Darwinian Theory, Functionalism, and the First American Psychological Revolution

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American functionalist psychology constituted an effort to model scientific psychology on the successes of English evolutionary theory. In part it was a response to the stagnation of Wundt's psychological research program, which had been grounded in German experimental physiology. In part it was an attempt to make psychology more appealing within the highly pragmatic American context and to facilitate the application of psychology to domains outside of the scientific laboratory. Applications of psychology that emerged from the functionalist ethos included child and developmental psychology, clinical psychology, psychological testing, and industrial/vocational psychology. Functionalism was also the ground within which behaviorism rooted and grew into the dominant form of psychology through the middle of the 20th century.

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Functionalism, which dominated the American psychological scene at the turn of the 20th century, is mentioned in most textbooks on psychology's history. The coverage is typically thin, often running 10 pages or so. William James is always identified as the "school's" primary inspiration, if not as an actual "member." John Dewey and his younger Chicago colleague James Rowland Angell are typically named as functionalism's chief proponents. Although the exact content of the "school" is often left vague, it is usually said to have been influenced by Darwin's theory of evolution by natural selection, but what the nature of that influence was is rarely explained in any detail. Functionalism is also often portrayed as having been engaged in a long-standing debate with another major American "school" of psychology called structuralism, led by the Cornell psychologist Edward Bradford Titchener. Before long, however, the typical discussion of functionalism moves on to John Watson and the behaviorist "revolution," which is usually portrayed as the critical pivot point in American scientific psychology.

In this article, I argue that this image of functionalism and its relations to European psychology, structuralism, and behaviorism is fundamentally flawed. Functionalism was not merely "influenced" by Darwinian theory but, in the wake of the stagnation of the Wundtian program, constituted a radical attempt to start over by establishing a new scientific basis for psychology. It did this, first, by abandoning key elements of Wundt's effort to model scientific psychology on the physiological successes of the mid-19th century and, instead, attempting to model psychology on evolutionary theory. Moreover, although individual functionalists debated with Titchener, functionalist psychology, broadly conceived, effectively dominated the American psychological landscape from the 1890s to the end of World War I. Although Titchener was well respected, his structuralism rarely established a self-sustaining "settlement" anywhere apart from Ithaca itself. It is mainly because Titchener's former student E. G. Boring wrote the most influential history-of-psychology textbook of the era that it is widely believed that there was a sustained debate between functionalism and structuralism. Indeed, Boring's book can be seen as a late shot in Titchener's battle to minimize the significance of *applied* psychology, which was closely connected to functionalism (O'Donnell, 1979).

Further, I show that although early behaviorism entailed a critical *conceptual* shift—replacing "consciousness" with "behavior" as the core concept of the discipline—many of the procedures and interests that energized Watson and his colleagues were developed under the approving aegis of functionalism (see Wozniak, 1993). In short, I argue that the Darwin-inspired rise of functionalism in the 1890s was the first "revolution" in American psychology and, in turn, made behaviorism possible.

Chauncey Wright and the Evolutionist Foundations of American Psychology

In January of 1872, William James, then just 30 years old, joined an informal band of young intellectuals in Cambridge, Massachusetts, who were keen to discuss controversial scientific and philosophical issues of the day. They called themselves the Metaphysical Club. In addition to James, the group included the sons of two Harvard professors: Oliver Wendell Holmes Jr., later a renowned justice on the U.S. Supreme Court, and Charles Sanders Peirce, the prodigy philosopher and scientist. Within the discussion group he joined with James and Holmes, Peirce (1877a, 1878) developed the basic principles of philosophical pragmatism, a stance for which William James (1898,

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1907) would become famous only decades later. Peirce (1877b) would later become, perhaps, the first American experimental psychologist (Cadwallader, 1974), publishing an article on color vision, a topic that would interest him intermittently throughout his life.

The Cambridge salon that drew James, Holmes, and Peirce was led by a brilliant Cambridge sage named Chauncey Wright. Then in his early 40s, Wright was *the* renegade intellect of Cambridge: Agnostic, positivist, utilitarian, and evolutionist, he boarded in the house of an escaped former slave whose children he had helped to recover from the South during the Civil War (Menand, 2001, p. 206). An 1852 graduate of Harvard, Wright gradually abandoned Unitarianism in favor of the naturalistic philosophies of Francis Bacon and John Stuart Mill. He read Darwin's (1859) *On the Origin of Species* almost as soon as it was published and became a vocal advocate for the theory of natural selection.

In 1870, Harvard's new president, Charles Eliot, a life-long friend of Wright's, invited him to teach a course on psychology. Wright taught mostly the psychology of the Scottish empiricist and utilitarian Alexander Bain. Wright also published a critical review of Alfred Russel Wallace's (1870) book *Contributions to the Theory of Natural Selection*, in which the co-discoverer of natural selection claimed that evolution could not have been responsible for the emergence of the human mind. Wright, by contrast, found Darwinism to awaken a new interest in the problems of consciousness. In an audacious extension of the principles of natural selection to the intellectual realm, Wright argued that the stable contents of our intellects are produced from a kind of Darwinian competition among our immediate thoughts: "Our knowledges and rational beliefs result, *truly and literally*, from the survival of the fittest among our original and spontaneous beliefs" (Wright, 1870/1971d, p. 116).[1] Wright's review caught the attention of Darwin himself, who cited it in *The Descent of Man* (Darwin, 1871).

In a review the following year, Wright bemoaned the widespread misunderstanding of Darwin's theory even by his would-be advocates:

> It would seem, at first sight, that Mr. Darwin has won a victory, not for himself, but for Lamarck. Transmutation, it would seem, has been accepted, but Natural Selection, its explanation, is still rejected by many converts to the general theory, both on religious and scientific grounds. (Wright, 1871/1971c, p. 128)

Darwin was so impressed that he arranged to have Wright's review reprinted in England (Browne, 2002).

After writing a third article defending natural selection (Wright, 1872/1971a), Wright traveled to England, where he met Darwin and experienced what he exuberantly described as a "beatific condition" (cited in Madden, 1963, p. 28). Darwin, for his part, was impressed enough to ask Wright to compose an article on the evolution of self-consciousness. Wright began immediately and published it the following year. In defense of the evolutionary emergence of so singular a feature as consciousness, Wright wrote,

> The word evolution . . . misleads by suggesting a continuity in the *kinds* of powers and functions in living beings, that is, by suggesting transition by insensible steps from one *kind* to another . . . . The truth is, on the contrary, that according to the theory of evolution, new uses of old powers arise discontinuously both in the bodily and mental natures of the animal. (Wright, 1873/1971b, pp. 199–200)

In September of 1875, Wright suffered a stroke and died at the age of 45. Although Wright remains unknown to most historians of psychology, some philosophers have recognized his importance to the development of Darwin-inspired functionalist psychology in America (Madden, 1974).

By the time of Wright's death, the Metaphysical Club had broken up and its younger members had begun their careers in earnest. James was invited to teach at Harvard, sharing a course in comparative anatomy and physiology in early 1873. In 1875, James published a review of Wilhelm Wundt's (1874) landmark textbook *Grundzüge der physiologischen Psychologie* (*Principles of Physiological Psychology*) in which the signs of Wright's profound influence on James's mind were visible everywhere. For instance, in the midst of praising Wundt's handling of the concept of apperception, James wrote,

> [Attention and recognition] postulate *interests* on the part of the subject—interests which, as ends or purposes set by his emotional constitution, keep interfering with the pure flow of impressions and their association and causing the vast majority of mere

[1] It is worth noting a certain similarity between Wright's idea and that of "memes" posed in the late 20th century by Richard Dawkins (1976), although there is no indication that Dawkins was aware of Wright or his work when he proposed the idea.

sensations to be ignored . . . . The only English-writing empiricist who has come near to making any use of it is Mr. Chauncey Wright, in his article on the evolution of self-consciousness. (James, 1875/1980, p. 203)

Taking up the question of evolution himself, James went on to add,

Taking a purely naturalistic view of the matter, it seems reasonable to suppose that, unless consciousness served some useful purpose, it would not have been superadded to life. Assuming hypothetically that this is so, there results an important problem for psychophysicists to find out, namely, *how* consciousness helps an animal, how much complication of machinery may be saved in the nervous centers, for instance, if consciousness accompany their action. (James, 1875/1980, p. 205)

The man whose work James was reviewing, however, was decidedly ambivalent about Darwin's theory. Wundt's few remarks on the topic in the 1860s were favorable, but he seems to have read Heinrich Bronn's unreliable and distinctly "Lamarckian" translation of *On the Origin of Species* (Browne, 2002, pp. 140–141; Richards, 1980, p. 56). As Wundt later came to better understand Darwin's theory, he rejected natural selection (Richards, 1980, p. 58). For Wundt, German physiology remained the proper scientific basis for experimental psychology, not English evolutionism. In America, although Wundt's laboratory would remain a touchstone, his psychology would fade from view.

William James's Evolutionist Defense of Consciousness

About 1875, James acquired some scientific instruments and assembled a small laboratory to be used for demonstrating psychological phenomena to his students. In 1876 James taught a course titled "Physiological Psychology."[2] He used Herbert Spencer's *Principles of Psychology* but criticized the text from a Darwinian perspective (Richards, 1987, pp. 425-426). As he had learned from Wright, James spoke of "spontaneous variations" arising and being selected at the level of thought, not just among physical traits. This wealth of mental possibilities, James believed, made room for freedom of the will within a scientific framework. The argument was developed in two series of lectures that James gave at Johns Hopkins University early in 1878 and in the fall of that year at the Lowell Institute in Boston. Here James took on Darwin's own "bulldog," Thomas Henry Huxley (1874), who had argued that animals are essentially machines. Consciousness was, for Huxley, only excess "steam" rising from the operation of the real "engine" of behavior.

James objected that consciousness would not have evolved unless it enhanced the organism's chances of survival, and it could not affect survival unless it were involved in the causal process leading to particular actions. The cortex of higher animals is so complex, he argued, that it has "hair-triggers" and, thus, is likely to act erratically unless given some guidance. Consciousness, James went on, being able to see the best course of action in advance, can "load the dice" by increasing the brain's tendency to react in accord with that insight. "Consciousness," James later proclaimed, "is a fighter for ends" (James, 1890, p. 141).

The popularity of James's lectures led the prominent publisher Henry Holt to contract with him to write a textbook on the topic of "physiological" psychology. Although it would take 12 years for James to complete his two-volume masterwork *Principles of Psychology* (James, 1890), much of the outlook presented there found its origin here in James's adaptation of Darwin's argument for natural selection and Wright's argument for the evolution of consciousness into a naturalistic scheme for the evolution of freedom of the will.

Johns Hopkins and G. Stanley Hall

Although William James remained a central figure in American psychology through the 1880s, the primary crucible for the development of the field was Johns Hopkins University, where G. Stanley Hall, Charles Sanders Peirce, and an idealist philosopher named George Sylvester Morris competed for the sole available professorship. Hall brought to the table the expertise he had gained in the physiology laboratories of Berlin and Leipzig, as well as in Wundt's newly founded laboratory. The dominant aspect of Hall's American renown, however, stemmed from his European training in the new discipline of pedagogy and in his ability to parlay that knowledge into the founding of the American Child Study Movement. Like James before him, Hall's theoretical contributions were deeply steeped in evolutionary theory, though not so much in the natural selectionism of Darwin as in the recapitulationism (i.e., ontogeny follows phylogeny) of Darwin's unorthodox German disciple Ernst Haeckel (1866). One of Hall's early prominent graduate students was James McKeen Cattell, but a falling out between them led Cattell to depart for Leipzig, where he finished his training under Wundt.

Peirce brought his scientific and logical talents, publishing an important set of psychophysical researches with his student Joseph Jastrow (Peirce & Jastrow, 1884). Morris's primary interests were not in psychology, but his most famous student, John Dewey, would have a profound impact on the field, bringing evolutionary ideas to educational theory. Ultimately, Peirce was let go due to a scandal involving personal affairs, and Morris was offered a professorship at his "home" school of Michigan, to which he soon called Dewey as an instructor (Wenley, 1917). Hall won the coveted Hopkins professorship, from which he was able to establish the first psychology research laboratory in the United States and found the *American Journal of Psychology* (see Green, 2007). But before the decade

[2] In late 19th-century parlance, "physiological" psychology was the term given by Wundt to roughly what we today would call experimental psychology. The reason was that the study of psychology in a laboratory was seen to be an attempt to capitalize on the scientific successes that physiology had enjoyed earlier in the century at the hands of people such as J. Müller, Helmholtz, Brücke, and Du Bois Reymond. "Physiological" was the term of choice then for many disciplines that had new scientific aspirations, including pedagogy and even aesthetics.

was out, he left Hopkins for the presidency of Clark University, where he would found the American Psychological Association (APA) in 1892.

The Stagnation of the Leipzig Program and the American Evolutionist Alternative

Meanwhile, in Leipzig, Wundt's physiological psychology program was beginning to stall (see Danziger, 1990; Robinson, 2001). The reaction time studies at the heart of Wundt's experimental program were delivering inconsistent results rather than zeroing in on the nature of the mind. Wundt's assumption was that all normal human adults' minds are the same and that the basic features of this "generalized" mind could be discovered by experiment. He famously dismissed the suggestion (by his American assistant Cattell) that people may naturally differ from each other in the basic structures of their psychological processes—precisely the kind of variability on which natural selection would be able to work. One of Wundt's assistants, Ludwig Lange (1886), seemed to restore order, however, with his discovery that reaction times were consistently shorter if the attention of the "observer" was focused on the muscular response (e.g., tapping a key) than if attention was focused on the stimulus (e.g., the light or bell). The shorter muscular response, Lange hypothesized, short-circuited apperception and should be avoided.

Upon returning to the United States, Cattell revisited the inconsistencies that had bedeviled the Leipzig reaction time research program, discovering that some individuals seemed to naturally react more quickly when their attention was focused on the stimulus, precisely the opposite of the pattern Lange had observed (Cattell, 1893/1947). Wundt's most loyal follower in the United States at the time, Cornell's English-born psychologist Edward Bradford Titchener, rushed to Wundt's defense. After reviewing 10 different studies of the reaction time phenomenon that Cattell had questioned, Titchener (1895a) found that six favored Lange's interpretation and that the four contrary findings could be excluded on the grounds that the subjects were not experienced at the task and therefore did not have the proper *Anlage,* or "mental disposition," to do it correctly.

In response, the Princeton psychologist with whom Cattell had co-founded *Psychological Review* in 1894, James Mark Baldwin (1895), conducted a study of his own and, finding little of the consistency Titchener claimed, suggested that there might be a variety of naturally occurring psychological "types" in the human population. If true, this would undermine the fundamental premise of the Wundtian program, that there is a single kind of normal adult human mind that can be uncovered by a rigorous application of the experimental method. Baldwin went on to suggest that psychologists should actively seek out different types of minds, making comparative studies of children, "primitive" peoples, and the insane.

Baldwin's interest in demonstrating human mental variability was not idle curiosity. At the very time he was debating Titchener, he was also developing a theory of what he termed "organic selection" (Baldwin, 1894), which depended on such variability. According to Baldwin's scheme, behavioral characteristics that had been acquired by organisms during their individual lifetimes might be passed from parent to offspring through simple imitation. Because the imitations would rarely be perfect, it was a form of behavioral inheritance that came with a certain amount of variability. Most variations would be less successful than those after which they were modeled, but occasionally a variation would turn out to be more effective than the original on which it was based, and this more "fit" version would be more likely to be selected and passed on through imitation to the next generation of offspring. Baldwin (1896) argued that as the species gradually became more reliant on the new behavior, individuals who were *biologically* better disposed to learn and execute it would have a *biological* adaptive advantage over their competitors. Although others came up with similar proposals within months of Baldwin, the scheme came to be called the "Baldwin effect" (Simpson, 1953) and remains a source of debate among evolutionists today (e.g., Weber & Depew, 2003).

Returning to the debate with Titchener, Baldwin argued that Titchener and the Leipzigers were engaged in a circular self-justification, excluding those experimental subjects who did not conform to their theoretical position—those said not to have the correct "disposition"—for no reason other than the fact that they did not conform to the theory. Titchener (1895b) retorted that Baldwin had misconstrued the Leipzig position on the puzzling reaction time data. Titchener then questioned the reliability of Baldwin's new data and concluded that "the evidence for the [type theory] at present is so slight that it is hardly more than a conjecture" (Titchener, 1895b, p. 514). Rejoinders followed and the debate rapidly descended into a futile war of recriminations.

Angell and Moore, and Dewey's "Reflex Arc"

Unbeknownst to either Titchener or Baldwin, at the University of Chicago, James Rowland Angell and Addison W. Moore were conducting the most extensive set of reaction time experiments yet. Responses were made by hand, foot, and lips, to visual and auditory stimuli, in light and in dark, while the subject attended either to the stimulus or to the reaction. Angell and Moore (1896) found, like Baldwin, that different people initially had different patterns of reaction. As the subjects became more practiced, however, the difference between the "sensory" and "motor" reactions narrowed to the point of being nearly indistinguishable, though the motor response was slightly faster on average, as the Wundtians had found.

Angell and Moore offered what they called a "dynamo-genetic" interpretation of the phenomenon in place of what they viewed as the "static" explanations of Titchener and Baldwin (Angell & Moore, 1896, p. 246). Following a suggestion by Dewey, who was mentor to them both, they rejected the idea that the reaction being studied

was a conventional "reflex," contending instead that "the whole act to be performed is not the mere response of the hand to the ear, but the act of attention in coördinating the incoming stimuli from both the hand and the ear" (Angell & Moore, 1896, p. 252). Angell and Moore argued that the sensory form of the reaction typically takes longer because, for most unpracticed people, it involves a shift of attention from, for example, the ear to the hand. Because listening with the ear is, for most people, already more under the control of habit than is pressing a button with the hand, the attention initially focused on the ear in the "sensory form" of the task is "unnecessary work" that takes additional time.

Just weeks later, Dewey would publish a full account of the theoretical position implicit in Angell and Moore's (1896) discussion. This article is now widely regarded as the founding document of the functionalist school of psychology: "The Reflex Arc Concept in Psychology" (Dewey, 1896). Dewey argued that the idea of the reflex arc simply recapitulates the problematic dualisms of psychologies past: sensation versus idea, body versus soul, and so forth. As such, it is not

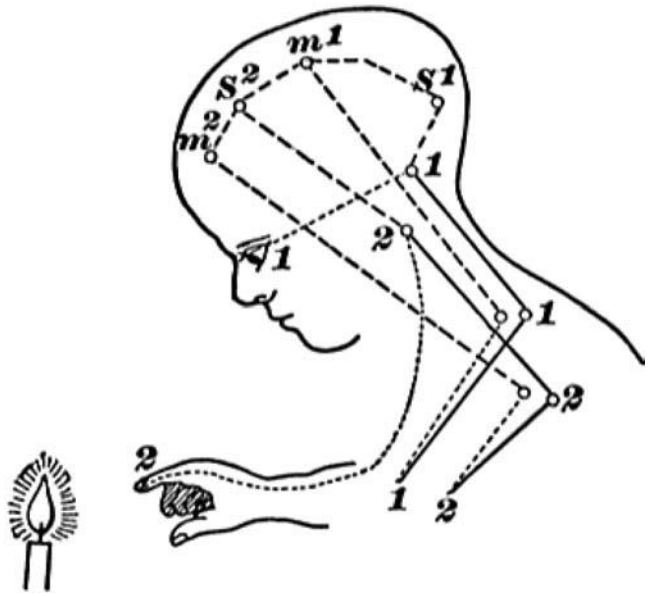
> a comprehensive or organic unity, but a patchwork of disjointed parts, a mechanical conjunction of unallied processes. . . . What is wanted is that the sensory stimulus, central connections and motor responses shall be viewed not as separate and complete entities in themselves, but as divisions of labor, function factors, within the single concrete whole, now designated the reflex arc. (Dewey, 1896, p. 358)

To explain this, he borrowed an example from the opening pages of William James's (1890) *Principles of Psychology*—that of the child reaching for the flame of a candle (see Figure 1):

> We find that we begin not with a sensory stimulus, but with a sensori-motor coördination, the optical-ocular, and that in a certain sense it is the movement which is primary, and the sensation which is secondary, the movement of the body, head and eye muscles determining the quality of what is experienced. In other words, the real beginning is with the act of seeing; it is looking, and not a sensation of light. . . . Now if this act of seeing stimulates another act, the reaching, it is because both of these acts fall within a larger coördination; because seeing and grasping have been so often bound together to reinforce each other, to help each other out, that each may be considered practically a subordinate member of a bigger coördination. . . . The reaching, in turn, must both stimulate and control the seeing. The eye must be kept upon the candle if the arm is to do its work. . . . We now have an enlarged and transformed coördination; the act of seeing no less than before, but it is now seeing-for-reaching-purposes. (Dewey, 1896, pp. 358–359)

Dewey had moved to profoundly change the rules of the game. The objects of the world are responded to by psychological beings not simply on the basis of their physical qualities but also on the basis of their practical significance for the organism—whether dangerous or nutritive or comforting. Whereas Titchener preached a doctrine of decomposing seen objects into their presumably constituent sensations, images, and feelings, Dewey looked primarily to their *functions*, conceived of as adaptations to the organism's environment.

Figure 1
Image of Child Reaching for Flame



Note. Reprinted from *Principles of Psychology* (Vol. 1, p. 25) by W. James, 1890, New York: Henry Holt.

Titchener's response to Dewey's challenge began by drawing an illustrative parallel between psychology and biology. Biology has, on the one hand, morphology, the study of the physical structure of organisms, and, on the other hand, physiology, the study of the functions of the structures discovered by morphology. One cannot study the functions, he warned, until one is certain of the structures. Similarly in psychology, he argued, there is, on the one hand, the study of mental structures—the attempt to "isolate the constituents in the given conscious formation" (Titchener, 1898, p. 450). "Structural psychology" was how Titchener characterized his own approach to the discipline. One could study psychological functions such as memory, imagination, attention, and volition, but this cannot proceed successfully until the basic structures of the mind have first been worked out. Far from resolving the debate with his analogy, Titchener succeeded only in making more plain the intellectual distance between him and many of his American colleagues (see also Titchener, 1899).

Cattell and the American Search for Mental Variability

Although Angell and Dewey were the leaders of the Chicago "school" of functionalism (Angell, 1907), the movement spread widely. Indeed it had been implicit in much of what American psychologists had been doing over the

previous decade. It took on somewhat different characters in different places, however, often by emphasizing different aspects of the Darwinian ground in which it was rooted.

At Columbia University, for instance, James McKeen Cattell produced the first "mental tests" by adapting anthropometric techniques he had learned in England from Darwin's cousin, Francis Galton, in the year after his graduation from Leipzig. Cattell's tests covered a wide range of questions: "keenness" of eye and ear, reaction times, color preferences, pain sensitivity, memory, and mental imagery, among others (Cattell & Farrand, 1896). The tests were aimed at measuring various kinds of mental variability which, if heritable (as was often assumed), could provide the raw material for natural selection in the psychological realm. It was widely thought that mental evolutionary change, if carefully managed, could serve to improve the human race. This set of assumptions about the desirability, heritability, and perfectibility of mental traits had led Galton to propose a program of "eugenics," as he dubbed it. Cattell's mental testing program was derailed, however, when his graduate student Clark Wissler (1901) found little correlation between the test scores and various other measures of intellectual success. This finding rapidly ended Cattell's anthropometric program, but the idea of measuring mental variability with the aim of evolving the mental powers of the human race through eugenic policies continued on.

In 1908, the psychologist at the New Jersey Training School for Feebleminded Boys and Girls, Herbert Henry Goddard (a former student of G. Stanley Hall), happened upon a new test of intelligence that had been developed by Alfred Binet and Théodore Simon. Goddard (1910) translated the test and examined 400 children at his school. His apparent success led to both the Binet-Simon test and Goddard's scheme of mental classification (idiot, imbecile, moron, normal) being widely adopted. Goddard soon became an advocate of the idea that even mildly feebleminded individuals posed a grave threat to American society because, although appearing normal in most respects, they would "inbreed" with the "normal" population, thus lowering the nation's overall intelligence. He urged that the feeble-minded be rooted out in the urban ghettos and the rural backcountry, that they be stopped at the borders from entering the country, and that they be identified in the prisons (see Zenderland, 1998). In 1916, a young Stanford professor named Lewis Terman (also from Clark University) expanded and revised the Binet-Simon test into what came to be known as the Stanford-Binet IQ test (Minton, 1998).

In 1917 the United States entered World War I, and APA president Robert Mearns Yerkes—primarily known as a comparative psychologist, though he had contributed to testing as well (Yerkes, Bridges, & Hardwick, 1915)—assembled a group of psychologists including Goddard and Terman to develop a test that would enable the military to screen their millions of new draftees. The results were the now-notorious Army Alpha and Beta tests. Over 1.7 million draftees were tested, and the apparent results shocked America: Over half of draftees tested as "morons" or lower. Southern and Eastern European immigrants, as well as African Americans, were said to have average mental ages of preteen children (Yerkes, 1921). The widespread acceptance of these putative results, of course, was buttressed by racist and anti-immigration trends already common in American society, but they were taken by most to be objective, scientific findings. Some, such as John Dewey (1922) and Walter Lippman (1922), objected, but the feeling of the nation was against them. The Army itself mostly ignored Yerkes's data set (Kelves, 1968), but American eugenicists nevertheless mined it for decades afterwards. Whatever inspiration the early 20th century eugenics movement may have found in the hopes and fears of the American psyche, it assembled its intellectual justification out of (a portion of) the evolution-inspired functionalist psychology of the day.

Functionalism and the Birth of American Applied Psychology

Not all of functionalism's impact on the broader culture partook of this dark character. Even mental testing, born of eugenical ideals, had a more pragmatic side. Yerkes was not the only psychologist hired by the Army to guide a testing program. Walter Dill Scott, a Northwestern University professor who had been trained by Wundt, turned his attention to the application of psychology in the world of commerce, developing tests for the selection of salesmen and other business positions. Scott argued against Yerkes that the army tests should focus simply on selecting the best military officers, whatever combination of intelligence and other virtues that might entail (Von Mayrhauser, 1987). Scott was hired to design his tests for a War Department committee separate from Yerkes's, and for his efforts he was awarded the Distinguished Service Medal.

Many other psychologists became involved in practical, business-oriented testing of this kind as well. Chief among these were Harvard's Hugo Münsterberg, Columbia University's Harry and Leta Hollingworth, and the Carnegie Institute's Walter Bingham, among others (see Benjamin & Baker, 2003).

Functionalism and its Darwinian approach to the mind found applications besides mental testing. Whereas mental *variability* was the focus of the testing movement, other strains focused on the *adaptation* of the organism to its environment. It was quickly recognized that, especially for humans, the environment is not wholly physical but also crucially involves social relations. Dewey's famous laboratory school, for instance, aimed at developing educational methods to enhance children's abilities to adapt to the rapidly changing social environment of the late 19th century. It is often forgotten that Dewey's arrival in Chicago coincided with a time when American labor strife had nearly reached the point of civil war. In July 1894 President Grover Cleveland ordered to Chicago 12,000 federal troops—nearly half of the U.S. army—in order to break the Pullman train boycott, which was rapidly shutting down

rail transportation across the country. Dewey and his circle at Chicago believed it important for psychology to address the downward spiral in relations between the rich and the poor, and between "natives" and immigrants, before the sporadic bombings and shootings came to all out war.

In addition to the laboratory school, members of Dewey's circle volunteered their time at the most famous immigrant settlement house in Chicago, Jane Addams's Hull House. There they met and befriended a young psychiatrist who had recently immigrated from Switzerland, Adolf Meyer. They taught him their evolutionist, functionalist view of psychology and the importance of adaptation to the social environment. Meyer eventually moved to a psychiatric position in Massachusetts, where he befriended William James and G. Stanley Hall. The influential clinical approach that Meyer ultimately developed was suffused with functionalist thinking, particularly the idea that mental problems often arise from poor adaptation to the social environment and from the development of ineffective habits. One of the optimistic implications of this view was that, far from being the result of inherent brain defects, many psychiatric conditions could be treated by teaching the patient more adaptive modes of behavior.

The idea that psychological problems are, at root, failures of adaptation arose in educational psychology as well. Lightner Witmer, a former student of Cattell's and Wundt's, began working with schoolchildren near the University of Pennsylvania, testing them carefully and giving them extra training in specific topics (e.g., reading, spelling). In 1896 he founded the first "psychological clinic" in America and soon launched a journal in which he called for the formation of a new field: "clinical psychology" (Witmer, 1907).

Another form of functionalist-inspired educational psychology arose at Columbia University, mainly at the hands of Edward Lee Thorndike. Thorndike had first risen to prominence with his work on animal learning (about which more below). He then co-authored a series of landmark studies of the transfer of training from one topic to another, which showed there to be little generalization (Thorndike & Woodworth, 1901). Thorndike went on to become a leading advocate for testing and empirical evidence in educational studies.

Functionalist Animal Psychology and the Birth of Behaviorism

Functionalists also promoted the comparative study of animal and human minds. In the late 19th century, a Darwinian tradition of investigating animal minds had arisen in England, led by figures such as John Lubbock (1882), George John Romanes (1881, 1883), and Conwy Lloyd Morgan (1891). The connection to evolutionary theory was clear: If humans are descendents of other animals, then there must be a continuity between the abilities of humans and those of other animals. Research in this area typically followed the approach of naturalistic observation.

Thorndike, first as a student of William James and later under Cattell at Columbia, departed from the naturalist tradition by devising equipment that would enable him to *experiment* on animal learning. The best known of these was the puzzle-box, from which cats learned to escape (Thorndike, 1898). By the time the studies were published in book form over a decade later, Thorndike (1911) had captured his results with his law of effect, now a staple of introductory psychology textbooks.

The turn of the 20th century saw the first use of white rats (Kline, 1899) and the maze (Small, 1901) in animal learning studies (both at Hall's Clark University). Other young psychologists, such as Yerkes, then at Harvard, and John Broadus Watson, then at Chicago, became interested in the psychological study of animals. During the first decade of the 20th century, when Watson was working under the supervision of Angell at Chicago, he referred to his object of study as the animal *mind* (Watson, 1907). The focus on "behavior" came later.

The idea that consciousness was an intensely problematic concept began to crystallize with the publication of James's (1904) article "Does Consciousness Exist?" Soon after, Yerkes (1907) published his landmark study *The Dancing Mouse*. Just two years after that he brought the Pavlovian scheme for modifying animal behavior to the attention of the American psychological community (Yerkes & Morgulis, 1909).

In 1908, James Mark Baldwin hired Watson at Johns Hopkins. That same year, however, Baldwin was arrested in a brothel and, when the facts became public in 1909, Baldwin was forced to resign. Watson not only took over the department, but also the editorships of Baldwin's journals, including *Psychological Review*. Just four years later, Watson (1913) published the article for which he is best known: "Psychology as the Behaviorist Views It." It is worth noting, however, that the basic "furniture" of early behaviorism was built under the sponsorship of functionalism.[3]

Conclusion

I have tried to show that Darwin's theory of evolution by means of natural selection was not merely an influence on the development of American functionalism. It was the very foundation of functionalism, intended to virtually replace the physiological underpinnings of Wundt's psychology. Furthermore, functionalism was the "nest," so to speak, in which so many different American forms of psychology were "hatched" and grew to adulthood. These include child/educational psychology, psychological testing, clinical psychology, industrial/vocational psychology, and behaviorism. Thus, natural selection is also a primary foundation of the great bulk of American psychology from

[3] Indeed, the functionalist psychiatrist Adolf Meyer provided Watson with the space in the Henry Phipps Psychiatric Clinic of the Johns Hopkins Hospital that enabled him to conduct the Little Albert study that was so important in the development of behaviorism. (Thanks to Donald Dewsbury for pointing this out to me.)

its inception up to the present.[4] In order to see all this clearly, however, one must go back to the 1860s, when Chauncey Wright accepted the theory of natural selection before almost any other significant figure in the United States and, in the 1870s, wrote an article commissioned by Darwin himself on the evolution of self-consciousness. He then passed these ideas on to William James and Charles Sanders Peirce in the Cambridge Metaphysical Club. James and Peirce, in turn, were mentors to a large portion of the next generation of American psychologists, particularly Hall, Jastrow, and Dewey.

Hall and his former student E. C. Sanford, in turn, supervised the key intelligence testers Goddard and Terman, as well as the little-known but crucial animal researchers Kline and Small. Dewey would supervise and then hire Angell, who would in turn supervise Watson. Dewey, James, and Hall would be key influences on Adolf Meyer's approach to psychiatry as well. Münsterberg, hired to Harvard by James, would supervise Yerkes. The final "anchor" in this web of relations is Cattell, who left Hall to study in Leipzig with Wundt but in the end was more deeply impressed by Galton's anthropometric program. Upon his return to the United States, Cattell supervised Witmer, Thorndike, and Woodworth. The Columbia group would then supervise the key applied psychologists Harry and Leta Hollingworth.

There are, of course, many other related figures that I cannot examine in this limited space, but one can begin to see a rather different origin and pattern of relations in the early development of American functionalist psychology than was developed and passed on by Titchener's student E. G. Boring. What I hope to have demonstrated is that functionalism was much more lively, variegated, and significant than it is usually given credit for and that it was deeply infused with Darwinian thinking.

[4] A reviewer of this article argued that "behaviorism and blank-slatism dominated American psychology for much of the 20th century—doctrines that are fundamentally antithetical to evolutionary psychology as envisioned by Darwin or William James, and as represented in modern evolutionary psychology." While it is true that modern evolutionary psychology is opposed to the "blank-slatism" (normally termed *psychological empiricism*) of some forms of behaviorism, it is not true that behaviorism was opposed to evolutionary doctrine per se. By contrast, it carried on the functionalist tradition, dating back to Baldwin, of applying the mechanism of natural selection to the appearance, selection, and transmission of behaviors themselves, not just to the underlying genotype. One can still see this idea carried on in the work of modern evolutionary luminaries such as Richard Dawkins and Daniel Dennett.

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