



William James, Gustav Fechner, and Early Psychophysics

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American psychologist and philosopher William James devoted the entirety of his career to exploring the nature of volition, as expressed by such phenomena as will, attention, and belief. As part of that endeavor, James's unorthodox scientific pursuits, from his experiments with nitrous oxide and hallucinogenic drugs to his investigation of spiritualist mediums, represent his attempt to address the "hard problems" of consciousness for which his training in brain physiology and experimental psychology could not entirely account. As a student, James's reading in chemistry and physics had sparked his interest in the concepts of energy and force, terms that he later deployed in his writing about consciousness and in his arguments against philosophical monism and scientific materialism, as he developed his "radically empiricist" ideas privileging discontinuity and plurality. Despite James's long campaign against scientific materialism, he was, however, convinced of the existence of a naturalistic explanation for the more "wayward and fitful" aspects of mind, including transcendent experiences associated with hysteria, genius, and religious ecstasy. In this paper, I examine aspects of James's thought that are still important for contemporary debates in psychology and neuroscience: his "transmission theory" of consciousness, his ideas on the "knowing of things together," and, finally, the related concept of "the compounding of consciousness," which postulates the theoretical possibility for individual entities within a conscious system of thought to "know" the thoughts of others within the system. Taken together, these ideas suggest that James, in spite of, or perhaps because of, his forays into metaphysics, was working toward a naturalistic understanding of consciousness, what I will term a "distributive model," based on his understanding of consciousness as an "awareness" that interacts dynamically within, and in relation to, its environment.

Keywords: history of psychology, William James, Gustav Fechner, psychophysics, neuroscience, philosophy

Those familiar with the legacy of William James (1842–1910) know him best as the father of American psychology, founded the first experimental psychology laboratory at Harvard, bestowed the first Ph.D. degree in psychology to his student, G. Stanley Hall (1844–1924), and popularized a new philosophical method called Pragmatism. But this list of "firsts" yields an incomplete picture of James the iconoclast who devoted his intellectual life to intractable problems. As one of his earliest biographers aptly suggests, James possessed "the kind of mind which requires an anvil to its hammer, a resistance to overcome – whether unmitigated evil for which to devise a remedy, or stubborn facts on which to think" (Perry, 1967, p. 64). In his lifetime, James persistently defended the scientific study of what he termed the "wild facts" of human subjectivity (James, 1983, p. 249). For James, these consisted of mediumistic trance, hallucinations, and religious ecstasy. As he would write, "Anyone will renovate his science who will steadily look after the irregular phenomena" (James, 1979, p. 223). And that is exactly what James did, building an entire philosophy, termed "radical empiricism," around the pluralistic, disjointed, discontinuous range of human novelty he had discovered as a psychologist. Crucially, his philosophy argued for indeterminacy and uncertainty, based on his scientific investigation of the idiosyncrasies of consciousness and the influence of personality on individual free will and volition.

In this regard, James has much in common, both personally and professionally, with his elder nineteenth-century contemporary, German physicist Gustav Fechner (1801–1887) who founded psychophysics, a new field that undertook the empirical measurement and correlation of brain states with sensory experience. Both men were the sons of deeply religious fathers. James's father was a follower of the Swiss mystic Immanuel Swedenborg, while Fechner's father was a minister. Both James and Fechner studied the natural sciences and took formal degrees in medicine but did not practice it. Both ended up professors in fields where neither had taken a doctoral degree. Fechner became a professor of physics at the University of Leipzig, while James became a Harvard professor of philosophy and psychology, based on knowledge independently earned by his obsessive reading in natural science, philosophy, and brain physiology. Both men represented their psychological and philosophical worldviews in ways they believed were compatible with Darwinian evolutionary biology. Finally, since both men's intellectual development took place at a time when science and philosophy were not yet institutionally distinct as disciplines, their contributions were indebted to both scientific exploration and philosophical speculation.

There is much to connect James and Fechner, then, intellectually. Both rejected strictly materialist scientific accounts of the mind–brain relationship and postulated new theoretical scientific

frameworks to account for spontaneity, novelty, and evolutionary change within individuals and larger systems. Both were led by scientific questions into metaphysical terrain as a means of helping them to forge new frameworks to account for the novelty they encountered. In keeping with the positivistic spirit underlying the science of their age, both James and Fechner aimed to distil a range of philosophical and scientific ideas concerning the composition of nature and of experienced reality into a few underlying principles, but, most crucially, without deterministic consequences for individuals. Science, for both men, was based on the entirety of human experience; nothing that could be experienced, therefore, would be excluded from the domain of scientific inquiry. From a Jamesian perspective, this is the very definition of his “radical empiricism.” “To be radical,” James wrote, “an empiricism must neither admit into its constructions any element that is not directly experienced, nor exclude from them any element that is directly experienced” (James, 1904, p. 315). James thus cultivated a philosophy that would be true to reality as it was experienced: a world of discontinuous flux and novelty. In keeping with that experience, he called radical empiricism “a mosaic philosophy, a philosophy of plural facts” (James, 1904, 315).

This essay follows a similarly mosaic-like structure, providing a brief account of Fechner’s psychophysics and its influence on James, in the context of the early history of experimental psychology, the field that served as the final wedge dividing philosophy from psychology. As a cultural historian, I am primarily interested in the sociological consequences of Fechner’s and James’s contributions to experimental psychology and neuroscience. The controversies each figure inspired highlight pervasive tensions between scientific and speculative epistemologies that continue to have significant consequences for those working in the embattled terrain of the mind sciences. The discussion that follows illuminates James and Fechner’s shared scientific and philosophic interests as well as the historical and social contexts for their complex *weltanschauungen*, while suggesting ways in which contemporary neuroscientists continue to draw upon ideas that originated with Fechner and James.

FECHNER AND JAMES: SCIENTIST–PHILOSOPHERS

Though historians of science have described Fechner’s epistemology as monistic, devoted to identifying the natural world with single origins, whether of a transcendent or mechanical order (Marshall, 1974), his science and philosophy are in fact closer to James’s pluralism. German science historian and neuroscientist Michael Heidelberger, who has written the most recent and most comprehensive monograph on Fechner’s intellectual origins and the significance of his scientific and metaphysical works, describes Fechner as “a radical empiricist with a phenomenalist outlook” (Heidelberger, 2004, p. 73). For Fechner, empirical observations came first. Subsequently, these observations became the basis for his metaphysical and natural-philosophic speculations regarding the constitution of the universe and the nature of human perception. For Fechner, the psychical (or mental) and the physical (or material) were different modalities of experience. Like the opposing sides of a single coin, the psychical and the physical were functionally parallel; they operated simultaneously, yet maintained an interdependency that was not linked by causality

(Marshall, 1982; Heidelberger, 2004). What has been termed Fechner’s “double-aspect” view of the psychical and the physical, first described in his metaphysical work *Zend-Avesta* [*Zend-Avesta oder über die Dinge des Himmels und des Jenseits. Vom Standpunkt der Naturebetrachtung*] (1851), postulated a functional relationship between human experience and perception. Fechner declared that this idea came to him in a flash of intuitive insight in the wee hours of October 22, 1850, when he awakened to the realization that “the functional relation between mental and physical might be construed logarithmically.” The term Fechner coined, “psychophysics,” stood for “physiological bodily processes immediately accompanying psychical events” (Marshall, 1982, p. 71, 80). His subsequent work, *Elements of Psychophysics* (1860) [*Elemente der Psychophysik*] delineated a mathematical means (later refined by Weber) of expressing this relationship that influenced mathematicians, such as James’s friend Charles Sanders Peirce, in the USA, and the founders of German experimental psychology, Ernst Mach and Wilhelm Wundt, whose Leipzig laboratory was the training ground for a generation of American experimental psychologists who followed James.

James’s knowledge of Fechner’s psychophysics, chronicled in his student notebooks, began as early as 1868 while studying psychology under Wundt and Herman von Helmholtz in Germany. As Marshall has shown, James was not entirely at ease with Fechner’s formula for correlating physical sensations with mental cognition. In his 1876 essay, “The Teaching of Philosophy in Our Colleges,” James dismissed Fechner’s psychophysical formula, writing, “It is more than doubtful whether Fechner’s ‘psychophysical law’ (that sensation is proportional to the logarithm of its stimulus) is of any great *psychological* importance” (qtd. in Marshall, 1982). Subsequently, James wrote condescendingly of Fechner, calling him that “dear old man,” in his *Principles of Psychology* (1890). No amount of statistical measurement, James argued, could overcome the problem of retrospective analysis of perception and external stimuli, a problem that, for James, stemmed from “the misleading influence of speech” (James, 1981, p. 193). In other words, the brain cannot speak for itself; it requires human agents to interpret its responses to stimuli. While James concluded with the experimental psychologists that “introspection is no sure guide to truths,” he nonetheless found fault with the strict statistical empiricism of the experimentalists on the grounds that “the poverty of the psychological vocabulary leads us to drop out certain states from our consideration, and to treat others as if they knew themselves and their objects as the psychologist knows both” (p. 196).

In part because of James’s original dismissal of Fechner’s psychophysics in *Principles of Psychology* (1890), we have overlooked both James’s later indebtedness to Fechner for his radical empiricism and, consequently, James’s potential contributions to contemporary neuroscience. By the time James delivered his Hibbert lectures comprising *A Pluralistic Universe* (1904), in which he devoted his fourth lecture to the “compounding of consciousness” and Fechner’s panpsychic worldview, much had changed in psychology and in modern physics that would make James more receptive to Fechnerian thought. Almost a decade earlier, in his lecture “On Human Immortality” (1896), James made the German physicist his intellectual ally in exploring the most intractable of problems facing the mind sciences: the mind’s relation to the brain

and that of consciousness to human embodiment. James was most attracted to Fechner's metaphysical ideas, set forth in such works as *Little Book of Life After Death* [*Das Büchlein vom Leben nach dem Tode*] (1835; to which James wrote the introduction to the 1904 English translation) and *Zend-Avesta*, subtitled, "On the Things of Heaven and the Afterlife: From the Standpoint of Meditating on Nature" (1851). These metaphysical works lay the groundwork for Fechner's important 1861 *Elements of Psychophysics* (Marshall, 1982; Heidelberger, 2004), and influenced James's radical empiricism, a philosophy that promotes a theoretical middle ground between strictly materialist and strictly metaphysical means of addressing the mind-brain problem.

This essay not only provides a cultural and historical framework for situating James's psychology in the context of psychophysics, the field Fechner pioneered, it also traces a genealogy of descent from Fechner to James and to James's modern descendants in the mind sciences. This requires us to look back upon the nineteenth-century divide between philosophy and psychology as a necessary starting point for understanding the on-going tensions and debates between contemporary psychology and neurophysiology. As experimental psychology in the USA was coming into its own as a scientific discipline in the late nineteenth century, it opened up disputed borders between the natural sciences and philosophy, raising significant questions about whether or not philosophy could meaningfully contribute to scientific progress (Bordogna, 2008). In the following section, I will first discuss James's formal and informal education in the natural sciences and his investigation of brain physiology before going on to show how Fechner's psychophysics relates to James's most significant psychological theories for contemporary neuroscience: "transmission theory," "the compounding of consciousness," or co-consciousness, and, finally, the radical empiricist scientific framework James developed before his death in 1910. Finally, I will conclude by presenting the ideas of several contemporary psychologists, neuroscientists, and philosophers whose thought is indebted to James's unique understanding of psychophysics, while further suggesting ways that James's philosophical work remains significant for the mind sciences.

THE FORCE OF HUMAN WILL

The "zig-zag" course with which James's career is said to have unfolded is not quite as inconsistent as accounts by his biographers and intellectual historians – or even James himself – would have us believe (Perry, 1967; Simon, 1998; Feinstein, 1999; Richardson, 2007). In fact, James's earliest diaries and reading notebooks show a remarkable consistency in his study of "energy" and "force," concepts from physics to which James attributed a psychological dimension, in part as a consequence of his daring fusion of philosophical idealism with British and Germanic strains of scientific materialism. Will, habit, and attention form the Jamesian triumvirate of psychological inquiry concerning subjectivity and volition, dating from his earliest days as a student. James's artistic training with the renowned painter William Hunt cultivated his keen eye for empirical observation and accounts for the significance the role of attentive perception plays in his philosophical and psychological works (Feinstein, 1999; Leary, 2002). Between 1864, the year James enrolled at Harvard's medical school, and 1875, the year he

launched Harvard's and the nation's first experimental psychology laboratory, he had read Laplace in mathematics; Newton, Maxwell, and Planck in physics; Hughlings-Jackson in neurology; Spinoza, Leibnitz, Descartes, and Schopenhauer in philosophy; and Galton, Spencer, and Wundt in psychology (Taylor, 1996, p. 73). He was well versed in neurology and was deeply influenced by German laboratory science, for he had studied physiology and experimental neurology in Berlin, and experimental psychology at Heidelberg under Wundt and Helmholtz. In 1875, the same year James opened his experimental psychology laboratory at Harvard, he also gave a series of 10 lectures at Johns Hopkins on "The Brain and the Mind."

Any consideration of James's renewed interest in Fechner's psychophysics in his later years, then, must begin with James's life-long study of energy and force as components of human intellectual endeavor, from the ravings of the insane to the inspiring cognitive leaps of genius. James enrolled at Harvard the same year James Clerk Maxwell's (1831–1879) *A Dynamical Theory of the Electromagnetic Field* (1861), inaugurated a unified "field theory" of electromagnetism. At Harvard, he studied chemistry and read Michael Faraday's (1791–1867) *Experimental Researches in Chemistry and Physics* (1859), the landmark work describing his experiments with "electromagnetic induction" (Richardson, 2007, p. 51). In his second year at Harvard's Lawrence Scientific School, James began independently studying philosophical and scientific works related to matter and force. Among these were British physicist William Robert Grove's (1811–1896) *On the Correlation of Physical Forces* (1846), a book that anticipates by 1 year Hermann von Helmholtz's ground-breaking theory on the conservation of energy. James read German orientalist and philologist Max Müller (1823–1900), and Ludwig Büchner's (1824–1899) *Kraft und Stoff: Empirisch-naturphilosophische Studien (Force and Matter: Empirical-philosophical Studies)*, 1855). From Müller he took the idea that the mind as a kind of force that possesses a little understood power of "synthesis," or "of joining two or more ideas and contemplating them in their mutual relations as one."¹ From Büchner, James copied down the materialist maxims that "force and matter are inseparable" and that "matter is imperishable." (Croce, 1995, p. 108). Years later, James gave the concepts energy and force the following psychological formulation: "matter is motion, motion is force, force is will" (Richardson, 2007, p. 51). In the midst of all this heady reading in physics, James also read Charles Darwin on the origin of species and Jonathan Edwards on original sin. Natural science, physics, and Christian theology supplied the intellectual and philosophical ballast for James's understanding of consciousness as a component of the personal subjectivity known as the "self," and the cultivation of the will, which formed the basis for individual beliefs and subsequent actions. The study of what motivates individual and group choices and actions, then, form the core of James's person-centered investigation of consciousness.

What James recognized, more than anything, was the powerful force of ideation, both socially and epistemologically. Moreover, when it came to the study of human consciousness, he underscored

¹"Reading Notes and Observations; Sketches," bMS Am 1092.9 (4497). William James Papers (MS Am 1092.9–1092.12). Houghton Library, Harvard University.

the impossibility of overcoming first-person narration. No matter how carefully one attempts to purge figurative speech and metaphor from scientific discourse, a human agent (with all its attendant messiness and subjectivity) is at the center of it. Furthermore, the translation and interpretation of observed or experienced facts into scientifically meaningful “events” – particularly in the case of the mind sciences – necessarily reduces complex inner states to static principles and formulae that describe physiological functions, while providing little account of how or why complex mental states come into being (James, 1981). The problem for James, as it was for Fechner, in his philosophy and in his psychophysical formula, was how to connect the subjective experience of inner psychological states with the so-called “external” facts of perception and sensory experience. This is where an understanding of James’s interest in physics allows us to pick up the lost thread of the more technical and scientific aspects of his philosophical thought.

THE DEMISE OF THE PHILOSOPHER–SCIENTIST AND THE RISE OF THE NEW PHYSICS

In the early twentieth century, the philosopher’s displacement by the natural scientist as an authoritative public spokesperson for secular values played an essential role in the modernization of American intellectual life. James was a transitional figure in this movement, as he worked between shifting disciplinary borders, namely physiology and medicine on the one hand and the philosophy and psychology of religious and transcendent experience on the other. Throughout his lifetime, the respect James would earn in one domain often came at the expense of the other. For example, many psychologists maintain that after James published his landmark two-volume work, *Principles of Psychology* in 1890, he made no further contributions to the field (see Taylor, 1992, 2002, 2003, 2010). James had always to negotiate between the “professional” standards of his scientist colleagues and the unorthodox research he believed was necessary for psychology’s advancement, but that ultimately undermined his professional scientific authority (Bjork, 1983). The “wild facts” of human experience that interested James, were, from the standpoint of scientific positivism, not facts at all, only epiphenomena, rogue brain activity that was not only unclassifiable, but also unworthy of sustained scientific investigation.

The larger problem for James, however, was how to overcome the epistemological and methodological problems related to identifying how interior states of consciousness correspond to physiological processes, an effort that necessarily would rely on accurate self-reporting and careful observation by investigators. From James’s perspective, investigators would have to be self-observers as well, attuned to the ways in which their own biases might influence and predetermine results. In today’s terms, an investigator serves as a witness to the self-reporting of phenomena, in tandem with seemingly “objective” visualizing technologies, such as EEG, or other means of visually representing internal cognitive processes. But these are merely descriptive of processes and fail to address the more complex actions that lead to individual and collective decisions, including the decision-making of researchers themselves. To address this problem, investigators have called for a more “phenomenologically oriented psychology,” one that

focuses on “the phenomenology of the science-making process itself, and the experimenter as the new confounding variable in the conduct of experiments” (Taylor, 2010, p. 411). The study of “neurophenomenology,” writes Taylor, would address an epistemological divide between the neuroscientific and philosophy of mind approaches. The problem is that the brain is physical, while the “mind” is impossible to locate; to be more accurate, “the mind is a metaphor for experience” (Taylor, 2010, pp. 421–422). And this experience, for James, was riddled with inconsistencies. There is no transcendentally true experience that holds for all individuals at all times.

James’s championing of the discontinuity, indeterminacy, and flux that characterized his psychical research was anathema to psychologists invested in systematizing psychology by promoting experimental methods with reproducible, certain results, identifying psychophysical laws, and charting the brain’s neurophysiologic coordinates for mental response. Indeed by the 1890s, James was declared the “nemesis” of all self-respecting psychologists invested in having psychology taken seriously as a scientific discipline. Those, like Hall, who had initially been his allies in founding the American Society for Psychical Research (ASPR) in 1884, fled its ranks to launch the American Psychological Association in 1890, what would become the bastion of scientific respectability for the new field (Coon, 2002, p. 129).

Experimental psychology promoted by Hall at Clark University, James Rowland Angell at the University of Chicago, Hugo Münsterberg at Harvard University, and Edward Bradford Titchener at Oxford and Cornell Universities – and later canonized by Edwin G. Boring’s monumental *History of Experimental Psychology* (1929) – displaced an older American tradition of introspective self-scrutiny going back to the Puritans. The reigning narrative set forth by Boring of the American experimental psychologist’s descent from a German laboratory tradition, as psychology historians suggest, has occluded the significant role that the religiously schooled early American “mental philosophers” played in the development of American psychology; moreover, transcendentalist and Swedenborgian elements pervade James’s reevaluation of ecstatic religious experience as a valid source of intuitive knowledge (Fuchs, 2002, pp. 79–84; Taylor, 1996, p. 182; Taylor, 2002). Something else, however, accounts for James’s invigorated metaphysical speculations after 1896. As religious historian Catherine Albanese has shown, the unknown and mysterious new forces unleashed by the discoveries of modern physics breathed new life into these older, mystical traditions belonging to the early Americas (Albanese, 2007).

If we track James’s major publications with the discoveries that distinguish modern physics from the mechanistic, Newtonian worldview, the influence of the new physics on James’s thinking becomes clear. James developed his “transmission theory” of consciousness in 1897, in which he described the brain’s transmissive function in terms of invisible “rays,” a mere 2 years after Wilhelm Roentgen’s discovery of the X-ray. In 1902, the year Marie and Pierre Curie discovered the invisible element, radium; James lectured on mystical experience and the “reality of the unseen,” later published as *The Varieties of Religious Experience*. James’s heavily annotated copy of mathematician and philosopher of science Karl Pearson’s second edition of *The Grammar of Science* (1900; a

text that deeply influenced Einstein) highlights the ways in which James's thought had taken a relativistic turn. Indeed, the lectures comprising *A Pluralistic Universe*, forming the basis for his philosophy called "radical empiricism," were published in 1904, just 1 year before Einstein arrived at his special theory of relativity. What I want to suggest is that these new discoveries in physics gave James a lexicon for describing consciousness, and reality itself, as palpably physical yet luminously immaterial. Moreover, what the historian Henry Adams at the turn-of-the nineteenth-century described as the "supersensual" domains disclosed by modern physics gave James a conceptual underpinning for his *Pluralistic Universe*, a universe honoring novelty, discontinuity, and ceaseless change within subjective experience. As he would write of consciousness, "motion there obeys no Newton's laws" (1922, p. 34). Building on the electromagnetic "field theory," which represented physical reality as interpenetrating, "continuous fields" (Einstein 269), James's 1890 *Principles of Psychology* described consciousness in terms of a spherical structure, composed of a "halo," a "penumbra," or a "fringe" radiating outward from a central awareness, what we might think of as a unified "self."

While James turned to physics for insights regarding the "force" of the human mind, he turned to philosophy for explanations. The kinds of questions James pursued in his physiological study of the brain led him to philosophy and metaphysics for answers. James's multidisciplinary approach to the study of mind combined his knowledge of natural history, psychology of religious experience and abnormal mental states to affirm a non-reductive materialism, a "softer" positivism, similar to that of Fechner. Radical empiricism, furthermore, marked James's attempt to refute the positivism of his skeptical peers with a philosophical framework that would justify the scientific investigation of dissociative trance, abnormal and ordinary subjective mental states, associated with volition. James's radical empiricism was ahead of its time in suggesting that what we think of as "mind" is a consequence of many interpenetrating systems, a result of the brain's interactions with the environment, but not reduced to brain physiology or external stimuli alone. Though James had the philosophical framework in place, he lacked the technical scientific background to make it useful to the scientific study of consciousness. Therefore he turned to Fechner for the means of substantiating his theory of transmission and co-consciousness.

FECHNER'S PSYCHOPHYSICAL THRESHOLD AND JAMES'S COMPOUNDING OF CONSCIOUSNESS

First off, let us review a brief chronology of James's concern with the problem of the compounding of consciousness. Two versions of compounding appear in James's thought: (1) the compenetration of individual thoughts within the "stream" of consciousness; in other words, "compounding" describes the process by which thoughts and perceptions are filtered and influenced by a past history of perception and succeed each other in time. (2) The compenetration of individual fields of consciousness within a larger panpsychic world system, a hypothesis that presumes that all organic systems are perceiving and sensate. James initially launched a discussion of the first version of the phenomenon he called "compounding" in his "mind stuff" chapter of the *Principles of Psychology* (1890), in which he endeavored to purge psychology

of all metaphysical speculations, focusing only on empirical data relating to brain physiology and sensations. As James understood it then, "compounding" had to do with the question of whether simpler mental states or perceptions could give rise to more complex mental states. James's answer to this question was a decisive "no." Rather than perceive individual thought or sensations as discretely separate parts split off from each other, James represented "consciousness" as a meandering "stream" in which thoughts and sensations are not disjointed but "flow" successively one into the next. James revisited the theme of compounding in his 1894 presidential address to the American Psychological Association on "The Knowing of Things Together." Try as he might, however, James could not altogether divorce psychology from metaphysical questions. "On Human Immortality" (1898) invokes the second version of compounding, which involves considering the collective compenetration of individual minds or consciousnesses; this form of compounding is possible, James suggests, if we take the brain to be a "transmissive," rather than productive organ; Lecture V in a *Pluralistic Universe* (1904) continued this theme by postulating the existence of compenetration fields of individual awareness, building on his theory articulated in "A World of Pure Experience" (1904) that thoughts compenetrate other thoughts in the form as "co-conscious" transitions "by which one experience passes into another when both belong to the same self" (James, 1922). Collectively these essays represent what I would like to call James's populist "metaphysics for the masses," ideas that would challenge, yet ultimately not disturb individual religious needs. James's Pragmatism, after all, was not concerned with proving the ultimate truth of individual beliefs but affirmed their ethical value for helping individuals lead more fulfilling and meaningful lives. Yet these popular lectures and essays, which have received the most sustained critical attention, belie James's stringent efforts to fulfill the strict empiricist criteria of Fechner's psychophysics.

While James's use of terms culled from physics was more poetical than technical, his ideas anticipate more recent understandings on the part of contemporary neuroscientists that mind is an emergent property of the nervous system's engagement with its environment. James would have agreed with the recent consensus that identifying the neuronal correlates to consciousness alone will not address the "hard problems" concerning the *how* and *why* of subjective experience. The mind theorists whose ideas most resonate with those of James – from the Australian philosopher David Chalmers, to science historian and Buddhist practitioner B. Alan Wallace, phenomenologist Evan Thompson, and biomedical engineer Paul Nuñez – each postulate an interdependency of consciousness on the structure of reality itself. They approach the hard problem of consciousness by focusing on the "explanatory gap" between consciousness and the natural world. To understand the manifold attributes of consciousness, in relation to, but not reducible to neuronal networks, they argue, requires taking a closer look at the structure of reality. In recognition that consciousness and reality are co-constitutive, researchers are turning to dynamic systems, or complexity, theory to synthesize the efforts of neurobiology, phenomenology, and psychology in order to arrive at a better understanding of consciousness as a constituent component of reality itself.

JAMES'S TRANSMISSION THEORY OF CONSCIOUSNESS

James anticipates these scientists by positing a structure of reality more in keeping with the discoveries of modern physics: reality was more than what the eye itself could see. Material substance, far from being physically inert, was composed of invisibly moving, highly charged particles, and permeated by invisible rays. In keeping with these new understandings of reality as composed of invisible substances, James's transmission theory of consciousness builds upon his earlier writing in which James described consciousness's outer barrier as a "haze," "penumbra," or "halo." Consciousness (that awareness that we think of as the "self") is encompassed and surrounded by a permeable "fringe," suggesting a model for consciousness that is both broad and diffuse, in touch with environmental phenomena of which individual persons are not always consciously aware. Potentially, for James, as we shall later see, the outer "fringes" or "fields" of each individual consciousness touch upon other fields in ways that multiply or compound fields within fields of other subjective experience (Barnard, 1997).

James presented his "transmission theory" in the most unlikely of contexts. He had been asked by Harvard to give the annual Ingersoll Lecture, named after a deeply religious alumnus, one Caroline Haskell Ingersoll, who bequeathed money to Harvard to advance the study of the afterlife. Bemused by his selection, and hardly feeling himself an appropriate choice, James admitted dryly that he was selected not "because he is known as an enthusiastic messenger of the future life," but "apparently because he is a university official" (James, 1992b, p. 1100). James's rhetorical stance in "On Human Immortality: Two Supposed Objections to the Doctrine" (1898/1900) was a strategic one; as a scientist tasked with making psychology into a respected science, he could not risk throwing it back into a mire of metaphysical speculation. Therefore, James asked his audience to take as gospel "the great psycho-physiological formula: *Thought is a function of the brain*" (James, 1992b, p. 1104). If we take this formulation as a given, James asked, "Does this doctrine logically compel us to disbelieve in immortality?" James then bases the rest of his lecture on a philosophical thought experiment in which he uses the concept of immortality, or the survival of human consciousness beyond bodily death, to hypothesize a possible structure of consciousness in relation to the human brain quite apart from functional dependency. In place of the production theory, James argued for the brain's "permissive" or "transmissive" potential, in which the brain acts as a filter to information coming from outside.

As James himself argued, "My thesis now is this: that, when we think of the law that thought is a function of the brain, we are not required to think of productive function only: *we are entitled also to consider permissive or transmissive function*. And this the ordinary psycho-physiologist leaves out of his account" (James, 1992b, p. 1110, emphasis in original). In describing the brain as analogous to a "prism, or a refracting lens," which transmits light, or to a pipe organ, through which air produces sounds, but is not itself "engendered in the organ" (James, 1992b, pp. 1109–1110), James argued that "mind is not generated by the brain but instead focused, limited, and constrained by it" (Kelly et al., 2007, p. xxx). Postulating that "*our brains* are such thin and half-transparent places in the veil" of nature, James went on to suggest that "the

genuine matter of reality. . . will break through our several brains into this world in all sorts of restricted forms, and with all the imperfections and queernesses that characterize our finite individualities here below" (James, 1992b, p. 1111). For James, the phenomenon we think of as "mind," cognition, or mental awareness, is a consequence of the brain's behaving as a kind of receiving station to "the genuine matter of reality" transmitted by the environment. There is, of course, a peculiarly Jamesean legerdemain in not naming the substance of this reality, except through suggestive metaphors: invisible light, the trajectory of an arrow shooting through air, air passing through the apparatus of a pipe organ or, more poetically as a "white radiance." Consciousness was a "sphere of being" that is "continuous" with "that more real world" (James, 1992b, p. 1111). Of what invisible substance "genuine" reality was composed, James would leave to others to discover.

James was not the first to argue that the brain functioned as a "filter" to consciousness, or to argue for experiential flux as a pervasive aspect of reality. As James himself acknowledged, philosophers Immanuel Kant and F. C. S. Schiller made similar arguments. Kant, for example, maintained that the body restricts the intellectual function of the brain, which only comes into full flower after death. Schiller similarly argued that matter restricts "the consciousness which it encases" (James, 1992b, p. 1119, n9). James's "transmission theory" was indebted to the ideas of at least two other key individuals: psychophysicist Fechner and Frederic H. Myers, founder of the British Society for Psychical Research. James's transmission theory was modeled in part on Fechner's "conception of a fluctuating psychophysical threshold" (Kelly et al., 2007, p. 29), while his notion of the self as an entity that contains a plurality of possible mental states and secondary "personalities," drew upon Myers's concept of a "subliminal" or "supraliminal" Self – an entity that encompasses a field of broader awareness coexistent with a subject's more narrow sense of a coherent self, but that is not necessarily restricted by or even known to that primary self.

In developing his "transmission theory," James had refined Myers's theory of the Subliminal Self by being the first to explicitly link "notions of transmission and filtering with the brain" (through the metaphor of the "prism" through which light passes), only to come out on "the other side filtered, reduced, focused, redirected, or otherwise altered in some systematic fashion" (Kelly et al., 2007, p. 606). On the face of it, James's "transmission theory" with its metaphors of a prismatic dome and pipe organ may sound like outlandish metaphysical claptrap, but, in fact, these metaphors suggest models that resemble more recent conceptions of mind–brain dynamics. James's model of the brain as a "filter," or, in contemporary terms, a "nested hierarchy" (Nuñez, 2010, p. 11), for processing information from the environment posits the mind and environment as co-dynamic, mutually constitutive entities. In a different context, James would describe this "permissive" or "transmissive" function of the brain as a kind of "Marconi station" (James, 1986, p. 359). Making no reference to James's transmission theory, biomedical engineer Paul Nuñez then goes on to posit "a highly speculative" account of consciousness that is nonetheless dramatically similar to that of James when he describes how "whole brains or special parts of brains might behave like antenna systems sensitive to an unknown physical field or other entity that, for want of a better name, may be called Mind" (Nuñez, 2010, p. 274). In

this way, James's account of the brain's "transmissive" properties resembles more contemporary accounts assigning the mind–brain specific temporal–spatial dimensions and a hierarchical structure.

THE "KNOWING OF THINGS TOGETHER" AND THE COMPOUNDING OF CONSCIOUSNESS

When James discussed the "knowing of things together" he was initially thinking of the phenomenon of how individuals experience the sensation of their thought as one continuous succession, as ideas co-penetrate, as attention wanders, or as one shifts one's awareness to a new introspective thought or aspect of the environment. In "A World of Pure Experience," James described the "conjunctive relation," or "co-conscious transition. . . by which one experience passes into another when both belong to the same self," as that which "has given the most trouble to philosophy." He would go on to say that my and your experiences may be "with" each other externally, "but mine pass into mine, and yours pass into yours in a way in which yours and mine never pass into one another. Within each of our personal histories, subject, object, interest and purpose are continuous or may be continuous. Personal histories are processes of change in time, and the change itself is one of the things immediately experienced" (James, 1922). Philosopher David Chalmers's "double-aspect theory of information" makes a similar point. Adopting "information" as a basic principle of consciousness, Chalmers maintains that "information" represents the "basic structure of [a] *difference* [of] relations between its elements, characterizing the ways in which different elements in a space are similar or different, possibly in complex ways" (Chalmers, 2010, p. 25). For Chalmers, as for James, what consciousness perceives or apprehends, then, is actually a *difference* among relations.

When James later discussed the "compounding of consciousness" in the fifth chapter of his *Pluralistic Universe*, however, he extended this idea to include that of other consciousnesses, writing,

My present field of consciousness is a centre surrounded by a fringe that shades insensibly into a subconscious more. . . The centre works in one way while the margins work in another, and presently overpower the centre and are central themselves. What we conceptually identify ourselves with and say we are thinking of at any time is the centre; but our *full* self is the whole field, with all those indefinitely radiating subconscious possibilities of increase that we can only feel without conceiving, and can hardly begin to analyze (1977, p. 130).

In writing this, James was thinking expressly of Fechner's psychophysical threshold, now known as the Weber–Fechner law, postulating that "consciousness" is the threshold at which subjective perception and subjective sensation coincide. James was less interested in the mathematical formulation for this law than he was in the assigning of temporal–spatial movement to consciousness. These "movements," as James would write in his introduction to the English translation of Fechner's *Little Book of Life and Death*, "can be superimposed and compounded, the smaller on the greater, as wavelets upon waves. This is as true in the mental as in the physical sphere. Speaking psychologically, we may say that a general wave of consciousness rises out of a subconscious background, and that certain portions of it catch the emphasis,

as wavelets catch the light. . . On the physical side we say that the brain-processes that corresponded to it altered permanently the future mode of action of the brain" (1904, p. xv). What James was arguing – drawing upon Fechner's model of the threshold of consciousness as a sinusoidal wave – is richly suggestive of dynamical systems. James's point of view similarly accords with that of phenomenologist Evan Thompson, who collaborated with the late Francisco Varela to write *Mind in Life* (2007). In this phenomenological account of neurophysiological processes, Thompson understands "dynamical systems" as "a collection of related entities or processes that stands out from a background as a single whole, as some observer sees and conceptualizes things" (Thompson, 2007, p. 39). The solar system is one such example, but James's transmission theory offers the example of the social environment, in which one consciousness coexists among many others. In a very real sense, the compounding of consciousness suggests the co-penetration of individual consciousnesses within ever larger and interpenetrating systems.

This idea that consciousnesses themselves co-penetrate is made explicit in an even earlier passage, from the first lecture in *A Pluralistic Universe*. In distinguishing monism from his philosophical pluralism, James writes: "My thoughts animate and actuate this very body which you see and hear, and thereby influence your thoughts. The dynamic current somehow does get from me to you, however numerous the intermediary conductors may have to be. Distinctions may be insulators in logic as much as they like, but in life distinct things can and do commune together every moment" (James, 1977, pp. 115–116). The world of a *Pluralistic Universe*, is just such a dynamical system comprised of a world of interconnecting relations, of "complexity-in-unity" enveloped by a surrounding "earth-consciousness" (James, 1977, p. 73; James, 1909, 1910). And here we finally arrive at the panpsychic view James adopted later in life and attributed to Fechner. What exactly panpsychism means, particularly for James has been the source of much misunderstanding in James scholarship.

Just what is this "panpsychic view" and how does it correspond to contemporary neuroscientific debates about consciousness? James scholar David Lamberth distinguishes James's "moderate" panpsychism from the "strong" or "idealistic" versions held by his contemporaries. The basic tenet of panpsychism is that nature is animate. More rigid versions are dualistic, positing an essential correspondence between the psyche and nature. The "pluralistic panpsychism" that James embraced allowed him to develop "a pluralistic metaphysics of pure experience and a correspondingly pluralistic notion of causality" (Lamberth, 1997, p. 250). This philosophical position of James's strongly accords with the contemporary neuroscientific theory of "dynamic co-emergence," held by Thompson and Varela, in which living and mental processes are understood as "unities or structured wholes rather than simply as multiplicities of events external to each other, bound together by efficient causal relations" (Lamberth, 1997, p. 67). In phenomenological terms, this means revising our understanding nature as "not pure exteriority," but rather as possessing "its own interiority." Thompson is careful to distinguish this perspective from "metaphysical idealism," the argument for a "preexistent consciousness." Instead, it implies a "transcendental orientation" by which we understand that "the world is never given to us as a brute fact

detachable from our conceptual frameworks. Rather, it shows up in all the describable ways it does thanks to the structure of our subjectivity and our intentional activities” (Lamberth, 1997, p. 82). James would understand this in terms of an inherent intimacy of relations between the self and the world with which the self engages. Consciousness itself is “transcendent,” in Thompson’s terms, in part because, as he says, it “is always already presupposed as an invariant condition of possibility for the disclosure of any object[;] there is no way to step outside, as it were, of experiencing subjectivity, so as to effect a one-to-one mapping of it onto an external reality purged of any and all subjectivity” (Lamberth, 1997, p. 87). Consciousness seems defined then by some variable movement or change in time that is perceived differently in relation to one’s location in time and space, and that also depends upon one’s particular role and orientation toward the experiment, that is, whether one is experiencing mental phenomena as a subject in an experiment or as the witnessing and recording observer. In light of Thompson’s phenomenological orientation toward the mind–brain conundrum, it is this intersubjective dimension that becomes most salient to the future of contemporary mind–brain research.

James’s metaphors of “stream,” “halo,” and “penumbra” to describe what has been termed a “fringe” consciousness describe a structure for consciousness that is, in my words, a “distributed” one. To explain what I envision by the term “distributed,” I will use a familiar metaphor from the natural world. Imagine a tree in winter: a single trunk gives rise to smaller branches, forming the essential architecture of the tree; from these branches, smaller ones grow, giving rise to even smaller, finer branches as the tree extends upward and outward. Imagine, if you will, a whole forest of such trees, whose branches co-penetrate to a greater or lesser extent, depending on their proximity to one another, or upon other natural forces in the environment: a gust of wind, birds alighting, rain or snow falling on the branches. It would not be hard to imagine this “system” of co-penetrating branches in still other naturalistic forms: a flock of birds, a school of fish, a moving crowd, or bundles of neurons within a human brain, as each individual within the larger system imperceptibly shifts in relation to the subtle movements communicated at a subconscious level. These images are not hierarchical and they are not necessarily linear, for, at any point within the system a single movement, or a random complex of movements among disparate individual parts could produce something like the perception, to an observer, of cooperative “decision” within the system as a whole. But the observer is also part of the system, and we now arrive at a problem that links physics indelibly to consciousness as part of the “measurement problem” in quantum physics.

The observer’s volitional role of visually arresting an object in space in the act of perception is deeply problematized by the phenomenon known as the “collapse of [the] wave function” in quantum physics. As B. Alan Wallace explains, “quantum measurement entails the ‘collapse of a wave function,’” in which measurement itself involves selecting one alternative from “a range of probabilities.” This selection thus forces a “reduction” in which “all the alternatives vanish.” This “reduction postulate” attempts to “describe what is actually observed in the measurements of quantum systems using classical methods” (Wallace, 2007, p. 81). Building on

Michael Mensky’s “many-worlds interpretation,” Wallace argues for an abandonment of classical methods and a recognition that “Consciousness does not mechanically cause the wave function to collapse or influence physical particles. Rather, the observer’s brain and the observed system are synchronously entangled” (Wallace, 2007, p. 82). The measurement problem has brought increased attention to the role that the observer’s “cognitive frame of reference” plays in studies of consciousness, particularly in acquiring the first-person accounts necessary for an empirical study of subjectivity. As a Buddhist adept, Wallace maintains that scientific observers should integrate “contemplative methods of inquiry” into the study of mind; only by acquiring heightened powers of mental concentration, will scientists develop more reliable first-person accounts of subjectivity (Wallace, 2007, p. 105). Thompson, whose phenomenological approach to the mind–brain problem we have just seen, similarly argues for the need for observers to “suspend or refrain from judgment,” and “to develop more explicitly the pragmatics” of such practice “as a first-person method for investigating consciousness” (Thompson, 2007, p. 20). James’s concluding remarks in his *Pluralistic Universe*, anticipates the words of both Wallace and Thompson, when he urges his listeners to “discriminate ‘theoretic’ or scientific knowledge from the deeper ‘speculative’ knowledge aspired to by most philosophers, and concede that theoretic knowledge, which is knowledge about things, as distinguished from living contemplation or sympathetic acquaintance with them, touches only the outer surface of reality” (James, 1977, p. 111). This more philosophic attitude of receptivity, delineated by Thompson, is one that James pioneered in his radical empiricist philosophy and in his life-long willingness to attend to the less clear-cut aspects of individual psychological experience.

CONCLUSION: RADICAL PHENOMENALISM

Contemporary neuroscientists attempt to resolve the “explanatory gap” between mind and nature. James attempted this linguistically by adopting metaphors for the structure of consciousness that served to reconcile Darwinian evolutionary theory with discoveries in the physics of his day. Both models helped him explore intractable, yet fundamental, epistemological, and ontological questions: Was the universe self-unifying and ordered according to absolute metaphysical or mechanical causes, or was it inherently discontinuous with human perception? Correspondingly, he asked, What is the nature of human consciousness itself, and how do we account for our awareness of our thoughts or of the sensation of possessing a unified “Self?” To put the matter as succinctly as possible, as a philosopher and as a psychologist James was interested in understanding the relationship between the one and the many, the “each form,” as he termed it, and the “universal,” or “all form” (1977, p. 20). His writings emphasize Darwinian “variety,” and “struggle,” while invoking invisible particles and forces resonant with Faraday, Maxwell, and Hertz’s representation of physical reality as interpenetrating, continuous fields. A passage from his 1890 *Principles of Psychology*, illustrates this fusion of scientific world views that pervades James’s thought:

The mind . . . works on the data it receives very much as a sculptor works on his block of stone. In a sense the statue

stood there from eternity. But there were a thousand different ones beside it, and the sculptor alone is to thank for having extricated this one from the rest. Just so the world of each of us, howsoever different from our several views of it may be, all lay embedded in the primordial chaos of sensations, which gave the mere matter to the thought of all of us indifferently. We may, if we like, by our reasonings unwind things back to that black and jointless continuity of space and moving clouds of swarming atoms which science calls the only real world. But all the while the world we feel and live in will be that which our ancestors and we, by slowly cumulative strokes of choice, have extricated out of this, like sculptors, by simply rejecting certain portions of the given stuff. Other sculptors, other statues from the same stone! Other minds, other worlds from the same monotonous and inexpressive chaos! My world is but one in a million alike embedded, alike real to those who may abstract them. How different must be the worlds in the consciousness of ant, cuttlefish, or crab!

(James, 1981, pp. 277–278).

In this extended metaphor for consciousness, the mind, playing the role of “sculptor,” participates in natural selection. It emerges randomly from the “primordial chaos of sensations,” and evolves “by slowly cumulative strokes of choice.” Yet each organism, from cuttlefish to crab, represents a variety of sentient forms evolving from the same primordial chaos. Born in a Darwinist age to a father who was a Swedenborgian mystic and close friend of the transcendentalist Ralph Waldo Emerson, James himself embodied the deeply rooted conflict so many of his generation felt between the indisputable facts of evolutionary biology and, as James later wrote in an address delivered to the Harvard Young Men’s Christian Association in 1895, “the craving of the heart to believe that behind nature there is a spirit whose expression nature is” (James, 2000, p. 225). If scientifically proving the existence of a transcendent aspect of organic life was the longed-for “invisible reality” of James’s era, identifying a phenomenal link between consciousness, experience, and the natural world seems to be that of ours.

For his own part, Fechner’s “day view” speculations attempted to bridge these realms by hypothesizing that organic life is interconnected by a “divine consciousness,” which represents the “inner side” of the natural world. Fechner’s panpsychism was attractive to James because it allowed him to develop a coherent philosophy for the science of psychology, a science that in his view would blend the personal and humanistic attributes of individual experience with biological principles common to the human species. James belonged to an era that needed a more optimistic philosophy than was found in the period’s social Darwinism and scientific positivism; his radical empiricism provided an ethics grounded in understanding reality as a complex of interconnected systems, founded on individual responsibility to larger communities, whether in the natural world or a global community. Like Fechner, he sought a naturalistic understanding of consciousness that could account for the spontaneity and novelty of individual minds – their flashes of insight and bursts of genius – the very expressions of individual creativity that appear to distinguish human forms of cognition from that of other species. According to Heidelberg, although Fechner’s metaphysics is often dismissed as “antimodern”

and “backward” from the perspective of mechanistic materialists, he “sketches a new sort of epistemology, explaining the reality of the mental and the organic, bridging the cleft that separates nature and consciousness, reality and perceptual appearance, and combining science with direct human experience” (Heidelberg, 2004, p. 65). Both Marshall and Heidelberg point out that Fechner and James were philosopher–scientists who felt morally and ethically bound to “to understand science in a way that reunites science with the real world of people, with all the ethical and esthetic implications involved, instead of excluding them from it, as mechanistic materialism does” (Heidelberg, 2004, p. 65). Fechner’s “day view,” like James’s radical empiricism, sought a social role for his psychophysics; both carried out a phenomenological investigation of knowledge perception and construction, believing it was essential to ethical scientific inquiry, for the advancement of all the sciences, and for the mind sciences in particular.

Like James in his own cultural moment, recent contemporary discussions of the mind–brain problem similarly try to bridge divergent biological, psychological, and philosophical approaches. I like to call these “combinatory approaches,” that aim for some “middle ground” between the mind–brain as productive and the mind–brain as transmissive. Each new theory requires a correspondingly new definition of reality, one that makes consciousness, or experience, or information, awareness, or criticality, an emergent quality of the universe, and which all living things to a greater or lesser extent seem to possess. What today’s mind theorists invested in tackling the “hard” problem of consciousness share with James is his pluralistic conception of mind as an entity composed of, but not limited by, physical reality. A “disseminated, distributed, or incompletely unified appearance,” writes James, “is the only form that reality may yet have achieved” (1977, p. 25). Underlying their concept is a conviction that reality – invisible or otherwise – may be discovered to have a subtler structure consonant with that of consciousness itself.

Science historians have aptly described James as a “serial transgressor” of orthodox and unorthodox intellectual and disciplinary boundaries (Cotkin, 1990; Bordogna, 2008). I would suggest, however, that James did not so much make a deliberate program of transgressing boundaries, as he sought knowledge from a constellation of disciplines that he felt would best address his intellectual concerns. In so doing, he also recognized the possibility for fruitful interdisciplinary collaboration on resolving challenging problems in the mind sciences. Though the methodologies of philosophy and experimental psychology in the era of James and Fechner were sometimes antagonistic, more often than not, they facilitated rather than hindered each other’s pursuits. Although Fechner endorsed the liberation of natural science from philosophy, he nonetheless believed his own philosophical interests to be compatible with his scientific ones. Intellectually, James collaborated with an international cohort of scientist–philosophers – psychologists, physicists, and physiologists – who not only rejected the growing disciplinary divide between philosophy and the natural sciences, but who also disputed the opposition between science and metaphysics. Not all practitioners of experimental psychology in the late nineteenth and early twentieth centuries agreed that science could so easily be divorced from speculative philosophy.

Neither an empiricist nor a philosophical approach need be absolutist to James's way of thinking. The same could be said for all the scientist–philosophers with whom James enjoyed a rich correspondence: in England, figures like Frederick Meyers; in France, Pierre Janet and Theodore Flournoy; in Germany, psychologist Carl Stumpf, and physicist Ernst Mach – to name only a few. James's affinity for both Fechner and the French philosopher Henri Bergson derived from his sense that Bergson was a philosopher

who respected science and that Fechner was a scientist who valued the ways in which speculative philosophy could supply a theoretical framework for the hard facts and formulas later discovered by science. In this regard, James and Fechner alike were figures who not only thought deeply about how volitional and subjective aspects of consciousness influence scientific hypotheses, but who also believed that science should not lose sight of the larger human issues: the reverence for mystery and meaning in individual lives.

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Conflict of Interest Statement: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received: 05 September 2011; accepted: 18 September 2011; published online: 04 October 2011.

Citation: Hawkins SL (2011) William James, Gustav Fechner, and Early Psychophysics. *Front. Physiol.* 2:68. doi: 10.3389/fphys.2011.00068

This article was submitted to *Frontiers in Fractal Physiology, a specialty of Frontiers in Physiology*.

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