between different parts of the brain. The second stage, that of maturity, begins when myelination is completed and is marked by a stability of brain structures that soon thereafter begins to erode, a process that marks the beginning of the third stage, decline. In general, the brain decreases in weight and size by about 2% for every decade of adult life, connections between neurons become increasingly sparse, and blood flow and oxygen supply to the brain decreases.

However, the pace of development and decline is not uniform, as different parts of the brain mature and decline at different rates. For example, while neurons begin to form at gestation, new evidence suggests that the process continues throughout one's lifetime. Beginning at gestation, neurons also develop axons and dendrites, a process that is completed during the first few years of life. However, the length of time it takes the synapses to form varies from one part of the brain to another. For example, synapses in the visual cortex finish forming in a few years, whereas synapses in the frontal cortex do not finish developing until as late as age 30, the time that myelination concludes.¹¹ Brain decline also takes place at a differential rate, too. In general, the last area to develop, the frontal cortex, is the first to feel the effects of aging, while the older parts of the brain feel the effects of these changes last—although this pattern is often offset by habitual use—as we will see below.

A second insight into wisdom from the neurosciences comes from investigation into the areas of the brain that are used for various tasks. Remember that connections between disparate parts of the brain are formed in the run up to maturity. Research with brain imaging and animal studies suggest that the so-called executive functions of the brain (planning, foresight, impulse control, empathy, etc.) are not located in any single spot of the frontal cortex, but are instead spread throughout the cortex. Moreover, since the frontal cortex acts as a “conductor,” it has deep connections both to centers for long-term memory (the hippocampus) and the motor cortex.¹²

These interconnections are important to understanding wisdom, according to Goldberg, who construes wisdom as a form of problem-solving that becomes increasingly dependent on pattern recognition.¹³ As one becomes adept at pattern recognition, brain activity shifts predominantly to the neo-cortical regions of the brain and becomes increasingly left-brain. Moreover, wisdom seems to depend on generic memories, which involve frequently-used knowledge and are stored in the neo-cortex. Because of their physiological location, they are less reliant on brain structures associated with other types of memory, such as the hippocampus and brain stem.

This localization makes generic memory less susceptible to many kinds of brain injury. Other ways generic memory is safeguarded from more general patterns of brain decline are what Goldberg calls pattern expansion and effortlessness experts. In the former phenomenon, repeated use means that brain areas allocated to some skill expand or colonize other parts of the cortex. In the latter, repeated use means that the brain uses fewer resources, such as blood supply, to solve problems, thus making generic memory more resistant to the declines that should come with aging.

A final insight into wisdom from the neurosciences has to do with the plasticity of the brain, i.e., the fact that the development of brain structures is heavily influenced by experience. At birth, the brain of a child contains an estimated 100 billion nerve cells. As the child develops, excess neurons, dendrites, and synapses are pruned—not randomly, however, but on the basis of use. The phenomenon is much like the way that driving in the same path on a dirt road creates ruts which guide the car on later trips down that road. Thus many neuroscientists quip, “the cells that fire together wire together,” or as one scholar puts it, this phenomenon of brain mapping amounts to a narrative of lived experience.¹⁴

That “experience,” understood as response to external stimuli, plays a part in shaping or sculpting the enduring structures of the brain has been confirmed by numerous studies. For example, studies of speech perception indicate that by 12 months, children can hear only the speech sounds of their own language, whereas before they perceived the nuances of other languages, even if it was not their own. Moreover, experiments with kittens in which one eye has been sown shut at birth show that the neurons associated with that eye wither from disuse so that the eye remains blind, even after it is later opened. The flip side is also true, too, in that continued use makes connections stronger—perhaps even permanent parts of brain structure. In one of the more interesting studies, researchers found that the hippocampus (a part of the brain involved in directional memory) is bigger in more experienced and knowledgeable cab drivers than in rookies.

The duration of experience also seems important. In the case of the taxi drivers, it takes an average of two years to develop expertise in navigating London. More generally, studies of expertise suggest that it takes upwards of ten years to become an expert in fields as diverse as chess, mathematics, painting, or music composition. In the case of classical pianists, the amount of practice over a ten-year period is the best predictor of performance levels and even seems to counteract the declines that one might expect from aging.¹⁵

That experience, understood as internal effort can also shape brain structures has only more recently been acknowledged. For example, work with patients suffering from obsessive-compulsive disorder and Tourette’s syndrome suggests that mental rehearsal is as effective as physical action in remapping brain circuitry—a finding that raises some intriguing questions about brain/mind relationships and the direction of causation.¹⁶

In sum, the neurosciences have told us something of the process and development of portions of the brain that are associated with wisdom. In particular, one is struck by the duration of brain development and the relationship between experience and physiology. These observations have both practical and philosophical implications. What is the import of these findings for teaching? What insights do they shed on the old mind-body problem? This work plows fertile ground for many areas of scholarship.

Conclusion

I conclude then with some impressions of this literature, admittedly unsubstantiated in this brief document, along with some observations about how this work might fit with Polanyi. One impression, again, is that the psychological literature commendably seeks to be inclusive in perspective. It tries to examine historical, cultural, philosophical, and religious perspectives on wisdom. Perhaps these treatments are not as sophisticated as one would like and could benefit from the inclusion of actual historians, cultural anthropologists, philosophers, and theologians in the conversation, but the discipline is indeed trying to combine some degree of philosophical reflection with empirical investigation. A second impression is that, for the most part, the literature on neurobiology is strikingly nonreductive in that it does not seek to explain away wisdom as nothing but electrochemical activity in the brain.¹⁷

While Polanyi rarely gets any attention in this literature (apart from an occasional citation related to the concept of tacit knowing), I cannot help but think that he would have approved of this kind of endeavor, at least in principle. Were he able to comment on this research, I wonder what he might have said. I suspect that he would want to push the psychologists more on the notion of wisdom as pattern recognition. I suspect that he would push the neuroscientists on the matter of top-down and bottom-up causation by pointing them to his discussions of boundary conditions and levels of reality. Finally, I suspect he would remind all involved of the virtues necessary to sustain the scientific community. In short, it seems there is ample room for a fruitful, Polanyian contribution in this shared endeavor of striving to make sense of the alluring and elusive reality of the virtues.

Endnotes

¹The University of Chicago has also just begun its Science of the Virtues project, which is part of its Arete Initiative. For more information, see <http://arete.uchicago.edu>.

²For more information on positive psychology, see <http://www.apa.org/apags/profdev/pospsyc.html>. See also www.ppc.sas.upenn.edu/executivesummary.htm and <http://www.ppc.sas.upenn.edu/faqs.htm>. All accessed 19 August 2009. The “Bible” of Positive Psychology is Christopher Peterson and Martin P. Seligman’s encyclopedic *Character Strengths and Virtues* (New York: Oxford University Press, 2004). For a trenchant critique of positive psychology and especially its treatment of wisdom, see Barry Schwartz and Kenneth E. Sharpe, “Practical Wisdom: Aristotle Meets Positive Psychology.” *Journal of Happiness Studies* 7 (2006):377-395.

³See for example, Robert J. Sternberg, ed., *Wisdom: Its Nature, Origins, and Development* (New York: Cambridge University Press, 1990), Warren S. Brown, ed., *Understanding Wisdom: Sources, Science, and Society* (Radnor, PA: Templeton Foundation Press, 2000), and Robert J. Sternberg and Jennifer Jordan, eds., *A Handbook of Wisdom: Psychological Perspectives* (New York: Cambridge University Press, 2005).

⁴See Paul B. Baltes and Ursula M. Staudinger, “Wisdom: A Metaheuristic (Pragmatic) to Orchestrate Mind and Virtue Toward Excellence,” *American Psychologist* 55 No. 1:123-124.

⁵This summary draws from Baltes and Staudinger, “Metaheuristic” 122-136.

⁶Monisha Pasupathi, Ursula Staudinger and Paul B. Baltes, “Seeds of Wisdom: Adolescents’ Knowledge and Judgment About Difficult Life Problems.” *Developmental Psychology* 37, 3 (2001):358.

⁷See Jennifer Jordan, “The Quest for Wisdom in Adulthood,” pp. 167-176 in *Handbook* as well as M.J. Richardson and M. Pasupathi, “Young and Growing Wiser,” pp. 152-154 in *Handbook*.

⁸My summary draws on Robert J. Sternberg, “A Balance Theory of Wisdom,” in *Review of General Psychology* 2:4 (1998):347-365.

⁹This summary draws from Jeffrey A. Greene and Scott C. Brown, “The Wisdom Development Scale: Further Validity Investigations.” *The International Journal of Aging and Human Development* 68 (4) 2009:292-294.

¹⁰This summation draws from Elkhonen Goldberg, *The Wisdom Paradox: How Your Mind Can Grow Stronger as Your Brain Grows Older* (New York: Gotham Books, 2005), 37-49, Jeffrey Schwartz and Sharon Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (New York: HarperCollins, 2002), 96-131 and Joseph LeDoux, *The Synaptic Self: How Our Brains Become Who We Are* (New York: Penguin Books, 2002), 33-96.

¹¹Although I have not summarized the research here, it is interesting to note that measures of cognitive maturity correlate with that of brain maturity: peak development of both reasoning skills and brain physiology occurs sometime after age 20. See James Rest, et al, *Moral Development: Advances in Research and Theory* (New York: Praeger, 1986), 176-179. See also his “Research on Moral Judgment in College Students,” in *Approaches to Moral Development: New Research and Emerging Themes*, ed. by Andrew Garrod (New York: Teachers College Press, 1993), 201-227, Blythe Clinchy, “Beyond Subjectivism” in *Tradition and Discovery* XXXIV, No. 1 (2007-2008):27 and Patricia M. King and Karen Strohm Kitchener, *Developing Reflective Judgment* (San Francisco: Jossey-Bass, 1994), pp. 13-19, 149-150, and 219).

¹²See Goldberg, 163-164, 175-177, and 180-181, as well as LeDoux, 185-188 and 252-254. For a succinct list of brain regions and their relevant functions, see Darcia Narvaez and Jenny L. Vaydich, “Moral Development and Behavior Under the Spotlight of the Neurobiological Sciences.” *Journal of Moral Education* 37, 3 (September 2008):293-294. A helpful literature review can be found in Thomas W. Meeks and Dilip V. Jeste, “Neurobiology of Wisdom: A Literature Review.” *Archives of General Psychiatry* 66, 4 (April 2009):355-365.

¹³This account draws from Goldberg, 20-1, 107, 114, and 135-139.

¹⁴Leslie Paul Thiele, *The Heart of Judgment: Practical Wisdom, Neuroscience, and Narrative* (Cambridge: Cambridge University Press, 2006), 205.

¹⁵This account of expertise draws from the work of Goldberg, 19-20; Narvaez, “Neo Kohlbergian Tradition and Beyond: Schemas, Expertise, and Character,” in Gustavo Carls and Carolyn Pope Edwards, eds., *Moral Motivation through the Lifespan* (Lincoln: University of Nebraska Press, 2005), 151; Thiele, 93; John L. Horn and Hiromi Masunga, “On the Emergence of Wisdom,” in *Understanding Wisdom*, 262-267; Robert J. Sternberg, et al, *Practical Intelligence in Everyday Life* (Cambridge: Cambridge University Press, 2001), 105 and 210; and Malcolm Gladwell, *Blink: the Power of Thinking without Thinking* (New York: Back Bay Books, 2005), 176-186.

¹⁶Schwartz and Begley, 217, 236 and 250-2.

¹⁷This is especially true of Schwartz and Begley, as well as Narvaez. Le Doux is a bit vexing, however.